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

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

Estimated Canister usage:
18"x10'
5 92

II. Estimates

Radionuclide	m: Ci/MWd From Template	x_n: Nominal Fuel Burnup (MWd)[2]	x_b: Bounding Fuel Burnup (MWd)[2]	b: Initial Activity (Ci)	y_n: Nominal Fuel Inventories(Ci)	y_b: Bounding Fuel Inventories(Ci)
Ac-227	6 6313E-10	16,809 59	33,619 19	0 00E+00	1 11E-05	2 23E-05
Am-241	2.0060E-03	16,809 59	33,619 19	0 00E+00	3 37E+01	6 74E+01
Am-242m	4.2429E-07	16,809 59	33,619 19	0 00E+00	7 13E-03	1 43E-02
Am-243	1.4899E-06	16,809 59	33,619 19	0 00E+00	2 50E-02	5 01E-02
C-14	5 7135E-09	16,809 59	33,619 19	0 00E+00	9 60E-05	1 92E-04
Cl-36	1.3124E-32	16,809 59	33,619 19	0 00E+00	2 21E-28	4 41E-28
Cm-243	1 6443E-07	16,809 59	33,619 19	0 00E+00	2 76E-03	5 53E-03
Cm-244	2 9330E-05	16,809 59	33,619 19	0 00E+00	4 93E-01	9 86E-01
Co-60	5 3186E-06	16,809 59	33,619 19	0 00E+00	8 94E-02	1 79E-01
Cs-134	3 1563E-03	16,809 59	33,619 19	0 00E+00	5 31E+01	1 06E+02
Cs-135	3 4477E-06	16,809 59	33,619 19	0 00E+00	5 80E-02	1 16E-01
Cs-137	2 0313E+00	16,809 59	33,619 19	0 00E+00	3 41E+04	6 83E+04
Eu-154	2 4513E-02	16,809 59	33,619 19	0 00E+00	4 12E+02	8 24E+02
Eu-155	4 8175E-03	16,809 59	33,619 19	0 00E+00	8 10E+01	1 62E+02
Fe-55	1.2397E-04	16,809 59	33,619 19	0 00E+00	2 08E+00	4 17E+00
H-3	4 5697E-03	16,809 59	33,619 19	0 00E+00	7 68E+01	1 54E+02
I-129	7 5300E-07	16,809 59	33,619 19	0 00E+00	1.27E-02	2.53E-02
Kr-85	1 0850E-01	16,809 59	33,619 19	0 00E+00	1 82E+03	3 65E+03
Np-237	9 5561E-06	16,809 59	33,619 19	0 00E+00	1.61E-01	3.21E-01
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
Tl-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
U-233	2.5825E-09	16,809.59	33,619 19	0 00E+00	4 34E-05	8 68E-05
U-234	1.8450E-04	16,809 59	33,619 19	0 00E+00	3 10E+00	6.20E+00
U-235	-2 7235E-06	16,809 59	0 00	7 67E-02	3 09E-02	7.67E-02
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

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg MeV	
0 0150	3 549E+15
0 0250	7.380E+14
0 0375	6 437E+14
0 0575	6 894E+14
0 0850	4 166E+14
0 1250	2 819E+14
0 2250	3 595E+14
0 3750	1 565E+14
0 5750	2 552E+15
0 8500	4 315E+13
1.2500	2 464E+13
1 7500	1 131E+12
2.2500	9 921E+07
2 7500	5 609E+07
3 5000	2 579E+05
5 0000	1 467E+04
7 0000	1 620E+03
11 0000	1 816E+02

Thermal Power

Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
4.01E+02	8 01E+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 %	20	60 to 100

Basis for Parameter Drifferences:

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		16,809 59
Bounding		33 619 19

Basis for burnup used in estimate:

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

Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup
Nominal	0 30	
Bounding	0 60	

Estimated EOL HM/Given EOL HM: 1 01

[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 (U308-LEU) PERU
SNF ID #: 504
Fuel Units & Descr: 23 - ASSEMBLY
Heavy Metal Mass: BOL=32.2kg; EOL=28.98kg
ROD Storage Site: SRS

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

Estimated Canister usage: 18"x10' 0.96

II. Estimates

Radionuclide	m: Ci/MWd From Template	x_n: Nominal Fuel Burnup (MWd)[2]	x_b: Bounding Fuel Burnup (MWd)[2]	b: Initial Activity (Ci)	y_n: Nominal Fuel Inventories(Ci)	y_b: Bounding Fuel Inventories(Ci)
Ac-227	6.6313E-10	3,049.40	6,098.80	0.00E+00	2.02E-06	4.04E-06
Am-241	2.0060E-03	3,049.40	6,098.80	0.00E+00	6.12E+00	1.22E+01
Am-242m	4.2429E-07	3,049.40	6,098.80	0.00E+00	1.29E-03	2.59E-03
Am-243	1.4899E-06	3,049.40	6,098.80	0.00E+00	4.54E-03	9.09E-03
C-14	5.7135E-09	3,049.40	6,098.80	0.00E+00	1.74E-05	3.48E-05
Cl-36	1.3124E-32	3,049.40	6,098.80	0.00E+00	4.00E-29	8.00E-29
Cm-243	1.6443E-07	3,049.40	6,098.80	0.00E+00	5.01E-04	1.00E-03
Cm-244	2.9330E-05	3,049.40	6,098.80	0.00E+00	8.94E-02	1.79E-01
Co-60	5.3186E-06	3,049.40	6,098.80	0.00E+00	1.62E-02	3.24E-02
Cs-134	3.1563E-03	3,049.40	6,098.80	0.00E+00	9.62E+00	1.92E+01
Cs-135	3.4477E-06	3,049.40	6,098.80	0.00E+00	1.05E-02	2.10E-02
Cs-137	2.0313E+00	3,049.40	6,098.80	0.00E+00	6.19E+03	1.24E+04
Eu-154	2.4513E-02	3,049.40	6,098.80	0.00E+00	7.47E+01	1.49E+02
Eu-155	4.8175E-03	3,049.40	6,098.80	0.00E+00	1.47E+01	2.94E+01
Fe-55	1.2397E-04	3,049.40	6,098.80	0.00E+00	3.78E-01	7.56E-01
H-3	4.5697E-03	3,049.40	6,098.80	0.00E+00	1.39E+01	2.79E+01
I-129	7.5300E-07	3,049.40	6,098.80	0.00E+00	2.30E-03	4.59E-03
Kr-85	1.0850E-01	3,049.40	6,098.80	0.00E+00	3.31E+02	6.62E+02
Np-237	9.5561E-06	3,049.40	6,098.80	0.00E+00	2.91E-02	5.83E-02
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
Sn-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
Tl-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

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg MeV	
0.0150	6.438E+14
0.0250	1.339E+14
0.0375	1.168E+14
0.0575	1.251E+14
0.0850	7.557E+13
0.1250	5.114E+13
0.2250	6.521E+13
0.3750	2.839E+13
0.5750	4.630E+14
0.8500	7.828E+12
1.2500	4.470E+12
1.7500	2.052E+11
2.2500	1.800E+07
2.7500	1.017E+07
3.5000	4.679E+04
5.0000	2.663E+03
7.0000	2.940E+02
11.0000	3.296E+01

Thermal Power

Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
7.27E+01	1.45E+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 %	16.42857201	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		3,049.40
Bounding		6,098.80

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	0.30	
Bounding	0.60	

Estimated EOL HM/Given EOL HM: 1.01

[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) CANADA
SNF ID #: 513
Fuel Units & Descr: 35 - ASSEMBLY
Heavy Metal Mass: BOL=50 75kg EOL=45 675kg
ROD Storage Site: SRS

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

Estimated Canister usage

18"x10'
1.46

II. Estimates

Radionuclide	m: C/MWd From Template	x_n: Nominal Fuel Burnup (MWd)[2]	x_b: Bounding Fuel Burnup (MWd)[2]	b: Initial Activity (Ci)	y_n: Nominal Fuel Inventories(Ci)	y_b: Bounding Fuel Inventories(Ci)
Ac-227	6 6313E-10	4,806.12	9,612.25	0 00E+00	3 19E-06	6 37E-06
Am-241	2 0060E-03	4,806 12	9,612.25	0 00E+00	9 64E+00	1 93E+01
Am-242m	4.2429E-07	4,806 12	9,612.25	0 00E+00	2 04E-03	4 08E-03
Am-243	1.4899E-06	4,806 12	9,612 25	0 00E+00	7 16E-03	1 43E-02
C-14	5 7135E-09	4,806 12	9,612 25	0 00E+00	2 75E-05	5 49E-05
Cl-36	1.3124E-32	4,806 12	9,612 25	0 00E+00	6 31E-29	1.26E-28
Cm-243	1 6443E-07	4,806 12	9,612 25	0 00E+00	7 90E-04	1.58E-03
Cm-244	2 9330E-05	4,806 12	9,612.25	0 00E+00	1 41E-01	2 82E-01
Co-60	5 3186E-06	4,806 12	9,612.25	0 00E+00	2.56E-02	5 11E-02
Cs-134	3 1563E-03	4,806 12	9,612.25	0 00E+00	1 52E+01	3 03E+01
Cs-135	3 4477E-06	4,806 12	9,612.25	0 00E+00	1 66E-02	3 31E-02
Cs-137	2 0313E+00	4,806 12	9,612.25	0 00E+00	9 76E+03	1 95E+04
Eu-154	2 4513E-02	4,806 12	9,612.25	0 00E+00	1 18E+02	2 36E+02
Eu-155	4 8175E-03	4,806 12	9,612.25	0 00E+00	2.32E+01	4 63E+01
Fe-55	1.2397E-04	4,806 12	9,612 25	0 00E+00	5 96E-01	1.19E+00
H-3	4.5697E-03	4,806 12	9,612 25	0 00E+00	2 20E+01	4.39E+01
I-129	7.5300E-07	4,806 12	9,612 25	0 00E+00	3 62E-03	7.24E-03
Kr-85	1 0850E-01	4,806 12	9,612 25	0 00E+00	5 21E+02	1 04E+03
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
Tl-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

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg MeV	
0 0150	1 015E+15
0 0250	2.110E+14
0 0375	1 840E+14
0 0575	1 971E+14
0 0850	1.191E+14
0 1250	8 060E+13
0 2250	1 028E+14
0 3750	4 474E+13
0 5750	7.298E+14
0 8500	1.234E+13
1.2500	7 045E+12
1 7500	3.234E+11
2.2500	2.836E+07
2 7500	1 604E+07
3 5000	7.374E+04
5 0000	4 195E+03
7 0000	4 633E+02
11 0000	5 193E+01

Thermal Power

Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
1.15E+02	2.29E+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 %:	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		4 806 12
Bounding		9 612.25

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	0.30	
Bounding	0 60	

Estimated EOL HM/Given EOL HM: 1 01

[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) GERMANY
SNF ID #: 519
Fuel Units & Descr: 97 - ASSEMBLY
Heavy Metal Mass: BOL=155.2kg; EOL=131 804kg
ROD Storage Site: SRS

[1]Fuel decay start date: 2010
Estimates as of: 2030
Template: TRIGA-Al (LW/U-Zrx, Alum., 10 to 20%, U)
[2]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

Radionuclide	m: C/MWd From Template	x_n: Nominal Fuel Burnup (MWd)[2]	x_b: Bounding Fuel Burnup (MWd)[2]	b: Initial Activity (Ci)	y_n: Nominal Fuel Inventories(Ci)	y_b: Bounding Fuel Inventories(Ci)
Ac-227	2 4556E-09	22,332 30	44,664 59	0 00E+00	5 48E-05	1 10E-04
Am-241	3 8752E-03	22,332.30	44,664 59	0 00E+00	8 65E+01	1 73E+02
Am-242m	1 8617E-06	22,332.30	44,664 59	0 00E+00	4 16E-02	8 32E-02
Am-243	2 3293E-07	22,332.30	44,664 59	0 00E+00	5 20E-03	1 04E-02
C-14	4 3233E-05	22,332.30	44,664 59	0 00E+00	9 65E-01	1 93E+00
Cl-36	4 3023E-08	22,332.30	44,664 59	0 00E+00	9 61E-04	1 92E-03
Cm-243	1 9053E-07	22,332.30	44,664 59	0 00E+00	4 25E-03	8 51E-03
Cm-244	1 7744E-06	22,332.30	44,664 59	0 00E+00	3 96E-02	7 93E-02
Co-60	4 3188E-03	22,332 30	44,664 59	0 00E+00	9 64E+01	1 93E+02
Cs-134	6 7188E-04	22,332.30	44,664 59	0 00E+00	1 50E+01	3 00E+01
Cs-135	3 1549E-05	22,332 30	44,664 59	0 00E+00	7 05E-01	1.41E+00
Cs-137	1 9489E+00	22,332.30	44,664 59	0 00E+00	4 35E+04	8.70E+04
Eu-154	4 0301E-01	22,332.30	44,664 59	0 00E+00	9 00E+03	1 80E+04
Eu-155	5 4000E-02	22,332 30	44,664 59	0 00E+00	1.21E+03	2.41E+03
Fe-55	1 5955E-04	22,332.30	44,664 59	0 00E+00	3 56E+00	7.13E+00
H-3	4 6571E-03	22,332 30	44,664 59	0 00E+00	1.04E+02	2 08E+02
I-129	7 3805E-07	22,332 30	44,664 59	0 00E+00	1 65E-02	3.30E-02
Kr-85	9 5684E-02	22,332 30	44,664 59	0 00E+00	2.14E+03	4.27E+03
Np-237	1 4618E-06	22,332 30	44,664.59	0 00E+00	3.26E-02	6.53E-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

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg MeV	
0 0150	4 584E+15
0 0250	9 465E+14
0 0375	9 907E+14
0 0575	9 157E+14
0 0850	5.575E+14
0 1250	6.258E+14
0 2250	5.052E+14
0 3750	2.076E+14
0 5750	3.307E+15
0 8500	3.519E+14
1.2500	3 791E+14
1 7500	1 136E+13
2.2500	1 800E+08
2 7500	2.996E+07
3 5000	2 051E+05
5 0000	2.520E+04
7 0000	2 845E+03
11 0000	3.235E+02

Thermal Power

Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
5 80E+02	1 16E+03
Total	Total

III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary

	From SFD	Used
Reactor Moderator	LW AND U ZIRC HYDRIDE	LW AND U ZIRC HYDRIDE
Fuel Cladding	ALUM	ALUM
BOL HM Constituents.	U	U
BOL Enrichment %:	19 99999963	10 to 20 1

Basis for Parameter Drifferences:

Burnup Summary (MWd)[2]

	From SFD	Estimated	Basis for burnup used in estimate:
Nominal:		22,332.30	Nominal burnup calculated from the heavy metal mass destroyed.
Bounding:		44 664.59	Bounding burnup assumed to be twice nominal burnup.

Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup	Estimated EOL HM/Given EOL HM
Nominal	3 89		1 00
Bounding	7 79		

[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) GERMANY
SNF ID #: 1067
Fuel Units & Descr: 7 - ASSEMBLY
Heavy Metal Mass: BOL=14 7kg, EOL=12.936kg
ROD Storage Site: SRS

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

Estimated Canister usage: 18"x10" = 0 29

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)
							Avg MeV	
Ac-227	6 6313E-10	1,670 54	3,341 08	0 00E+00	1 11E-06	2.22E-06	0 0150	3.527E+14
Am-241	2 0060E-03	1,670 54	3,341 08	0 00E+00	3 35E+00	6 70E+00	0 0250	7.334E+13
Am-242m	4.2429E-07	1,670.54	3,341 08	0 00E+00	7.09E-04	1 42E-03	0 0375	6 397E+13
Am-243	1.4899E-06	1,670 54	3,341 08	0 00E+00	2.49E-03	4 98E-03	0 0575	6 851E+13
C-14	5 7135E-09	1,670 54	3,341 08	0 00E+00	9 54E-06	1 91E-05	0 0850	4 140E+13
Cl-36	1.3124E-32	1,670 54	3,341 08	0 00E+00	2 19E-29	4 38E-29	0 1250	2.802E+13
Cm-243	1 6443E-07	1,670 54	3,341.08	0 00E+00	2 75E-04	5 49E-04	0.2250	3 572E+13
Cm-244	2 9330E-05	1,670 54	3,341.08	0 00E+00	4 90E-02	9 80E-02	0 3750	1.555E+13
Co-60	5 3186E-06	1,670 54	3,341 08	0 00E+00	8 88E-03	1 78E-02	0.5750	2.537E+14
Cs-134	3 1563E-03	1,670 54	3,341 08	0 00E+00	5 27E+00	1 05E+01	0 8500	4.289E+12
Cs-135	3 4477E-06	1,670.54	3,341 08	0.00E+00	5 76E-03	1 15E-02	1.2500	2 449E+12
Cs-137	2.0313E+00	1,670 54	3,341 08	0.00E+00	3.39E+03	6 79E+03	1 7500	1 124E+11
Eu-154	2 4513E-02	1,670 54	3,341 08	0 00E+00	4 09E+01	8 19E+01	2.2500	9 859E+06
Eu-155	4 8175E-03	1,670 54	3,341 08	0 00E+00	8 05E+00	1 61E+01	2.7500	5.574E+06
Fe-55	1 2397E-04	1,670 54	3,341 08	0 00E+00	2 07E-01	4 14E-01	3.5000	2.563E+04
H-3	4 5697E-03	1,670 54	3,341.08	0 00E+00	7 63E+00	1.53E+01	5.0000	1 456E+03
I-129	7 5300E-07	1,670 54	3,341.08	0 00E+00	1.26E-03	2 52E-03	7 0000	1 608E+02
Kr-85	1 0850E-01	1,670 54	3,341 08	0 00E+00	1 81E+02	3 62E+02	11 0000	1 803E+01
Np-237	9 5561E-06	1,670 54	3,341 08	0 00E+00	1 60E-02	3 19E-02		
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		
Tl-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		

Thermal Power	
Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
3 98E+01	7.96E+01
Total	Total

III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary

	From SFD	Used
Reactor Moderator	LIGHT WATER	LIGHT WATER
Fuel Cladding	ALUM	ALUM
BOL HM Constituents	U	U
BOL Enrichment %	20 00000028	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		1 670.54
Bounding		3,341 08

Basis for burnup used in estimate:

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

Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup
Nominal	0.36	
Bounding	0 72	

Estimated EOL HM/Given EOL HM: 1 01

[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

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

Estimated Canister usage: 18"x10' 2 79

II. Estimates

	m	x_a	x_b	b	y_a	y_b
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	6,332 34	12,664 68	0 00E+00	4.20E-06	8 40E-06
Am-241	2 0060E-03	6,332.34	12,664 68	0 00E+00	1.27E+01	2 54E+01
Am-242m	4 2429E-07	6,332.34	12,664 68	0 00E+00	2 69E-03	5 37E-03
Am-243	1 4899E-06	6,332.34	12,664 68	0 00E+00	9 43E-03	1 89E-02
C-14	5 7135E-09	6,332 34	12,664 68	0 00E+00	3 62E-05	7 24E-05
Cl-36	1 3124E-32	6,332 34	12,664 68	0 00E+00	8 31E-29	1 66E-28
Cm-243	1 6443E-07	6,332 34	12,664 68	0 00E+00	1 04E-03	2 08E-03
Cm-244	2 9330E-05	6,332 34	12,664 68	0 00E+00	1 86E-01	3 71E-01
Co-60	5 3186E-06	6,332 34	12,664 68	0 00E+00	3 37E-02	6 74E-02
Cs-134	3 1563E-03	6,332 34	12,664 68	0 00E+00	2 00E+01	4 00E+01
Cs-135	3 4477E-06	6,332 34	12,664 68	0 00E+00	2 18E-02	4.37E-02
Cs-137	2 0313E+00	6,332 34	12 664 68	0 00E+00	1.29E+04	2 57E+04
Eu-154	2 4513E-02	6,332.34	12,664 68	0 00E+00	1 55E+02	3 10E+02
Eu-155	4 8175E-03	6,332.34	12,664 68	0 00E+00	3 05E+01	6 10E+01
Fe-55	1.2397E-04	6,332.34	12,664 68	0 00E+00	7 85E-01	1 57E+00
H-3	4 5697E-03	6,332.34	12,664 68	0 00E+00	2 89E+01	5 79E+01
I-129	7 5300E-07	6,332.34	12,664 68	0 00E+00	4.77E-03	9 54E-03
Kr-85	1 0850E-01	6,332 34	12,664 68	0 00E+00	6 87E+02	1 37E+03
Np-237	9 5561E-06	6,332 34	12,664 68	0 00E+00	6 05E-02	1 21E-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
Sn-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
Tl-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

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg. MeV	
0 0150	1.337E+15
0 0250	2 780E+14
0 0375	2.425E+14
0 0575	2.597E+14
0 0850	1 569E+14
0 1250	1 062E+14
0.2250	1 354E+14
0.3750	5 895E+13
0 5750	9 615E+14
0 8500	1 626E+13
1.2500	9.282E+12
1 7500	4.260E+11
2.2500	3 737E+07
2.7500	2 113E+07
3 5000	9 716E+04
5 0000	5.532E+03
7 0000	6 109E+02
11 0000	6.848E+01

Thermal Power

Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
1.51E+02	3 02E+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 %	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		6,332 34
Bounding		12 664 68

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	0.27	
Bounding	0 54	

Estimated EOL HM/Given EOL HM: 1 01

[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) JAPAN
SNF ID #: 506
Fuel Units & Descr: 70 - ASSEMBLY
Heavy Metal Mass: BOL=73 5kg EOL=70 413kg
ROD Storage Site: SRS

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

Estimated Canister usage 18"x10': 2 92

II. Estimates

Radionuclide	m: C/MWd From Template	x_n: Nominal Fuel Burnup (MWd)[2]	x_b: Bounding Fuel Burnup (MWd)[2]	b: Initial Activity (Ci)	y_n: Nominal Fuel Inventories(Ci)	y_b: Bounding Fuel Inventories(Ci)
Ac-227	6 6313E-10	2,923 45	5,846 90	0 00E+00	1.94E-06	3 88E-06
Am-241	2 0060E-03	2,923 45	5,846 90	0 00E+00	5 86E+00	1 17E+01
Am-242m	4 2429E-07	2,923 45	5,846 90	0 00E+00	1.24E-03	2 48E-03
Am-243	1 4899E-06	2,923 45	5,846 90	0 00E+00	4.36E-03	8 71E-03
C-14	5 7135E-09	2,923 45	5,846 90	0 00E+00	1 67E-05	3 34E-05
Cl-36	1.3124E-32	2,923 45	5,846 90	0 00E+00	3 84E-29	7.67E-29
Cm-243	1.6443E-07	2,923 45	5,846 90	0 00E+00	4 81E-04	9 61E-04
Cm-244	2.9330E-05	2,923 45	5,846 90	0 00E+00	8 57E-02	1 71E-01
Co-60	5 3186E-06	2,923 45	5,846 90	0 00E+00	1 55E-02	3 11E-02
Cs-134	3 1563E-03	2,923 45	5,846 90	0 00E+00	9 23E+00	1 85E+01
Cs-135	3 4477E-06	2,923 45	5,846.90	0 00E+00	1 01E-02	2 02E-02
Cs-137	2 0313E+00	2,923 45	5,846 90	0 00E+00	5 94E+03	1 19E+04
Eu-154	2 4513E-02	2,923 45	5,846 90	0 00E+00	7.17E+01	1 43E+02
Eu-155	4 8175E-03	2,923 45	5,846 90	0 00E+00	1.41E+01	2 82E+01
Fe-55	1.2397E-04	2,923 45	5,846 90	0 00E+00	3 62E-01	7.25E-01
H-3	4.5697E-03	2,923 45	5,846 90	0 00E+00	1.34E+01	2.67E+01
I-129	7.5300E-07	2,923 45	5,846 90	0 00E+00	2 20E-03	4 40E-03
Kr-85	1 0850E-01	2,923 45	5,846 90	0 00E+00	3 17E+02	6 34E+02
Np-237	9 5561E-06	2,923 45	5,846 90	0 00E+00	2 79E-02	5 59E-02
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
Tl-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

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg MeV	
0 0150	6 172E+14
0 0250	1.283E+14
0 0375	1 119E+14
0 0575	1 199E+14
0 0850	7.245E+13
0 1250	4 903E+13
0.2250	6.252E+13
0 3750	2.721E+13
0 5750	4 439E+14
0 8500	7.505E+12
1.2500	4.285E+12
1.7500	1.967E+11
2.2500	1 725E+07
2 7500	9 754E+06
3.5000	4 491E+04
5 0000	2.578E+03
7 0000	2.848E+02
11 0000	3 194E+01

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

	From SFD	Used
Reactor Moderator	LIGHT WATER	LIGHT WATER
Fuel Cladding	ALUM	ALUM
BOL HM Constituents	U	U
BOL Enrichment %	20 00000028	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		2,923 45
Bounding		5,846.90

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 13	
Bounding	0.25	

Estimated EOL HM/Given EOL HM: 1 00

[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) JAPAN
SNF ID #: 508
Fuel Units & Descr: 149 - ASSEMBLY
Heavy Metal Mass: BOL=205 62kg; EOL=193.283kg
ROD Storage Site: SRS

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

Estimated Canister usage: 18"x10" = 6 21

II. Estimates

	m	x_n	x_b	b	y_n	y_b
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	11,683 57	23,367 15	0 00E+00	7 75E-06	1 55E-05
Am-241	2.0060E-03	11,683 57	23,367 15	0 00E+00	2 34E+01	4 69E+01
Am-242m	4.2429E-07	11,683 57	23,367.15	0 00E+00	4 96E-03	9 91E-03
Am-243	1 4899E-06	11,683.57	23,367 15	0 00E+00	1 74E-02	3 48E-02
C-14	5 7135E-09	11,683.57	23,367 15	0 00E+00	6 68E-05	1.34E-04
Cl-36	1.3124E-32	11,683.57	23,367.15	0 00E+00	1 53E-28	3 07E-28
Cm-243	1 6443E-07	11,683.57	23,367.15	0 00E+00	1 92E-03	3 84E-03
Cm-244	2 9330E-05	11,683.57	23,367.15	0 00E+00	3 43E-01	6.85E-01
Co-60	5 3186E-06	11,683.57	23,367.15	0 00E+00	6 21E-02	1.24E-01
Cs-134	3 1563E-03	11 683 57	23,367.15	0 00E+00	3 69E+01	7 38E+01
Cs-135	3 4477E-06	11,683 57	23,367.15	0 00E+00	4 03E-02	8 06E-02
Cs-137	2 0313E+00	11,683 57	23,367.15	0 00E+00	2 37E+04	4 75E+04
Eu-154	2 4513E-02	11,683 57	23,367.15	0 00E+00	2 86E+02	5 73E+02
Eu-155	4 8175E-03	11,683 57	23,367.15	0 00E+00	5 63E+01	1 13E+02
Fe-55	1 2397E-04	11,683 57	23,367 15	0 00E+00	1 45E+00	2 90E+00
H-3	4 5697E-03	11,683 57	23,367 15	0 00E+00	5.34E+01	1 07E+02
I-129	7 5300E-07	11,683 57	23,367 15	0 00E+00	8 80E-03	1 76E-02
Kr-85	1 0850E-01	11,683 57	23,367 15	0 00E+00	1.27E+03	2 54E+03
Np-237	9 5561E-06	11,683 57	23,367 15	0 00E+00	1.12E-01	2 23E-01
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
Tl-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

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg MeV	
0 0150	2 467E+15
0 0250	5 129E+14
0 0375	4 474E+14
0 0575	4 792E+14
0 0850	2.896E+14
0 1250	1 959E+14
0.2250	2 498E+14
0 3750	1.088E+14
0 5750	1 774E+15
0 8500	2.999E+13
1.2500	1 713E+13
1 7500	7.861E+11
2.2500	6 895E+07
2 7500	3 898E+07
3.5000	1 794E+05
5.0000	1 025E+04
7 0000	1 132E+03
11.0000	1 269E+02

Thermal Power

Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
2.79E+02	5 57E+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 %	19 99999957	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		11 683.57
Bounding		23,367 15

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

[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) NETHERLANDS	[1]Fuel decay start date	2010
SNF ID #	510	Estimates as of	2030
Fuel Units & Descr	43 - ASSEMBLY	Template	ATR (Light Water, Alum , 60 to 100%, U)
Heavy Metal Mass	BOL=64.5kg EOL=56 76kg	[2]Template Burnup(MWd)	367.2
ROD Storage Site	SRS	Template BOL Heavy Metal Mass (MT)	0 00116689
		Template Decay Time	20 years

Estimated Canister usage 18"x10'
1 79

II. Estimates

Radionuclide	m Ci/MWd From Template	x_n Nominal Fuel Burnup (MWd)[2]	x_b Bounding Fuel Burnup (MWd)[2]	b Initial Activity (Ci)	y_n Nominal Fuel Inventories(Ci)	y_b Bounding Fuel Inventories(Ci)
Ac-227	6 6313E-10	7,329 93	14,659 86	0 00E+00	4 86E-06	9 72E-06
Am-241	2 0060E-03	7,329 93	14,659 86	0 00E+00	1 47E+01	2.94E+01
Am-242m	4 2429E-07	7,329 93	14,659 86	0 00E+00	3 11E-03	6.22E-03
Am-243	1 4899E-06	7,329 93	14,659 86	0 00E+00	1 09E-02	2 18E-02
C-14	5 7135E-09	7,329 93	14,659 86	0 00E+00	4 19E-05	8 38E-05
Cl-36	1.3124E-32	7,329 93	14,659 86	0 00E+00	9 62E-29	1 92E-28
Cm-243	1 6443E-07	7,329 93	14,659 86	0 00E+00	1.21E-03	2 41E-03
Cm-244	2 9330E-05	7,329 93	14,659 86	0 00E+00	2.15E-01	4 30E-01
Co-60	5 3186E-06	7,329 93	14,659 86	0 00E+00	3 90E-02	7 80E-02
Cs-134	3 1563E-03	7,329 93	14,659 86	0 00E+00	2 31E+01	4 63E+01
Cs-135	3 4477E-06	7,329 93	14,659 86	0 00E+00	2.53E-02	5 05E-02
Cs-137	2 0313E+00	7,329 93	14,659 86	0 00E+00	1 49E+04	2 98E+04
Eu-154	2 4513E-02	7,329 93	14,659 86	0 00E+00	1.80E+02	3 59E+02
Eu-155	4 8175E-03	7,329 93	14,659 86	0 00E+00	3.53E+01	7 06E+01
Fe-55	1.2397E-04	7,329 93	14,659 86	0 00E+00	9 09E-01	1.82E+00
H-3	4.5697E-03	7,329 93	14,659 86	0 00E+00	3.35E+01	6 70E+01
I-129	7.5300E-07	7,329 93	14,659 86	0 00E+00	5 52E-03	1 10E-02
Kr-85	1 0850E-01	7,329 93	14,659 86	0 00E+00	7 95E+02	1.59E+03
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
Tl-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

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg MeV	
0 0150	1 547E+15
0 0250	3.218E+14
0 0375	2.807E+14
0 0575	3 006E+14
0 0850	1.817E+14
0 1250	1.229E+14
0.2250	1.567E+14
0 3750	6.823E+13
0 5750	1 113E+15
0 8500	1.882E+13
1 2500	1 074E+13
1 7500	4 932E+11
2.2500	4.326E+07
2 7500	2 446E+07
3.5000	1 124E+05
5 0000	6 390E+03
7.0000	7 056E+02
11 0000	7 910E+01

Thermal Power

Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
1 75E+02	3 49E+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 %	20 00000079	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		7,329 93
Bounding		14 659.86

Basis for burnup used in estimate

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

Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup
Nominal	0.36	
Bounding	0 72	

Estimated EOL HM/Given EOL HM: 1 01

[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

[1]Fuel decay start date: 2010
Estimates as of: 2030
Template: ATR (Light Water, Alum , 60 to 100%, U)
[2]Template Burnup(MWd): 367 2
Template BOL Heavy Metal Mass (MT): 0 00116689
Template Decay Time: 20 years

Estimated Canister usage: 18"x10" = 1.33

II. Estimates

Radionuclide	m: Ci/MWd From Template	x_n: Nominal Fuel Burnup (MWd)[2]	x_b: Bounding Fuel Burnup (MWd)[2]	b: Initial Activity (Ci)	y_n: Nominal Fuel Inventories(Ci)	y_b: Bounding Fuel Inventories(Ci)
Ac-227	6 6313E-10	7,636 76	15,273 53	0 00E+00	5 06E-06	1.01E-05
Am-241	2 0060E-03	7,636 76	15,273 53	0 00E+00	1.53E+01	3 06E+01
Am-242m	4.2429E-07	7,636 76	15,273 53	0 00E+00	3.24E-03	6.48E-03
Am-243	1 4899E-06	7,636.76	15,273.53	0 00E+00	1.14E-02	2.28E-02
C-14	5.7135E-09	7,636.76	15,273.53	0 00E+00	4 36E-05	8.73E-05
Cl-36	1.3124E-32	7,636.76	15,273.53	0 00E+00	1 00E-28	2 00E-28
Cm-243	1 6443E-07	7,636 76	15,273.53	0 00E+00	1.26E-03	2 51E-03
Cm-244	2 9330E-05	7,636 76	15,273.53	0 00E+00	2.24E-01	4 48E-01
Co-60	5.3186E-06	7,636.76	15,273.53	0 00E+00	4 06E-02	8.12E-02
Cs-134	3.1563E-03	7,636.76	15,273.53	0 00E+00	2 41E+01	4 82E+01
Cs-135	3.4477E-06	7,636.76	15,273.53	0 00E+00	2.63E-02	5.27E-02
Cs-137	2.0313E+00	7,636.76	15,273.53	0 00E+00	1 55E+04	3 10E+04
Eu-154	2 4513E-02	7,636.76	15,273.53	0 00E+00	1.87E+02	3.74E+02
Eu-155	4 8175E-03	7,636.76	15,273.53	0 00E+00	3 68E+01	7.36E+01
Fe-55	1.2397E-04	7,636.76	15,273.53	0 00E+00	9 47E-01	1 89E+00
H-3	4.5697E-03	7,636.76	15,273.53	0 00E+00	3 49E+01	6 98E+01
I-129	7.5300E-07	7,636.76	15,273.53	0 00E+00	5.75E-03	1 15E-02
Kr-85	1.0850E-01	7,636.76	15,273.53	0 00E+00	8.29E+02	1 66E+03
Np-237	9 5561E-06	7,636.76	15,273.53	0 00E+00	7.30E-02	1.46E-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
Tl-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
U-233	2 5825E-09	7,636.76	15,273 53	0 00E+00	1.97E-05	3.94E-05
U-234	1 8450E-04	7,636.76	15,273 53	0 00E+00	1 41E+00	2 82E+00
U-235	-2.7235E-06	7,636.76	0 00	2 90E-02	8.24E-03	2.90E-02
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

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg. MeV	
0 0150	1 612E+15
0 0250	3 353E+14
0 0375	2 924E+14
0 0575	3 132E+14
0 0850	1 893E+14
0 1250	1 281E+14
0.2250	1 633E+14
0.3750	7 109E+13
0.5750	1 160E+15
0 8500	1 960E+13
1.2500	1 119E+13
1 7500	5 138E+11
2.2500	4 507E+07
2 7500	2 548E+07
3 5000	1 171E+05
5 0000	6 658E+03
7 0000	7 351E+02
11 0000	8 241E+01

Thermal Power

Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
1 82E+02	3 64E+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 %	20 00000028	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		7 636 76
Bounding		15 273 53

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	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 (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

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

Estimated Canister usage 18"x10': 0 88

II. Estimates

Radionuclide	m Ci/MWd From Template	x_n Nominal Fuel Burnup (MWd)[2]	x_b Bounding Fuel Burnup (MWd)[2]	b Initial Activity (Ci)	y_n Nominal Fuel Inventories(Ci)	y_b Bounding Fuel Inventories(Ci)
Ac-227	6 6313E-10	1,481 61	2,963.22	0 00E+00	9.82E-07	1 96E-06
Am-241	2 0060E-03	1,481 61	2,963.22	0 00E+00	2 97E+00	5 94E+00
Am-242m	4.2429E-07	1,481 61	2,963 22	0 00E+00	6.29E-04	1.26E-03
Am-243	1.4899E-06	1,481 61	2,963 22	0 00E+00	2 21E-03	4 41E-03
C-14	5 7135E-09	1,481 61	2,963 22	0 00E+00	8 47E-06	1.69E-05
Cl-36	1.3124E-32	1,481 61	2,963 22	0 00E+00	1 94E-29	3 89E-29
Cm-243	1 6443E-07	1,481.61	2,963 22	0 00E+00	2 44E-04	4 87E-04
Cm-244	2 9330E-05	1,481.61	2,963 22	0 00E+00	4.35E-02	8 69E-02
Co-60	5.3186E-06	1,481 61	2,963.22	0 00E+00	7 88E-03	1 58E-02
Cs-134	3 1563E-03	1,481 61	2,963.22	0 00E+00	4 68E+00	9 35E+00
Cs-135	3 4477E-06	1,481 61	2,963.22	0 00E+00	5 11E-03	1 02E-02
Cs-137	2 0313E+00	1,481 61	2,963.22	0 00E+00	3 01E+03	6 02E+03
Eu-154	2 4513E-02	1,481 61	2,963 22	0 00E+00	3 63E+01	7.26E+01
Eu-155	4 8175E-03	1,481 61	2,963 22	0 00E+00	7 14E+00	1.43E+01
Fe-55	1.2397E-04	1,481 61	2,963 22	0 00E+00	1 84E-01	3 67E-01
H-3	4 5697E-03	1,481 61	2,963 22	0 00E+00	6 77E+00	1 35E+01
I-129	7 5300E-07	1,481.61	2,963.22	0 00E+00	1.12E-03	2 23E-03
Kr-85	1 0850E-01	1,481.61	2,963.22	0 00E+00	1 61E+02	3 22E+02
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
Tl-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	0 00	8 90E-03	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	0 00	1 04E-04	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
Other Radionuclides					2 87E+03	5 73E+03

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg MeV	
0 0150	3 128E+14
0 0250	6 504E+13
0.0375	5 673E+13
0 0575	6 076E+13
0 0850	3.672E+13
0 1250	2.485E+13
0 2250	3 168E+13
0 3750	1.379E+13
0 5750	2.250E+14
0.8500	3.803E+12
1.2500	2.172E+12
1 7500	9 968E+10
2.2500	8 744E+06
2 7500	4.943E+06
3 5000	2.271E+04
5 0000	1.284E+03
7 0000	1 417E+02
11.0000	1.589E+01

Thermal Power

Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
3 53E+01	7.06E+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 %	92.99999478	60 to 100

Basis for Parameter Differences

Burnup Summary (MWd)[2]

	From SFD	Estimated
Nominal		1,481 61
Bounding		2,963.22

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	1 06	
Bounding	2 13	

Estimated EOL HM/Given EOL HM: 1 03

[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) GERMANY
SNF ID #: 582
Fuel Units & Descr: 1 - MTR TYPE
Heavy Metal Mass: BOL=0 176kg; EOL=0 126kg
ROD Storage Site: SRS

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

Estimated Canister usage: 18"x10" 0 04

II. Estimates

	m	x_n	x_b	b	y_n	y_b
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	48 11	96.22	0 00E+00	3.19E-08	6 38E-08
Am-241	2 0060E-03	48 11	96.22	0 00E+00	9 65E-02	1 93E-01
Am-242m	4 2429E-07	48 11	96.22	0 00E+00	2 04E-05	4 08E-05
Am-243	1 4899E-06	48 11	96.22	0 00E+00	7 17E-05	1 43E-04
C-14	5 7135E-09	48 11	96.22	0 00E+00	2 75E-07	5 50E-07
Cl-36	1 3124E-32	48 11	96.22	0 00E+00	6 31E-31	1 26E-30
Cm-243	1 6443E-07	48 11	96.22	0 00E+00	7 91E-06	1 58E-05
Cm-244	2 9330E-05	48 11	96 22	0 00E+00	1 41E-03	2 82E-03
Co-60	5.3186E-06	48.11	96 22	0 00E+00	2 56E-04	5 12E-04
Cs-134	3.1563E-03	48 11	96 22	0 00E+00	1 52E-01	3 04E-01
Cs-135	3 4477E-06	48 11	96 22	0 00E+00	1 66E-04	3 32E-04
Cs-137	2.0313E+00	48 11	96 22	0 00E+00	9 77E+01	1 95E+02
Eu-154	2 4513E-02	48 11	96 22	0 00E+00	1 18E+00	2.36E+00
Eu-155	4 8175E-03	48 11	96 22	0 00E+00	2 32E-01	4 64E-01
Fe-55	1.2397E-04	48 11	96 22	0 00E+00	5 96E-03	1.19E-02
H-3	4 5697E-03	48 11	96.22	0 00E+00	2.20E-01	4 40E-01
I-129	7 5300E-07	48 11	96.22	0 00E+00	3 62E-05	7.25E-05
Kr-85	1 0850E-01	48 11	96.22	0 00E+00	5.22E+00	1 04E+01
Np-237	9 5561E-06	48 11	96.22	0 00E+00	4 60E-04	9 19E-04
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
Tl-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

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg MeV	
0 0150	1 016E+13
0 0250	2 112E+12
0 0375	1 842E+12
0 0575	1 973E+12
0 0850	1 192E+12
0 1250	8 068E+11
0 2250	1 029E+12
0 3750	4 478E+11
0.5750	7.305E+12
0 8500	1.235E+11
1.2500	7 052E+10
1 7500	3.237E+09
2.2500	2.839E+05
2.7500	1 605E+05
3.5000	7 374E+02
5.0000	4 169E+01
7 0000	4 602E+00
11 0000	5 158E-01

Thermal Power

Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
1.15E+00	2.29E+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 %	92.99999263	60 to 100

Basis for Parameter Drfferences:

Burnup Summary (MWd)[2]

	From SFD	Estimated
Nominal		48 11
Bounding		96.22

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 87	
Bounding	1 73	

Estimated EOL HM/Given EOL HM: 1 02

[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) GERMANY
SNF ID #: 584
Fuel Units & Descr: 44 - MTR TYPE
Heavy Metal Mass: BOL=8 136kg EOL=5 944kg
ROD Storage Site: SRS

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

Estimated Canister usage:

18"x10"
1 83

II. Estimates

Radionuclide	m: Ci/MWd From Template	x_n: Nominal Fuel Burnup (MWd)[2]	x_b: Bounding Fuel Burnup (MWd)[2]	b: Initial Activity (Ci)	y_n: Nominal Fuel Inventories(Ci)	y_b: Bounding Fuel Inventories(Ci)
Ac-227	6 6313E-10	2,075 11	4,150 22	0 00E+00	1.38E-06	2 75E-06
Am-241	2 0060E-03	2,075 11	4,150 22	0 00E+00	4.16E+00	8.33E+00
Am-242m	4.2429E-07	2,075 11	4,150 22	0 00E+00	8 80E-04	1 76E-03
Am-243	1 4899E-06	2,075 11	4,150 22	0 00E+00	3 09E-03	6 18E-03
C-14	5 7135E-09	2,075 11	4,150 22	0 00E+00	1 19E-05	2 37E-05
Cl-36	1.3124E-32	2,075 11	4,150.22	0 00E+00	2 72E-29	5 45E-29
Cm-243	1 6443E-07	2,075 11	4,150 22	0 00E+00	3 41E-04	6 82E-04
Cm-244	2 9330E-05	2,075 11	4,150 22	0 00E+00	6 09E-02	1 22E-01
Co-60	5 3186E-06	2,075 11	4,150.22	0 00E+00	1 10E-02	2 21E-02
Cs-134	3 1563E-03	2,075 11	4,150.22	0 00E+00	6 55E+00	1 31E+01
Cs-135	3 4477E-06	2,075 11	4,150.22	0 00E+00	7 15E-03	1.43E-02
Cs-137	2 0313E+00	2,075 11	4,150.22	0 00E+00	4 22E+03	8 43E+03
Eu-154	2 4513E-02	2,075 11	4,150.22	0 00E+00	5 09E+01	1 02E+02
Eu-155	4 8175E-03	2,075.11	4,150.22	0 00E+00	1 00E+01	2 00E+01
Fe-55	1.2397E-04	2,075 11	4,150.22	0 00E+00	2.57E-01	5 14E-01
H-3	4 5697E-03	2,075 11	4,150 22	0 00E+00	9 48E+00	1.90E+01
I-129	7.5300E-07	2,075 11	4,150 22	0 00E+00	1.56E-03	3 13E-03
Kr-85	1 0850E-01	2,075 11	4,150 22	0 00E+00	2.25E+02	4.50E+02
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
Tl-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
U-233	2 5825E-09	2,075 11	4,150 22	0 00E+00	5 36E-06	1 07E-05
U-234	1 8450E-04	2,075 11	4,150 22	0 00E+00	3 83E-01	7 66E-01
U-235	-2.7235E-06	2,075 11	0 00	1.64E-02	1 07E-02	1 64E-02
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

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg MeV	
0 0150	4.381E+14
0 0250	9 110E+13
0 0375	7 946E+13
0 0575	8 510E+13
0 0850	5 143E+13
0 1250	3 480E+13
0 2250	4 438E+13
0 3750	1.932E+13
0 5750	3 151E+14
0 8500	5.327E+12
1.2500	3.042E+12
1 7500	1.396E+11
2.2500	1.225E+07
2 7500	6 924E+06
3.5000	3 181E+04
5 0000	1 798E+03
7.0000	1 985E+02
11 0000	2 225E+01

Thermal Power

Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
4 95E+01	9.89E+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 00001838	60 to 100

Basis for Parameter Differences:

Burnup Summary (MWd)[2]

	From SFD	Estimated	Basis for burnup used in estimate:
Nominal		2,075 11	Nominal burnup calculated from the heavy metal mass destroyed
Bounding		4 150.22	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

[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) GERMANY
SNF ID #: 585
Fuel Units & Descr: 50 - MTR TYPE
Heavy Metal Mass: BOL=9 675kg; EOL=4 635kg
ROD Storage Site: SRS

[1]Fuel decay start date: 2010
Estimates as of: 2030
Template: TRIGA-Al (LW/U-Zrx, Alum , 10 to 20%, U)
[2]Template 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_n	y_b
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 4556E-09	4,810 77	9,234 97	0.00E+00	1 18E-05	2.27E-05
Am-241	3 8752E-03	4,810 77	9,234 97	0 00E+00	1 86E+01	3 58E+01
Am-242m	1 8617E-06	4,810 77	9,234 97	0 00E+00	8 96E-03	1.72E-02
Am-243	2 3293E-07	4,810 77	9,234 97	0 00E+00	1.12E-03	2 15E-03
C-14	4 3233E-05	4,810 77	9,234 97	0 00E+00	2 08E-01	3.99E-01
Cl-36	4 3023E-08	4,810 77	9,234 97	0 00E+00	2 07E-04	3 97E-04
Cm-243	1 9053E-07	4,810.77	9,234 97	0 00E+00	9 17E-04	1 76E-03
Cm-244	1 7744E-06	4,810.77	9,234 97	0 00E+00	8 54E-03	1 64E-02
Co-60	4 3188E-03	4,810.77	9,234 97	0 00E+00	2 08E+01	3 99E+01
Cs-134	6 7188E-04	4,810 77	9,234 97	0 00E+00	3 23E+00	6 20E+00
Cs-135	3 1549E-05	4,810.77	9,234 97	0 00E+00	1 52E-01	2 91E-01
Cs-137	1 9489E+00	4,810 77	9,234 97	0 00E+00	9 38E+03	1 80E+04
Eu-154	4 0301E-01	4,810 77	9,234 97	0 00E+00	1 94E+03	3 72E+03
Eu-155	5 4000E-02	4,810 77	9,234 97	0 00E+00	2 60E+02	4 99E+02
Fe-55	1 5955E-04	4,810 77	9,234 97	0 00E+00	7 68E-01	1 47E+00
H-3	4 6571E-03	4,810 77	9,234 97	0 00E+00	2.24E+01	4 30E+01
I-129	7 3805E-07	4,810 77	9,234 97	0 00E+00	3 55E-03	6 82E-03
Kr-85	9 5684E-02	4,810 77	9,234 97	0 00E+00	4 60E+02	8 84E+02
Np-237	1 4618E-06	4,810 77	9,234 97	0 00E+00	7 03E-03	1 35E-02
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
Tl-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

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg. MeV	
0 0150	9 477E+14
0.0250	1 957E+14
0 0375	2 048E+14
0 0575	1 893E+14
0 0850	1 153E+14
0 1250	1.294E+14
0.2250	1 045E+14
0 3750	4.292E+13
0 5750	6 838E+14
0 8500	7.276E+13
1 2500	7.837E+13
1 7500	2.348E+12
2.2500	3 722E+07
2.7500	6 194E+06
3 5000	4.237E+04
5 0000	5.191E+03
7 0000	5 859E+02
11 0000	6 663E+01

Thermal Power

Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
1.25E+02	2.40E+02
Total	Total

III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary

	From SFD	Used
Reactor Moderator	LW AND U ZIRC HYDRIDE	LW AND U ZIRC HYDRIDE
Fuel Cladding	ALUM	ALUM
BOL HM Constituents	U	U
BOL Enrichment %	92 9999938	10 to 20 1

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		4 810 77
Bounding		9.234 97

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	13 46	
Bounding	25 84	

Estimated EOL HM/Given EOL HM: 1 02

[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) GERMANY
SNF ID #: 588
Fuel Units & Descr: 2 - MTR TYPE
Heavy Metal Mass: BOL=0 404kg, EOL=0.273kg
ROD Storage Site: SRS

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

Estimated Canister usage:

18"x10'
0 08

II. Estimates

Radionuclide	m Ci/MWd From Template	x_n Nominal Fuel Burnup (MWd)[2]	x_b Bounding Fuel Burnup (MWd)[2]	b Initial Activity (Ci)	y_n Nominal Fuel Inventories(Ci)	y_b Bounding Fuel Inventories(Ci)
Ac-227	6 6313E-10	124 06	248 12	0 00E+00	8 23E-08	1 65E-07
Am-241	2 0060E-03	124 06	248 12	0 00E+00	2 49E-01	4 98E-01
Am-242m	4 2429E-07	124 06	248 12	0 00E+00	5.26E-05	1 05E-04
Am-243	1 4899E-06	124 06	248 12	0 00E+00	1.85E-04	3 70E-04
C-14	5 7135E-09	124 06	248 12	0 00E+00	7.09E-07	1 42E-06
Cl-36	1.3124E-32	124 06	248 12	0 00E+00	1 63E-30	3.26E-30
Cm-243	1 6443E-07	124 06	248 12	0 00E+00	2 04E-05	4 08E-05
Cm-244	2 9330E-05	124 06	248.12	0 00E+00	3 64E-03	7 28E-03
Co-60	5 3186E-06	124 06	248.12	0 00E+00	6 60E-04	1 32E-03
Cs-134	3 1563E-03	124 06	248.12	0 00E+00	3 92E-01	7 83E-01
Cs-135	3 4477E-06	124 06	248 12	0 00E+00	4.28E-04	8 55E-04
Cs-137	2 0313E+00	124 06	248 12	0 00E+00	2 52E+02	5 04E+02
Eu-154	2 4513E-02	124 06	248 12	0 00E+00	3 04E+00	6.08E+00
Eu-155	4 8175E-03	124 06	248 12	0 00E+00	5 98E-01	1.20E+00
Fe-55	1.2397E-04	124 06	248 12	0 00E+00	1 54E-02	3 08E-02
H-3	4 5697E-03	124 06	248 12	0 00E+00	5 67E-01	1 13E+00
I-129	7.5300E-07	124 06	248 12	0 00E+00	9 34E-05	1 87E-04
Kr-85	1 0850E-01	124 06	248.12	0 00E+00	1 35E+01	2 69E+01
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
Tl-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

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg MeV	
0 0150	2 619E+13
0 0250	5 446E+12
0 0375	4 750E+12
0 0575	5 088E+12
0 0850	3 075E+12
0 1250	2 081E+12
0.2250	2 653E+12
0 3750	1 155E+12
0 5750	1 884E+13
0 8500	3 185E+11
1.2500	1.819E+11
1 7500	8.347E+09
2.2500	7.322E+05
2 7500	4 139E+05
3 5000	1.902E+03
5 0000	1 075E+02
7 0000	1 187E+01
11 0000	1.330E+00

Thermal Power

Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
2 96E+00	5.91E+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 %	90 00000989	60 to 100

Basis for Parameter Differences:

Burnup Summary (MWd)[2]

	From SFD	Estimated
Nominal		124.06
Bounding		248 12

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	0.97	
Bounding	1.95	

Estimated EOL HM/Given EOL HM: 1.03

[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) JAPAN
SNF ID #: 602
Fuel Units & Descr: 40 - MTR TYPE
Heavy Metal Mass: BOL=7 74kg; EOL=6 012kg
ROD Storage Site: SRS

[1]Fuel decay start date: 2010
Estimates as of: 2030
Template: ATR (Light Water, Alum , 60 to 100%, U)
[2]Template Burnup(MWd): 367 2
Template BOL Heavy Metal Mass (MT): 0 00116689
Template Decay Time: 20 years

Estimated Canister usage: 18"x10' = 1 67

II. Estimates

	m	x_n	x_b	b	y_n	y_b
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	1,636.45	3,272 90	0 00E+00	1 09E-06	2.17E-06
Am-241	2 0060E-03	1,636 45	3,272.90	0 00E+00	3 28E+00	6 57E+00
Am-242m	4 2429E-07	1,636 45	3,272 90	0.00E+00	6 94E-04	1.39E-03
Am-243	1 4899E-06	1,636 45	3,272.90	0.00E+00	2 44E-03	4 88E-03
C-14	5 7135E-09	1,636 45	3,272 90	0 00E+00	9 35E-06	1 87E-05
Cl-36	1 3124E-32	1,636 45	3,272 90	0 00E+00	2 15E-29	4.30E-29
Cm-243	1 6443E-07	1,636 45	3,272 90	0 00E+00	2 69E-04	5 38E-04
Cm-244	2 9330E-05	1,636 45	3,272 90	0 00E+00	4 80E-02	9 60E-02
Co-60	5 3186E-06	1,636 45	3,272 90	0 00E+00	8 70E-03	1 74E-02
Cs-134	3 1563E-03	1,636 45	3,272 90	0 00E+00	5 17E+00	1 03E+01
Cs-135	3 4477E-06	1,636 45	3,272 90	0 00E+00	5 64E-03	1 13E-02
Cs-137	2.0313E+00	1,636 45	3,272 90	0 00E+00	3.32E+03	6 65E+03
Eu-154	2.4513E-02	1,636 45	3,272 90	0 00E+00	4 01E+01	8 02E+01
Eu-155	4 8175E-03	1,636 45	3,272 90	0 00E+00	7 88E+00	1 58E+01
Fe-55	1 2397E-04	1,636 45	3,272 90	0 00E+00	2 03E-01	4 06E-01
H-3	4 5697E-03	1,636.45	3,272.90	0 00E+00	7 48E+00	1.50E+01
I-129	7 5300E-07	1,636 45	3,272.90	0 00E+00	1.23E-03	2 46E-03
Kr-85	1 0850E-01	1,636 45	3,272.90	0 00E+00	1 78E+02	3.55E+02
Np-237	9 5561E-06	1,636 45	3,272.90	0 00E+00	1.56E-02	3 13E-02
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
Tl-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

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg MeV	
0 0150	3 455E+14
0 0250	7 184E+13
0 0375	6.266E+13
0 0575	6.711E+13
0 0850	4 056E+13
0 1250	2.744E+13
0.2250	3 499E+13
0 3750	1 523E+13
0 5750	2 485E+14
0 8500	4.201E+12
1 2500	2 399E+12
1 7500	1 101E+11
2 2500	9 658E+06
2 7500	5 460E+06
3.5000	2.508E+04
5 0000	1 418E+03
7 0000	1.566E+02
11 0000	1 755E+01

Thermal Power

Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
3 90E+01	7 80E+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 %	92 99999931	60 to 100

Basis for Parameter Differences:

Burnup Summary (MWd)[2]

	From SFD	Estimated
Nominal		1 636 45
Bounding		3,272.90

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 02

[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) NETHERLANDS
SNF ID #: 607
Fuel Units & Descr: 19 - MTR TYPE
Heavy Metal Mass: BOL=2.042kg, EOL=1.093kg
ROD Storage Site: SRS

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

Estimated Canister usage
18"x10'
0.79

II. Estimates

Radionuclide	m Ci/MWd From Template	x_n Nominal Fuel Burnup (MWd)[2]	x_b Bounding Fuel Burnup (MWd)[2]	b Initial Activity (Ci)	y_n Nominal Fuel Inventories(Ci)	y_b Bounding Fuel Inventories(Ci)
Ac-227	6.6313E-10	899.67	1,799.34	0.00E+00	5.97E-07	1.19E-06
Am-241	2.0060E-03	899.67	1,799.34	0.00E+00	1.80E+00	3.61E+00
Am-242m	4.2429E-07	899.67	1,799.34	0.00E+00	3.82E-04	7.63E-04
Am-243	1.4899E-06	899.67	1,799.34	0.00E+00	1.34E-03	2.68E-03
C-14	5.7135E-09	899.67	1,799.34	0.00E+00	5.14E-06	1.03E-05
Cl-36	1.3124E-32	899.67	1,799.34	0.00E+00	1.18E-29	2.36E-29
Cm-243	1.6443E-07	899.67	1,799.34	0.00E+00	1.48E-04	2.96E-04
Cm-244	2.9330E-05	899.67	1,799.34	0.00E+00	2.64E-02	5.28E-02
Co-60	5.3186E-06	899.67	1,799.34	0.00E+00	4.79E-03	9.57E-03
Cs-134	3.1563E-03	899.67	1,799.34	0.00E+00	2.84E+00	5.68E+00
Cs-135	3.4477E-06	899.67	1,799.34	0.00E+00	3.10E-03	6.20E-03
Cs-137	2.0313E+00	899.67	1,799.34	0.00E+00	1.83E+03	3.66E+03
Eu-154	2.4513E-02	899.67	1,799.34	0.00E+00	2.21E+01	4.41E+01
Eu-155	4.8175E-03	899.67	1,799.34	0.00E+00	4.33E+00	8.67E+00
Fe-55	1.2397E-04	899.67	1,799.34	0.00E+00	1.12E-01	2.23E-01
H-3	4.5697E-03	899.67	1,799.34	0.00E+00	4.11E+00	8.22E+00
I-129	7.5300E-07	899.67	1,799.34	0.00E+00	6.77E-04	1.35E-03
Kr-85	1.0850E-01	899.67	1,799.34	0.00E+00	9.76E+01	1.95E+02
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
Tl-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

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg MeV	
0.0150	1.899E+14
0.0250	3.950E+13
0.0375	3.445E+13
0.0575	3.690E+13
0.0850	2.230E+13
0.1250	1.509E+13
0.2250	1.924E+13
0.3750	8.375E+12
0.5750	1.366E+14
0.8500	2.310E+12
1.2500	1.319E+12
1.7500	6.053E+10
2.2500	5.310E+06
2.7500	3.002E+06
3.5000	1.379E+04
5.0000	7.796E+02
7.0000	8.606E+01
11.0000	9.645E+00

Thermal Power

Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
2.14E+01	4.29E+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 %	92.99998697	60 to 100

Basis for Parameter Differences:

Burnup Summary (MWd)[2]

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

Checks

	Burnup Multipher	Estimated Burnup/ Given Burnup
Nominal	1.40	
Bounding	2.80	

Estimated EOL HM/Given EOL HM: 1.05

[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) NETHERLANDS
SNF ID #: 608
Fuel Units & Descr: 61 - MTR TYPE
Heavy Metal Mass: BOL=12 462kg, EOL=6 667kg
ROD Storage Site: SRS

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

Estimated Canister usage

18"x10'
2 54

II. Estimates

Radionuclide	m Ci/MWd From Template	x_n Nominal Fuel Burnup (MWd)[2]	x_b Bounding Fuel Burnup (MWd)[2]	b Initial Activity (Ci)	y_n Nominal Fuel Inventories(Ci)	y_b Bounding Fuel Inventories(Ci)
Ac-227	6 6313E-10	5,487 98	10,975 95	0 00E+00	3 64E-06	7 28E-06
Am-241	2 0060E-03	5,487 98	10,975 95	0 00E+00	1 10E+01	2 20E+01
Am-242m	4.2429E-07	5,487 98	10,975 95	0 00E+00	2.33E-03	4 66E-03
Am-243	1 4899E-06	5,487 98	10,975.95	0 00E+00	8.18E-03	1 64E-02
C-14	5 7135E-09	5,487 98	10,975 95	0 00E+00	3.14E-05	6 27E-05
Cl-36	1 3124E-32	5,487 98	10,975.95	0 00E+00	7.20E-29	1 44E-28
Cm-243	1 6443E-07	5,487 98	10,975.95	0 00E+00	9 02E-04	1 80E-03
Cm-244	2 9330E-05	5,487.98	10,975.95	0 00E+00	1 61E-01	3 22E-01
Co-60	5 3186E-06	5,487.98	10,975 95	0 00E+00	2 92E-02	5 84E-02
Cs-134	3 1563E-03	5,487 98	10,975 95	0 00E+00	1 73E+01	3 46E+01
Cs-135	3 4477E-06	5,487.98	10,975 95	0 00E+00	1 89E-02	3 78E-02
Cs-137	2 0313E+00	5,487 98	10,975 95	0 00E+00	1 11E+04	2 23E+04
Eu-154	2 4513E-02	5,487 98	10,975 95	0 00E+00	1 35E+02	2.69E+02
Eu-155	4 8175E-03	5,487 98	10,975 95	0 00E+00	2 64E+01	5 29E+01
Fe-55	1 2397E-04	5,487 98	10,975 95	0 00E+00	6 80E-01	1.36E+00
H-3	4 5697E-03	5,487 98	10,975 95	0 00E+00	2 51E+01	5 02E+01
I-129	7 5300E-07	5,487 98	10,975 95	0 00E+00	4 13E-03	8.26E-03
Kr-85	1 0850E-01	5,487 98	10,975 95	0 00E+00	5 95E+02	1.19E+03
Np-237	9 5561E-06	5,487 98	10,975 95	0 00E+00	5 24E-02	1 05E-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
Tl-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
U-234	1 8450E-04	5,487.98	10,975 95	0 00E+00	1.01E+00	2 03E+00
U-235	-2 7235E-06	5,487.98	0 00	2.50E-02	1.01E-02	2 50E-02
U-236	1.5493E-05	5,487 98	10,975 95	0 00E+00	8.50E-02	1 70E-01
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

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg. MeV	
0 0150	1 159E+15
0 0250	2.409E+14
0 0375	2 101E+14
0 0575	2.251E+14
0 0850	1 360E+14
0 1250	9.204E+13
0.2250	1 174E+14
0 3750	5 109E+13
0 5750	8 333E+14
0 8500	1 409E+13
1.2500	8 044E+12
1 7500	3 692E+11
2.2500	3.239E+07
2 7500	1.831E+07
3.5000	8 411E+04
5 0000	4 755E+03
7.0000	5.250E+02
11.0000	5.884E+01

Thermal Power

Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
1.31E+02	2.62E+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 %	92.99998578	60 to 100

Basis for Parameter Drfferences:

Burnup Summary (MWd)[2]

	From SFD	Estimated
Nominal		5,487 98
Bounding		10 975 95

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 40	
Bounding	2.80	

Estimated EOL HM/Given EOL HM: 1 05

[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) PORTUGAL
SNF ID #: 632
Fuel Units & Descr: 22 - MTR TYPE
Heavy Metal Mass: BOL=6.246kg EOL=3 923kg
ROD Storage Site: SRS

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

Estimated Canister usage: 18"x10' = 0 92

II. Estimates

Radionuclide	m: Ci/MWd From Template	x_n: Nominal Fuel Burnup (MWd)[2]	x_b: Bounding Fuel Burnup (MWd)[2]	b: Initial Activity (Ci)	y_n: Nominal Fuel Inventories(Ci)	y_b: Bounding Fuel Inventories(Ci)
Ac-227	6 6313E-10	2,200.12	4,400 23	0 00E+00	1 46E-06	2.92E-06
Am-241	2 0060E-03	2,200 12	4,400 23	0 00E+00	4 41E+00	8 83E+00
Am-242m	4 2429E-07	2,200 12	4,400 23	0 00E+00	9 33E-04	1 87E-03
Am-243	1 4899E-06	2,200 12	4,400 23	0 00E+00	3 28E-03	6 56E-03
C-14	5 7135E-09	2,200 12	4,400 23	0 00E+00	1.26E-05	2 51E-05
Cl-36	1.3124E-32	2,200 12	4,400.23	0 00E+00	2 89E-29	5 77E-29
Cm-243	1 6443E-07	2,200 12	4,400.23	0 00E+00	3 62E-04	7.24E-04
Cm-244	2 9330E-05	2,200 12	4,400.23	0 00E+00	6.45E-02	1.29E-01
Co-60	5 3186E-06	2,200 12	4,400.23	0 00E+00	1 17E-02	2.34E-02
Cs-134	3 1563E-03	2,200.12	4,400 23	0 00E+00	6 94E+00	1.39E+01
Cs-135	3 4477E-06	2,200 12	4,400 23	0 00E+00	7 59E-03	1.52E-02
Cs-137	2 0313E+00	2,200 12	4,400 23	0 00E+00	4 47E+03	8 94E+03
Eu-154	2 4513E-02	2,200 12	4,400 23	0 00E+00	5 39E+01	1 08E+02
Eu-155	4 8175E-03	2,200 12	4,400 23	0 00E+00	1 06E+01	2 12E+01
Fe-55	1.2397E-04	2,200 12	4,400.23	0 00E+00	2.73E-01	5 45E-01
H-3	4 5697E-03	2,200 12	4,400.23	0 00E+00	1 01E+01	2 01E+01
I-129	7 5300E-07	2,200 12	4,400.23	0 00E+00	1 66E-03	3.31E-03
Kr-85	1 0850E-01	2,200 12	4,400.23	0 00E+00	2.39E+02	4.77E+02
Np-237	9 5561E-06	2,200 12	4,400.23	0 00E+00	2 10E-02	4 20E-02
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

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg MeV	
0 0150	4 645E+14
0 0250	9 659E+13
0 0375	8 425E+13
0 0575	9 023E+13
0 0850	5.453E+13
0 1250	3 690E+13
0.2250	4 705E+13
0.3750	2 048E+13
0.5750	3 341E+14
0 8500	5.648E+12
1.2500	3.225E+12
1 7500	1 480E+11
2.2500	1.298E+07
2 7500	7.341E+06
3.5000	3 372E+04
5 0000	1 906E+03
7.0000	2 105E+02
11 0000	2.359E+01

Thermal Power

Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
5.24E+01	1 05E+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 %	92.99999055	60 to 100

Basis for Parameter Differences:

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
Nominal	1 12	
Bounding	2.24	

Estimated EOL HM/Given EOL HM: 1 03

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

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

Estimated Canister usage: 18"x10' 2 29

II. Estimates

Radionuclide	m Gi/MWd From Template	x_n Nominal Fuel Burnup (MWd)[2]	x_b Bounding Fuel Burnup (MWd)[2]	b Initial Activity (Ci)	y_n Nominal Fuel Inventories(Ci)	y_b Bounding Fuel Inventories(Ci)
Ac-227	6 6313E-10	10,135 95	15,792 50	0 00E+00	6 72E-06	1 05E-05
Am-241	2 0060E-03	10,135 95	15,792 50	0 00E+00	2 03E+01	3 17E+01
Am-242m	4 2429E-07	10,135 95	15,792 50	0 00E+00	4 30E-03	6 70E-03
Am-243	1 4899E-06	10,135 95	15,792 50	0 00E+00	1 51E-02	2 35E-02
C-14	5 7135E-09	10,135 95	15,792 50	0 00E+00	5 79E-05	9 02E-05
Cl-36	1 3124E-32	10,135 95	15,792 50	0 00E+00	1.33E-28	2.07E-28
Cm-243	1 6443E-07	10,135 95	15,792 50	0 00E+00	1 67E-03	2 60E-03
Cm-244	2 9330E-05	10,135 95	15,792 50	0 00E+00	2.97E-01	4 63E-01
Co-60	5 3186E-06	10,135 95	15,792 50	0 00E+00	5.39E-02	8.40E-02
Cs-134	3 1563E-03	10,135 95	15,792 50	0 00E+00	3 20E+01	4 98E+01
Cs-135	3 4477E-06	10,135 95	15,792 50	0 00E+00	3 49E-02	5 44E-02
Cs-137	2 0313E+00	10,135 95	15,792 50	0 00E+00	2 06E+04	3 21E+04
Eu-154	2 4513E-02	10,135.95	15,792.50	0 00E+00	2 48E+02	3 87E+02
Eu-155	4 8175E-03	10,135 95	15,792.50	0 00E+00	4 88E+01	7 61E+01
Fe-55	1.2397E-04	10,135 95	15,792 50	0 00E+00	1 26E+00	1 96E+00
H-3	4.5697E-03	10,135 95	15,792.50	0 00E+00	4 63E+01	7 22E+01
I-129	7 5300E-07	10,135 95	15,792 50	0 00E+00	7 63E-03	1 19E-02
Kr-85	1 0850E-01	10,135 95	15,792 50	0 00E+00	1.10E+03	1 71E+03
Np-237	9 5561E-06	10,135 95	15,792 50	0 00E+00	9 69E-02	1 51E-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
Tl-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
U-233	2 5825E-09	10,135 95	15,792 50	0 00E+00	2 62E-05	4 08E-05
U-234	1 8450E-04	10,135 95	15,792 50	0 00E+00	1.87E+00	2 91E+00
U-235	-2.7235E-06	10,135 95	0 00	3 35E-02	5 91E-03	3 35E-02
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

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg MeV	
0 0150	1 667E+15
0 0250	3 467E+14
0 0375	3 024E+14
0 0575	3.238E+14
0 0850	1 957E+14
0 1250	1.324E+14
0.2250	1 689E+14
0 3750	7.351E+13
0 5750	1 199E+15
0 8500	2.027E+13
1.2500	1 157E+13
1 7500	5.313E+11
2.2500	4 660E+07
2.7500	2 635E+07
3 5000	1 210E+05
5 0000	6 842E+03
7 0000	7 553E+02
11 0000	8 465E+01

Thermal Power

Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
2.42E+02	3 76E+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 00000816	60 to 100

Basis for Parameter Drifferences:

Burnup Summary (MWd)[2]

	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

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

Estimated Canister usage.
18"x10'
0 75

II. Estimates

Radionuclide	m Ci/MWd From Template	x_n Nominal Fuel Burnup (MWd)[2]	x_b Bounding Fuel Burnup (MWd)[2]	b Initial Activity (Ci)	y_n Nominal Fuel Inventories(Ci)	y_b Bounding Fuel Inventones(Ci)
Ac-227	6 6313E-10	2,386 49	4,772.98	0 00E+00	1 58E-06	3 17E-06
Am-241	2 0060E-03	2,386 49	4,772.98	0 00E+00	4 79E+00	9 57E+00
Am-242m	4 2429E-07	2,386 49	4,772.98	0 00E+00	1 01E-03	2 03E-03
Am-243	1 4899E-06	2,386 49	4,772 98	0 00E+00	3 56E-03	7 11E-03
C-14	5 7135E-09	2,386 49	4,772 98	0.00E+00	1 36E-05	2 73E-05
Cl-36	1 3124E-32	2,386 49	4,772 98	0 00E+00	3 13E-29	6 26E-29
Cm-243	1 6443E-07	2,386 49	4,772 98	0 00E+00	3 92E-04	7 85E-04
Cm-244	2 9330E-05	2,386 49	4,772 98	0 00E+00	7 00E-02	1 40E-01
Co-60	5 3186E-06	2,386 49	4,772 98	0 00E+00	1.27E-02	2.54E-02
Cs-134	3 1563E-03	2,386 49	4,772 98	0 00E+00	7 53E+00	1 51E+01
Cs-135	3 4477E-06	2,386 49	4,772 98	0 00E+00	8.23E-03	1.65E-02
Cs-137	2.0313E+00	2,386 49	4,772 98	0 00E+00	4 85E+03	9 70E+03
Eu-154	2 4513E-02	2,386 49	4,772 98	0 00E+00	5 85E+01	1 17E+02
Eu-155	4 8175E-03	2,386 49	4,772 98	0 00E+00	1.15E+01	2 30E+01
Fe-55	1.2397E-04	2,386 49	4,772.98	0 00E+00	2 96E-01	5 92E-01
H-3	4 5697E-03	2,386 49	4,772 98	0 00E+00	1 09E+01	2 18E+01
I-129	7 5300E-07	2,386 49	4,772 98	0 00E+00	1 80E-03	3 59E-03
Kr-85	1 0850E-01	2,386 49	4,772 98	0 00E+00	2 59E+02	5 18E+02
Np-237	9 5561E-06	2,386 49	4,772 98	0 00E+00	2 28E-02	4 56E-02
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
Tl-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 9254E+00	2,386 49	4,772.98	0 00E+00	4 59E+03	9 19E+03
Other Radionuclides					4 62E+03	9.23E+03

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg MeV	
0 0150	5 038E+14
0.0250	1 048E+14
0 0375	9 138E+13
0 0575	9 787E+13
0 0850	5 915E+13
0 1250	4 002E+13
0.2250	5 103E+13
0 3750	2.222E+13
0 5750	3 624E+14
0 8500	6 126E+12
1.2500	3 498E+12
1 7500	1 606E+11
2.2500	1.408E+07
2 7500	7 963E+06
3 5000	3.658E+04
5 0000	2 068E+03
7 0000	2.283E+02
11 0000	2.559E+01

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

	From SFD	Used
Reactor Moderator	LIGHT WATER	LIGHT WATER
Fuel Cladding	ALUM	ALUM
BOL HM Constituents	U	U
BOL Enrichment %	92.99998782	60 to 100

Basis for Parameter Differences

Burnup Summary (MWd)[2]

	From SFD	Estimated
Nominal		2,386 49
Bounding		4 772.98

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 40	
Bounding	2.80	

Estimated EOL HM/Given EOL HM: 1 05

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

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

Estimated Canister usage
18"x10'
19 83

II. Estimates

Radionuclide	m Ci/MWd From Template	x_n Nominal Fuel Burnup (MWd)[2]	x_b Bounding Fuel Burnup (MWd)[2]	b Initial Activity (Ci)	y_n Nominal Fuel Inventories(Ci)	y_b Bounding Fuel Inventories(Ci)
Ac-227	8 5333E-10	77,499 76	154,999 52	0 00E+00	6 61E-05	1.32E-04
Am-241	2.2753E-02	77,499 76	154,999 52	0 00E+00	1 76E+03	3 53E+03
Am-242m	8 9133E-06	77,499 76	154,999 52	0 00E+00	6 91E-01	1 38E+00
Am-243	6 4007E-06	77,499 76	154,999 52	0 00E+00	4 96E-01	9 92E-01
C-14	2 9620E-08	77,499 76	154,999 52	0 00E+00	2 30E-03	4 59E-03
Cl-36	5 9513E-35	77,499 76	154,999 52	0 00E+00	4 61E-30	9 22E-30
Cm-243	2.2087E-06	77,499 76	154,999 52	0 00E+00	1 71E-01	3 42E-01
Cm-244	1 1007E-04	77,499 76	154,999 52	0 00E+00	8 53E+00	1 71E+01
Co-60	1 6340E-05	77,499 76	154,999 52	0 00E+00	1 27E+00	2 53E+00
Cs-134	2 1353E-03	77,499 76	154,999.52	0 00E+00	1 65E+02	3.31E+02
Cs-135	4 8607E-06	77,499 76	154,999.52	0 00E+00	3 77E-01	7 53E-01
Cs-137	2 0227E+00	77,499 76	154,999.52	0 00E+00	1.57E+05	3 14E+05
Eu-154	2 0887E-02	77,499 76	154,999 52	0 00E+00	1.62E+03	3.24E+03
Eu-155	4 0867E-03	77,499 76	154,999.52	0 00E+00	3.17E+02	6.33E+02
Fe-55	1 4167E-03	77,499 76	154,999 52	0 00E+00	1.10E+02	2.20E+02
H-3	4 6653E-03	77,499.76	154,999 52	0 00E+00	3 62E+02	7.23E+02
I-129	7 1600E-07	77,499.76	154,999 52	0 00E+00	5 55E-02	1.11E-01
Kr-85	1 0240E-01	77,499.76	154,999 52	0 00E+00	7 94E+03	1 59E+04
Np-237	3 7227E-06	77,499.76	154,999 52	0 00E+00	2.89E-01	5.77E-01
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
Tl-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

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg MeV	
0 0150	1.571E+16
0 0250	3.263E+15
0.0375	2.866E+15
0.0575	3 087E+15
0.0850	1 838E+15
0 1250	1 237E+15
0.2250	1 584E+15
0.3750	6 894E+14
0.5750	1 169E+16
0 8500	1 787E+14
1.2500	1 007E+14
1 7500	4 753E+12
2.2500	4 457E+08
2.7500	5.274E+07
3 5000	2 137E+06
5 0000	3.246E+05
7 0000	3 672E+04
11 0000	4 179E+03

Thermal Power

Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
1.85E+03	3 71E+03
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 %	20	10 to 20

Basis for Parameter Drfferences:

Burnup Summary (MWd)[2]

	From SFD	Estimated
Nominal		77,499 76
Bounding		154,999 52

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	2.48	
Bounding	4 96	

Estimated EOL HM/Given EOL HM: 1 03

[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-LEU) PORTUGAL
SNF ID #: 542
Fuel Units & Descr.: 6 - ASSEMBLY
Heavy Metal Mass.: BOL=5 4kg EOL=5 152kg
ROD Storage Site: SRS

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

Estimated Canister usage 18"x10': 0.25

II. Estimates

Radionuclide	m: Ci/MWd From Template	x_n: Nominal Fuel Burnup (MWd)[2]	x_b: Bounding Fuel Burnup (MWd)[2]	b: Initial Activity (Ci)	y_n: Nominal Fuel Inventories(Ci)	y_b: Bounding Fuel Inventories(Ci)
Ac-227	6 6313E-10	235.24	470 48	0 00E+00	1.56E-07	3 12E-07
Am-241	2 0060E-03	235.24	470 48	0 00E+00	4 72E-01	9 44E-01
Am-242m	4 2429E-07	235.24	470 48	0 00E+00	9 98E-05	2 00E-04
Am-243	1 4899E-06	235.24	470 48	0 00E+00	3 50E-04	7.01E-04
C-14	5 7135E-09	235.24	470 48	0 00E+00	1 34E-06	2 69E-06
Cl-36	1.3124E-32	235 24	470 48	0 00E+00	3 09E-30	6 17E-30
Cm-243	1 6443E-07	235 24	470 48	0 00E+00	3 87E-05	7 74E-05
Cm-244	2 9330E-05	235 24	470 48	0 00E+00	6 90E-03	1 38E-02
Co-60	5 3186E-06	235.24	470 48	0 00E+00	1.25E-03	2.50E-03
Cs-134	3 1563E-03	235.24	470 48	0 00E+00	7 42E-01	1 48E+00
Cs-135	3 4477E-06	235.24	470 48	0 00E+00	8 11E-04	1.62E-03
Cs-137	2 0313E+00	235.24	470 48	0 00E+00	4 78E+02	9.56E+02
Eu-154	2 4513E-02	235.24	470 48	0 00E+00	5 77E+00	1 15E+01
Eu-155	4 8175E-03	235 24	470 48	0 00E+00	1 13E+00	2.27E+00
Fe-55	1.2397E-04	235 24	470 48	0 00E+00	2 92E-02	5 83E-02
H-3	4 5697E-03	235 24	470 48	0 00E+00	1 07E+00	2 15E+00
I-129	7 5300E-07	235 24	470.48	0 00E+00	1 77E-04	3.54E-04
Kr-85	1 0850E-01	235.24	470 48	0 00E+00	2.55E+01	5 10E+01
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
Tl-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

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg. MeV	
0 0150	4 966E+13
0 0250	1.033E+13
0 0375	9 008E+12
0 0575	9 648E+12
0.0850	5 830E+12
0 1250	3 945E+12
0.2250	5 030E+12
0 3750	2.190E+12
0 5750	3.572E+13
0 8500	6 039E+11
1.2500	3 448E+11
1 7500	1.583E+10
2.2500	1.388E+06
2 7500	7 849E+05
3 5000	3 613E+03
5 0000	2.071E+02
7 0000	2.288E+01
11.0000	2.566E+00

Thermal Power

Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
5 61E+00	1 12E+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 00000132	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		235.24
Bounding		470 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 14	
Bounding	0.28	

Estimated EOL HM/Given EOL HM: 1 00

[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-MEU) GERMANY
SNF ID #: 1068
Fuel Units & Descr: 28 - MTR TYPE
Heavy Metal Mass: BOL=12.88kg EOL=9 17kg
ROD Storage Site: SRS

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

Estimated Canister usage: 18"x10" 1 17

II. Estimates

Radionuclide	m: C/MWd From Template	x_n: Nominal Fuel Burnup (MWd)[2]	x_b: Bounding Fuel Burnup (MWd)[2]	b: Initial Activity (Ci)	y_n: Nominal Fuel Inventories(Ci)	y_b: Bounding Fuel Inventories(Ci)
Ac-227	6 6313E-10	3,513 44	7,026 88	0 00E+00	2 33E-06	4 66E-06
Am-241	2 0060E-03	3,513 44	7,026 88	0.00E+00	7 05E+00	1 41E+01
Am-242m	4 2429E-07	3,513 44	7,026 88	0 00E+00	1 49E-03	2.98E-03
Am-243	1 4899E-06	3,513 44	7,026 88	0 00E+00	5 23E-03	1 05E-02
C-14	5 7135E-09	3,513 44	7,026 88	0 00E+00	2 01E-05	4 01E-05
Cl-36	1.3124E-32	3,513 44	7,026 88	0 00E+00	4 61E-29	9 22E-29
Cm-243	1 6443E-07	3,513 44	7,026 88	0 00E+00	5 78E-04	1 16E-03
Cm-244	2.9330E-05	3,513 44	7,026 88	0 00E+00	1 03E-01	2 06E-01
Co-60	5.3186E-06	3,513.44	7,026 88	0 00E+00	1 87E-02	3 74E-02
Cs-134	3.1563E-03	3,513.44	7,026 88	0 00E+00	1 11E+01	2 22E+01
Cs-135	3 4477E-06	3,513 44	7,026 88	0 00E+00	1.21E-02	2 42E-02
Cs-137	2 0313E+00	3,513 44	7,026 88	0 00E+00	7.14E+03	1 43E+04
Eu-154	2 4513E-02	3,513 44	7,026 88	0 00E+00	8 61E+01	1.72E+02
Eu-155	4 8175E-03	3,513 44	7,026 88	0 00E+00	1 69E+01	3.39E+01
Fe-55	1 2397E-04	3,513 44	7,026 88	0.00E+00	4 36E-01	8 71E-01
H-3	4 5697E-03	3,513 44	7,026 88	0 00E+00	1 61E+01	3 21E+01
I-129	7 5300E-07	3,513 44	7,026 88	0 00E+00	2 65E-03	5.29E-03
Kr-85	1 0850E-01	3,513 44	7,026 88	0 00E+00	3 81E+02	7 62E+02
Np-237	9 5561E-06	3,513 44	7,026.88	0 00E+00	3 36E-02	6.71E-02
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
Tl-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

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg. MeV	
0 0150	7 418E+14
0 0250	1.542E+14
0 0375	1.345E+14
0 0575	1 441E+14
0 0850	8 707E+13
0 1250	5 892E+13
0.2250	7 513E+13
0 3750	3.271E+13
0.5750	5 335E+14
0 8500	9 019E+12
1.2500	5 150E+12
1 7500	2.364E+11
2.2500	2.074E+07
2.7500	1 172E+07
3.5000	5.386E+04
5.0000	3.049E+03
7 0000	3.367E+02
11 0000	3.773E+01

Thermal Power

Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
8.38E+01	1 68E+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 %	45 07	60 to 100

Basis for Parameter Drfferences:

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		3,513 44
Bounding		7,026 88

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	
Bounding	1 73	

Estimated EOL HM/Given EOL HM: 1 02

[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

[1]Fuel decay start date 2010
Estimates as of 2030
Template HFBR (Heavy Water, Alum , 10 to 20%, U)
[2]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

Radionuclide	m Ci/MWd From Template	x_n Nominal Fuel Burnup (MWd)[2]	x_b Bounding Fuel Burnup (MWd)[2]	b Initial Activity (Ci)	y_n Nominal Fuel Inventories(Ci)	y_b Bounding Fuel Inventories(Ci)
Ac-227	8 5333E-10	541,647 53	1,083,295.06	0 00E+00	4 62E-04	9.24E-04
Am-241	2 2753E-02	541,647 53	1,083,295 06	0 00E+00	1 23E+04	2 46E+04
Am-242m	8 9133E-06	541,647 53	1,083,295 06	0 00E+00	4 83E+00	9 66E+00
Am-243	6 4007E-06	541,647.53	1,083,295 06	0 00E+00	3 47E+00	6.93E+00
C-14	2.9620E-08	541,647.53	1,083,295 06	0 00E+00	1 60E-02	3 21E-02
Cl-36	5 9513E-35	541,647.53	1,083,295 06	0 00E+00	3.22E-29	6 45E-29
Cm-243	2.2087E-06	541,647.53	1,083,295 06	0 00E+00	1.20E+00	2 39E+00
Cm-244	1 1007E-04	541,647.53	1,083,295 06	0 00E+00	5 96E+01	1 19E+02
Co-60	1 6340E-05	541,647 53	1,083,295 06	0 00E+00	8 85E+00	1 77E+01
Cs-134	2 1353E-03	541,647 53	1,083,295 06	0 00E+00	1 16E+03	2 31E+03
Cs-135	4 8607E-06	541,647 53	1,083,295 06	0 00E+00	2 63E+00	5 27E+00
Cs-137	2 0227E+00	541,647 53	1,083,295 06	0 00E+00	1 10E+06	2 19E+06
Eu-154	2 0887E-02	541,647 53	1,083,295 06	0 00E+00	1 13E+04	2.26E+04
Eu-155	4 0867E-03	541,647 53	1,083,295 06	0 00E+00	2 21E+03	4 43E+03
Fe-55	1 4167E-03	541,647 53	1,083,295 06	0 00E+00	7 67E+02	1.53E+03
H-3	4 6653E-03	541,647 53	1,083,295 06	0 00E+00	2 53E+03	5 05E+03
I-129	7.1600E-07	541,647.53	1,083,295 06	0 00E+00	3 88E-01	7 76E-01
Kr-85	1 0240E-01	541,647.53	1,083,295 06	0 00E+00	5 55E+04	1 11E+05
Np-237	3 7227E-06	541,647.53	1,083,295 06	0 00E+00	2.02E+00	4 03E+00
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
Tl-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
U-233	4 4013E-10	541,647 53	1,083,295 06	0 00E+00	2.38E-04	4 77E-04
U-234	4 6500E-07	541,647 53	1,083,295 06	0 00E+00	2.52E-01	5 04E-01
U-235	-2 5335E-06	541,647.53	0 00	1 62E+00	2.48E-01	1 62E+00
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

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg MeV	
0 0150	1 098E+17
0 0250	2.280E+16
0.0375	2.003E+16
0 0575	2.158E+16
0 0850	1.284E+16
0 1250	8 648E+15
0.2250	1 107E+16
0 3750	4 818E+15
0 5750	8 172E+16
0 8500	1.249E+15
1 2500	7 038E+14
1 7500	3.322E+13
2.2500	3 115E+09
2.7500	3.686E+08
3.5000	1 493E+07
5 0000	2.268E+06
7 0000	2.566E+05
11 0000	2.920E+04

Thermal Power

Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
1.30E+04	2.59E+04
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 %	19 75000043	10 to 20

Basis for Parameter Differences:

Burnup Summary (MWd)[2]

	From SFD	Estimated
Nominal		541 647.53
Bounding		1,083,295.06

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	3 26	
Bounding	6 52	

Estimated EOL HM/Given EOL HM: 1 04

[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 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

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

Estimated Canister usage: 18"x15" = 4 00

II. Estimates

	m	x_n	x_b	b	y_n	y_b
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	6,991 28	13,982.55	0 00E+00	4 64E-06	9 27E-06
Am-241	2 0060E-03	6,991.28	13,982 55	0 00E+00	1 40E+01	2 80E+01
Am-242m	4.2429E-07	6,991.28	13,982 55	0 00E+00	2 97E-03	5 93E-03
Am-243	1 4899E-06	6,991.28	13,982 55	0 00E+00	1 04E-02	2 08E-02
C-14	5 7135E-09	6,991.28	13,982 55	0 00E+00	3 99E-05	7 99E-05
Cl-36	1.3124E-32	6,991.28	13,982 55	0 00E+00	9 18E-29	1 84E-28
Cm-243	1 6443E-07	6,991.28	13,982 55	0 00E+00	1.15E-03	2 30E-03
Cm-244	2 9330E-05	6,991.28	13,982 55	0 00E+00	2.05E-01	4.10E-01
Co-60	5.3186E-06	6 991.28	13,982 55	0 00E+00	3.72E-02	7 44E-02
Cs-134	3.1563E-03	6,991.28	13,982 55	0 00E+00	2 21E+01	4 41E+01
Cs-135	3.4477E-06	6,991.28	13,982 55	0 00E+00	2 41E-02	4 82E-02
Cs-137	2 0313E+00	6,991.28	13,982 55	0 00E+00	1 42E+04	2 84E+04
Eu-154	2 4513E-02	6,991.28	13,982 55	0 00E+00	1 71E+02	3 43E+02
Eu-155	4 8175E-03	6,991.28	13,982 55	0 00E+00	3 37E+01	6 74E+01
Fe-55	1.2397E-04	6,991.28	13,982 55	0 00E+00	8 67E-01	1 73E+00
H-3	4 5697E-03	6,991.28	13,982 55	0 00E+00	3 19E+01	6 39E+01
I-129	7 5300E-07	6,991.28	13,982 55	0 00E+00	5 26E-03	1 05E-02
Kr-85	1 0850E-01	6,991.28	13,982 55	0 00E+00	7 59E+02	1 52E+03
Np-237	9 5561E-06	6,991.28	13,982 55	0 00E+00	6 68E-02	1 34E-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
Tl-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 69E+04
Other Radionuclides					1 35E+04	2 70E+04

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg MeV	
0 0150	1 476E+15
0 0250	3 069E+14
0 0375	2 677E+14
0 0575	2.867E+14
0 0850	1 733E+14
0 1250	1 172E+14
0 2250	1 495E+14
0 3750	6.508E+13
0 5750	1 062E+15
0 8500	1 795E+13
1.2500	1 025E+13
1 7500	4 704E+11
2.2500	4 126E+07
2 7500	2.333E+07
3 5000	1 072E+05
5 0000	6 094E+03
7 0000	6 729E+02
11 0000	7 543E+01

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

	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

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		6 991.28
Bounding		13 982.55

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 37	
Bounding	0 75	

Estimated EOL HM/Given EOL HM: 1 01

[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 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

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

Estimated Canister usage

18"x15'
13 17

II. Estimates

Radionuclide	m CI/MWd From Template	x_n Nominal Fuel Burnup (MWd)[2]	x_b Bounding Fuel Burnup (MWd)[2]	b Initial Activity (CI)	y_n Nominal Fuel Inventories(Ci)	y_b Bounding Fuel Inventories(Ci)
Ac-227	6 6313E-10	42,958 50	85,917 00	0 00E+00	2 85E-05	5 70E-05
Am-241	2 0060E-03	42,958 50	85,917.00	0 00E+00	8 62E+01	1 72E+02
Am-242m	4 2429E-07	42,958.50	85,917.00	0 00E+00	1.82E-02	3.65E-02
Am-243	1 4899E-06	42,958 50	85,917.00	0 00E+00	6 40E-02	1.28E-01
C-14	5 7135E-09	42,958.50	85,917 00	0 00E+00	2 45E-04	4 91E-04
Cl-36	1 3124E-32	42,958 50	85,917 00	0 00E+00	5 64E-28	1 13E-27
Cm-243	1 6443E-07	42,958 50	85,917 00	0 00E+00	7.06E-03	1 41E-02
Cm-244	2 9330E-05	42,958 50	85,917 00	0 00E+00	1.26E+00	2 52E+00
Co-60	5 3186E-06	42,958 50	85,917 00	0 00E+00	2 28E-01	4 57E-01
Cs-134	3 1563E-03	42,958 50	85,917 00	0 00E+00	1.36E+02	2 71E+02
Cs-135	3 4477E-06	42,958 50	85,917 00	0 00E+00	1 48E-01	2 96E-01
Cs-137	2.0313E+00	42,958 50	85,917 00	0 00E+00	8 73E+04	1 75E+05
Eu-154	2 4513E-02	42,958 50	85,917 00	0 00E+00	1 05E+03	2 11E+03
Eu-155	4 8175E-03	42,958 50	85,917 00	0 00E+00	2 07E+02	4 14E+02
Fe-55	1.2397E-04	42,958 50	85,917 00	0 00E+00	5 33E+00	1 07E+01
H-3	4 5697E-03	42,958 50	85,917 00	0 00E+00	1 96E+02	3 93E+02
I-129	7.5300E-07	42,958 50	85,917.00	0 00E+00	3.23E-02	6.47E-02
Kr-85	1 0850E-01	42,958 50	85,917.00	0 00E+00	4 66E+03	9 32E+03
Np-237	9 5561E-06	42,958 50	85,917.00	0 00E+00	4 11E-01	8.21E-01
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
Tl-208	4 6024E-08	42,958 50	85,917 00	0 00E+00	1 98E-03	3 95E-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

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg MeV	
0 0150	9 069E+15
0 0250	1.886E+15
0 0375	1 645E+15
0 0575	1 762E+15
0 0850	1.065E+15
0 1250	7.204E+14
0 2250	9 186E+14
0 3750	3 999E+14
0 5750	6 523E+15
0 8500	1 103E+14
1.2500	6.297E+13
1 7500	2 890E+12
2.2500	2 535E+08
2 7500	1 433E+08
3.5000	6 589E+05
5 0000	3 743E+04
7.0000	4 133E+03
11 0000	4 633E+02

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
Reactor Moderator	LIGHT WATER	LIGHT WATER
Fuel Cladding	ALUM	ALUM
BOL HM Constituents	U	U
BOL Enrichment %	20 00000055	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		42,958 50
Bounding		85 917 00

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 40	
Bounding	0 79	

Estimated EOL HM/Given EOL HM: 1 01

[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 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

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

Estimated Canister usage: 18"x15" = 18.75

II. Estimates

Radionuclide	m: Ci/MWd From Template	x_n: Nominal Fuel Burnup (MWd)[2]	x_b: Bounding Fuel Burnup (MWd)[2]	b: Initial Activity (Ci)	y_n: Nominal Fuel Inventories(Ci)	y_b: Bounding Fuel Inventories(Ci)
Ac-227	6.6313E-10	79,521.22	112,314.13	0.00E+00	5.27E-05	7.45E-05
Am-241	2.0060E-03	79,521.22	112,314.13	0.00E+00	1.60E+02	2.25E+02
Am-242m	4.2429E-07	79,521.22	112,314.13	0.00E+00	3.37E-02	4.77E-02
Am-243	1.4899E-06	79,521.22	112,314.13	0.00E+00	1.18E-01	1.67E-01
C-14	5.7135E-09	79,521.22	112,314.13	0.00E+00	4.54E-04	6.42E-04
Cl-36	1.3124E-32	79,521.22	112,314.13	0.00E+00	1.04E-27	1.47E-27
Cm-243	1.6443E-07	79,521.22	112,314.13	0.00E+00	1.31E-02	1.85E-02
Cm-244	2.9330E-05	79,521.22	112,314.13	0.00E+00	2.33E+00	3.29E+00
Co-60	5.3186E-06	79,521.22	112,314.13	0.00E+00	4.23E-01	5.97E-01
Cs-134	3.1563E-03	79,521.22	112,314.13	0.00E+00	2.51E+02	3.54E+02
Cs-135	3.4477E-06	79,521.22	112,314.13	0.00E+00	2.74E-01	3.87E-01
Cs-137	2.0313E+00	79,521.22	112,314.13	0.00E+00	1.62E+05	2.28E+05
Eu-154	2.4513E-02	79,521.22	112,314.13	0.00E+00	1.95E+03	2.75E+03
Eu-155	4.8175E-03	79,521.22	112,314.13	0.00E+00	3.83E+02	5.41E+02
Fe-55	1.2397E-04	79,521.22	112,314.13	0.00E+00	9.86E+00	1.39E+01
H-3	4.5697E-03	79,521.22	112,314.13	0.00E+00	3.63E+02	5.13E+02
I-129	7.5300E-07	79,521.22	112,314.13	0.00E+00	5.99E-02	8.46E-02
Kr-85	1.0850E-01	79,521.22	112,314.13	0.00E+00	8.63E+03	1.22E+04
Np-237	9.5561E-06	79,521.22	112,314.13	0.00E+00	7.60E-01	1.07E+00
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
Tl-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

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg. MeV	
0.0150	1.186E+16
0.0250	2.465E+15
0.0375	2.150E+15
0.0575	2.303E+15
0.0850	1.392E+15
0.1250	9.418E+14
0.2250	1.201E+15
0.3750	5.228E+14
0.5750	8.527E+15
0.8500	1.442E+14
1.2500	8.232E+13
1.7500	3.778E+12
2.2500	3.314E+08
2.7500	1.874E+08
3.5000	8.607E+05
5.0000	4.866E+04
7.0000	5.372E+03
11.0000	6.020E+02

Thermal Power

Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
1.90E+03	2.68E+03
Total	Total

III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary

	From SFD	Used
Reactor Moderator	LIGHT WATER	LIGHT WATER
Fuel Cladding	ALUM	ALUM
BOL HM Constituents	U	U
BOL Enrichment %	93.14999856	60 to 100

Basis for Parameter Differences:

Burnup Summary (MWd)[2]

	From SFD	Estimated	Basis for burnup used in estimate:
Nominal		79,521.22	Nominal burnup calculated from the heavy metal mass destroyed.
Bounding		112,314.13	Bounding burnup calculated assuming all BOL heavy metal burned.

Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup	Estimated EOL HM/Given EOL HM
Nominal	2.13		1.14
Bounding	3.01		

[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 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

[1]Fuel decay start date: 2010
Estimates as of: 2030
Template: HFBR (Heavy Water, Alum , 40 to 100% U)
[2]Template 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

Radionuclide	m Ci/MWd From Template	x_n Nominal Fuel Burnup (MWd)[2]	x_b Bounding Fuel Burnup (MWd)[2]	b Initial Activity (Ci)	y_n Nominal Fuel Inventories(Ci)	y_b Bounding Fuel Inventories(Ci)
Ac-227	3 1355E-10	274 584 76	364,474 92	0 00E+00	8 61E-05	1 14E-04
Am-241	8 0194E-03	274,584 76	364,474 92	0.00E+00	2 20E+03	2 92E+03
Am-242m	1.3694E-06	274,584 76	364,474 92	0 00E+00	3 76E-01	4 99E-01
Am-243	3 7096E-05	274,584 76	364,474 92	0 00E+00	1 02E+01	1 35E+01
C-14	2 6464E-08	274,584 76	364,474 92	0 00E+00	7.27E-03	9 65E-03
Cl-36	4 4441E-31	274,584 76	364,474 92	0 00E+00	1.22E-25	1 62E-25
Cm-243	5 7029E-06	274,584 76	364,474 92	0 00E+00	1.57E+00	2 08E+00
Cm-244	4 6555E-03	274,584 76	364,474 92	0 00E+00	1.28E+03	1 70E+03
Co-60	4 8663E-05	274,584 76	364,474 92	0 00E+00	1.34E+01	1 77E+01
Cs-134	1 0638E-02	274,584 76	364,474 92	0 00E+00	2 92E+03	3 88E+03
Cs-135	4.2564E-06	274,584 76	364,474.92	0 00E+00	1 17E+00	1 55E+00
Cs-137	2 0358E+00	274,584 76	364,474.92	0 00E+00	5 59E+05	7 42E+05
Eu-154	5 1956E-02	274,584 76	364,474.92	0 00E+00	1 43E+04	1 89E+04
Eu-155	1.4295E-02	274,584 76	364,474 92	0 00E+00	3 93E+03	5 21E+03
Fe-55	1.3560E-03	274,584 76	364,474 92	0 00E+00	3 72E+02	4 94E+02
H-3	4 6258E-03	274,584 76	364,474 92	0 00E+00	1 27E+03	1 69E+03
I-129	6 6403E-07	274,584 76	364,474 92	0 00E+00	1 82E-01	2 42E-01
Kr-85	1 0808E-01	274,584 76	364,474 92	0 00E+00	2 97E+04	3.94E+04
Np-237	3 1537E-05	274,584.76	364,474 92	0 00E+00	8 66E+00	1.15E+01
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
Tl-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

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg MeV	
0 0150	3 853E+16
0 0250	7 942E+15
0 0375	7 057E+15
0 0575	7.471E+15
0 0850	4.522E+15
0 1250	3.203E+15
0.2250	3.893E+15
0.3750	1 685E+15
0.5750	2 789E+16
0 8500	7.303E+14
1.2500	4 682E+14
1 7500	1.804E+13
2.2500	1 154E+09
2 7500	6 750E+08
3.5000	2.852E+07
5 0000	1 097E+07
7 0000	1.259E+06
11.0000	1 442E+05

Thermal Power

Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
7 94E+03	1.05E+04
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 99999565	40 to 100

Basis for Parameter Differences:

Burnup Summary (MWd)[2]

	From SFD	Estimated
Nominal		274 584 76
Bounding		364,474 92

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	1.59	
Bounding	2 11	

Estimated EOL HM/Given EOL HM: 1 06

[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 UALX HEU CANADA	[1]Fuel decay start date:	2010	Estimated Canister usage:	18"x15"
SNF ID #:	663	Estimates as of:	2030		10 92
Fuel Units & Descr:	131 - MULTI-PIN CLUSTER	Template	HFBR (Heavy Water, Alum., 40 to 100%, U)		
Heavy Metal Mass:	BOL=76 648kg; EOL=32.383kg	[2]Template Burnup(MWd):	164 6		
ROD Storage Site:	SRS	Template BOL Heavy Metal Mass (MT):	0 000377		
		Template Decay Time:	20 years		

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	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		
Tl-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		

Thermal Power	
Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
1 18E+03	2.04E+03
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	
Fuel Cladding	ALUM	ALUM	
BOL HM Constituents	U	U	
BOL Enrichment %	93 15000501	40 to 100	

Burnup Summary (MWd)[2]

	From SFD	Estimated	Basis for burnup used in estimate:
Nominal		40,772.53	Nominal burnup calculated from the heavy metal mass destroyed.
Bounding		70 600 79	Bounding burnup calculated assuming all BOL heavy metal burned.

Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup	Estimated EOL HM/Given EOL HM
Nominal	1.22		1 03
Bounding	2 11		

[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 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

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

Estimated Canister usage

18"x10'
0 08

II. Estimates

Radionuclide	m Ci/MWd From Template	x_n Nominal Fuel Burnup (MWd)[2]	x_b Bounding Fuel Burnup (MWd)[2]	b Initial Activity (Ci)	y_n Nominal Fuel Inventories(Ci)	y_b Bounding Fuel Inventories(Ci)
Ac-227	6 6313E-10	28.24	56 48	0 00E+00	1.87E-08	3 75E-08
Am-241	2 0060E-03	28.24	56 48	0 00E+00	5 66E-02	1.13E-01
Am-242m	4 2429E-07	28.24	56 48	0 00E+00	1.20E-05	2 40E-05
Am-243	1 4899E-06	28.24	56 48	0 00E+00	4 21E-05	8 42E-05
C-14	5 7135E-09	28 24	56 48	0 00E+00	1 61E-07	3 23E-07
Cl-36	1.3124E-32	28 24	56 48	0 00E+00	3 71E-31	7 41E-31
Cm-243	1 6443E-07	28 24	56 48	0 00E+00	4 64E-06	9.29E-06
Cm-244	2 9330E-05	28 24	56 48	0 00E+00	8.28E-04	1 66E-03
Co-60	5 3186E-06	28.24	56 48	0 00E+00	1.50E-04	3 00E-04
Cs-134	3 1563E-03	28.24	56 48	0 00E+00	8 91E-02	1 78E-01
Cs-135	3 4477E-06	28.24	56 48	0.00E+00	9 74E-05	1 95E-04
Cs-137	2 0313E+00	28.24	56 48	0 00E+00	5 74E+01	1 15E+02
Eu-154	2 4513E-02	28.24	56 48	0 00E+00	6 92E-01	1 38E+00
Eu-155	4 8175E-03	28 24	56 48	0 00E+00	1.36E-01	2 72E-01
Fe-55	1.2397E-04	28 24	56 48	0 00E+00	3 50E-03	7.00E-03
H-3	4 5697E-03	28 24	56 48	0 00E+00	1.29E-01	2.58E-01
I-129	7 5300E-07	28.24	56 48	0 00E+00	2 13E-05	4.25E-05
Kr-85	1 0850E-01	28.24	56 48	0 00E+00	3 06E+00	6 13E+00
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
Tl-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

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg MeV	
0 0150	5 962E+12
0 0250	1.240E+12
0 0375	1 081E+12
0 0575	1 158E+12
0 0850	6 999E+11
0 1250	4 736E+11
0.2250	6 040E+11
0 3750	2.629E+11
0 5750	4.288E+12
0 8500	7.250E+10
1.2500	4 140E+10
1 7500	1 900E+09
2.2500	1 667E+05
2 7500	9 422E+04
3 5000	4.332E+02
5 0000	2 461E+01
7 0000	2 717E+00
11.0000	3 045E-01

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	Basis for burnup used in estimate:
Nominal		28.24	Nominal burnup calculated from the heavy metal mass destroyed.
Bounding		56 48	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

[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 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

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

Estimated Canister usage: 18"x10" = 0 08

II. Estimates

	m	x_n	x_b	b	y_n	y_b
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	28.24	56 48	0 00E+00	1 87E-08	3 75E-08
Am-241	2 0060E-03	28.24	56 48	0 00E+00	5 66E-02	1 13E-01
Am-242m	4 2429E-07	28.24	56 48	0 00E+00	1.20E-05	2 40E-05
Am-243	1 4899E-06	28 24	56 48	0 00E+00	4.21E-05	8 42E-05
C-14	5 7135E-09	28 24	56 48	0 00E+00	1 61E-07	3.23E-07
Cl-36	1 3124E-32	28 24	56 48	0 00E+00	3 71E-31	7 41E-31
Cm-243	1 6443E-07	28 24	56.48	0 00E+00	4 64E-06	9.29E-06
Cm-244	2 9330E-05	28 24	56 48	0 00E+00	8 28E-04	1 66E-03
Co-60	5 3186E-06	28 24	56 48	0 00E+00	1 50E-04	3 00E-04
Cs-134	3 1563E-03	28 24	56 48	0 00E+00	8 91E-02	1 78E-01
Cs-135	3 4477E-06	28 24	56 48	0 00E+00	9 74E-05	1 95E-04
Cs-137	2 0313E+00	28 24	56 48	0 00E+00	5 74E+01	1 15E+02
Eu-154	2 4513E-02	28.24	56 48	0 00E+00	6 92E-01	1 38E+00
Eu-155	4 8175E-03	28.24	56 48	0 00E+00	1 36E-01	2 72E-01
Fe-55	1.2397E-04	28.24	56 48	0 00E+00	3 50E-03	7 00E-03
H-3	4 5697E-03	28.24	56 48	0 00E+00	1.29E-01	2 58E-01
I-129	7 5300E-07	28.24	56 48	0 00E+00	2.13E-05	4 25E-05
Kr-85	1 0850E-01	28.24	56 48	0 00E+00	3 06E+00	6 13E+00
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
Tl-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

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg MeV	
0 0150	5 962E+12
0 0250	1.240E+12
0.0375	1 081E+12
0 0575	1 158E+12
0 0850	6.999E+11
0 1250	4 736E+11
0 2250	6 040E+11
0 3750	2 629E+11
0 5750	4.288E+12
0 8500	7 250E+10
1 2500	4 140E+10
1 7500	1 900E+09
2.2500	1 667E+05
2 7500	9 422E+04
3 5000	4 332E+02
5 0000	2.461E+01
7 0000	2 717E+00
11.0000	3.045E 01

Thermal Power

Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
5 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	Basis for burnup used in estimate:
Nominal		28.24	Nominal burnup calculated from the heavy metal mass destroyed.
Bounding		56 48	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

[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 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

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

Estimated Canister usage: 18"x10' = 0 08

II. Estimates

	m	x_n	x_b	b	y_n	y_b
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	28.24	56 48	0 00E+00	1.87E-08	3 75E-08
Am-241	2.0060E-03	28.24	56 48	0 00E+00	5 66E-02	1 13E-01
Am-242m	4 2429E-07	28.24	56 48	0 00E+00	1.20E-05	2 40E-05
Am-243	1 4899E-06	28.24	56 48	0 00E+00	4.21E-05	8 42E-05
C-14	5 7135E-09	28 24	56 48	0 00E+00	1 61E-07	3.23E-07
Cl-36	1 3124E-32	28 24	56 48	0 00E+00	3 71E-31	7 41E-31
Cm-243	1 6443E-07	28 24	56 48	0 00E+00	4 64E-06	9.29E-06
Cm-244	2 9330E-05	28 24	56 48	0 00E+00	8.28E-04	1.66E-03
Co-60	5.3186E-06	28 24	56 48	0 00E+00	1.50E-04	3 00E-04
Cs-134	3 1563E-03	28.24	56 48	0 00E+00	8.91E-02	1 78E-01
Cs-135	3 4477E-06	28.24	56 48	0 00E+00	9 74E-05	1 95E-04
Cs-137	2 0313E+00	28.24	56 48	0 00E+00	5 74E+01	1 15E+02
Eu-154	2 4513E-02	28.24	56 48	0 00E+00	6 92E-01	1 38E+00
Eu-155	4 8175E-03	28 24	56 48	0 00E+00	1 36E-01	2.72E-01
Fe-55	1.2397E-04	28 24	56.48	0 00E+00	3 50E-03	7.00E-03
H-3	4 5697E-03	28 24	56 48	0 00E+00	1.29E-01	2 58E-01
I-129	7.5300E-07	28.24	56 48	0 00E+00	2.13E-05	4.25E-05
Kr-85	1.0850E-01	28.24	56 48	0 00E+00	3 06E+00	6 13E+00
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
Tl-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

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg MeV	
0 0150	5 962E+12
0 0250	1.240E+12
0 0375	1.081E+12
0 0575	1 158E+12
0 0850	6 999E+11
0 1250	4 736E+11
0.2250	6 040E+11
0 3750	2 629E+11
0 5750	4.288E+12
0 8500	7.250E+10
1.2500	4 140E+10
1.7500	1.900E+09
2.2500	1 667E+05
2 7500	9 422E+04
3 5000	4 332E+02
5 0000	2 461E+01
7 0000	2 717E+00
11 0000	3.045E-01

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	Basis for burnup used in estimate:
Nominal		28 24	Nominal burnup calculated from the heavy metal mass destroyed
Bounding		56 48	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

[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 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

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

Estimated Canister usage, 18"x10': 0 08

II. Estimates

	m	x_n	x_b	b	y_n	y_b
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	28.22	56 44	0 00E+00	1 87E-08	3 74E-08
Am-241	2 0060E-03	28.22	56 44	0 00E+00	5 66E-02	1 13E-01
Am-242m	4.2429E-07	28 22	56 44	0 00E+00	1.20E-05	2 39E-05
Am-243	1 4899E-06	28 22	56 44	0 00E+00	4.20E-05	8 41E-05
C-14	5 7135E-09	28 22	56 44	0 00E+00	1 61E-07	3 22E-07
Cl-36	1 3124E-32	28 22	56 44	0 00E+00	3.70E-31	7 41E-31
Cm-243	1 6443E-07	28 22	56.44	0 00E+00	4 64E-06	9 28E-06
Cm-244	2 9330E-05	28 22	56.44	0 00E+00	8.28E-04	1 66E-03
Co-60	5 3186E-06	28 22	56 44	0 00E+00	1 50E-04	3 00E-04
Cs-134	3 1563E-03	28.22	56 44	0 00E+00	8 91E-02	1 78E-01
Cs-135	3 4477E-06	28.22	56 44	0 00E+00	9 73E-05	1 95E-04
Cs-137	2 0313E+00	28.22	56 44	0 00E+00	5 73E+01	1 15E+02
Eu-154	2 4513E-02	28.22	56 44	0 00E+00	6 92E-01	1 38E+00
Eu-155	4 8175E-03	28.22	56 44	0 00E+00	1 36E-01	2.72E-01
Fe-55	1.2397E-04	28.22	56 44	0 00E+00	3 50E-03	7 00E-03
H-3	4 5697E-03	28.22	56 44	0 00E+00	1 29E-01	2 58E-01
I-129	7.5300E-07	28.22	56 44	0 00E+00	2.13E-05	4 25E-05
Kr-85	1.0850E-01	28.22	56 44	0 00E+00	3 06E+00	6 12E+00
Np-237	9 5561E-06	28 22	56 44	0 00E+00	2.70E-04	5 39E-04
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
Tl-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

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg MeV	
0 0150	5 958E+12
0 0250	1.239E+12
0 0375	1 081E+12
0 0575	1 157E+12
0 0850	6 994E+11
0 1250	4 733E+11
0.2250	6 036E+11
0.3750	2 627E+11
0.5750	4.285E+12
0 8500	7.245E+10
1.2500	4 137E+10
1 7500	1.899E+09
2.2500	1 666E+05
2.7500	9 416E+04
3 5000	4.329E+02
5 0000	2.459E+01
7 0000	2.715E+00
11 0000	3 043E-01

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

[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 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

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

Estimated Canister usage: 18"x10': 0 08

II. Estimates

Radionuclide	m: Ci/MWd From Template	x_n: Nominal Fuel Burnup (MWd)[2]	x_b: Bounding Fuel Burnup (MWd)[2]	b: Initial Activity (Ci)	y_n: Nominal Fuel Inventories(Ci)	y_b: Bounding Fuel Inventories(Ci)
Ac-227	6 6313E-10	28.24	56 48	0 00E+00	1.87E-08	3 75E-08
Am-241	2 0060E-03	28.24	56 48	0 00E+00	5 66E-02	1 13E-01
Am-242m	4 2429E-07	28 24	56 48	0 00E+00	1.20E-05	2 40E-05
Am-243	1 4899E-06	28.24	56 48	0 00E+00	4.21E-05	8 42E-05
C-14	5 7135E-09	28.24	56 48	0 00E+00	1 61E-07	3.23E-07
Cl-36	1.3124E-32	28 24	56 48	0 00E+00	3 71E-31	7.41E-31
Cm-243	1.6443E-07	28 24	56 48	0 00E+00	4 64E-06	9.29E-06
Cm-244	2 9330E-05	28 24	56 48	0.00E+00	8 28E-04	1 66E-03
Co-60	5.3186E-06	28 24	56 48	0 00E+00	1.50E-04	3 00E-04
Cs-134	3 1563E-03	28.24	56 48	0 00E+00	8 91E-02	1 78E-01
Cs-135	3 4477E-06	28.24	56 48	0 00E+00	9 74E-05	1 95E-04
Cs-137	2 0313E+00	28.24	56 48	0 00E+00	5 74E+01	1 15E+02
Eu-154	2 4513E-02	28.24	56 48	0 00E+00	6 92E-01	1.38E+00
Eu-155	4 8175E-03	28.24	56 48	0 00E+00	1 36E-01	2.72E-01
Fe-55	1.2397E-04	28.24	56 48	0 00E+00	3 50E-03	7 00E-03
H-3	4.5697E-03	28 24	56 48	0 00E+00	1 29E-01	2 58E-01
I-129	7.5300E-07	28 24	56 48	0 00E+00	2 13E-05	4 25E-05
Kr-85	1 0850E-01	28 24	56 48	0 00E+00	3 06E+00	6 13E+00
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
Tl-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

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg MeV	
0 0150	5.962E+12
0 0250	1.240E+12
0 0375	1.081E+12
0 0575	1 158E+12
0 0850	6 999E+11
0 1250	4 736E+11
0.2250	6 040E+11
0.3750	2 629E+11
0 5750	4.288E+12
0 8500	7.250E+10
1.2500	4 140E+10
1 7500	1 900E+09
2.2500	1 667E+05
2.7500	9 422E+04
3.5000	4 332E+02
5 0000	2 461E+01
7 0000	2 717E+00
11 0000	3 045E-01

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 24
Bounding		56 48

Basis for burnup used in estimate:

Nominal: Nominal burnup calculated from the heavy metal mass destroyed
Bounding: 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

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

[1]Fuel decay start date: 2010
Estimates as of: 2030
Template: Pathfinder (Light Water, SST, 60 to 100%, U)
[2]Template 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

Radionuclide	m Ci/MWd From Template	x_n Nominal Fuel Burnup (MWd)[2]	x_b Bounding Fuel Burnup (MWd)[2]	b Initial Activity (Ci)	y_n Nominal Fuel Inventories(Ci)	y_b Bounding Fuel Inventories(Ci)
Ac-227	8 0233E-09	75 00	149 99	0 00E+00	6 02E-07	1.20E-06
Am-241	8 8502E-05	75 00	149 99	0 00E+00	6 64E-03	1 33E-02
Am-242m	9 1098E-09	75 00	149 99	0 00E+00	6 83E-07	1 37E-06
Am-243	9 8652E-10	75 00	149 99	0 00E+00	7 40E-08	1 48E-07
C-14	2 3062E-04	75 00	149 99	0 00E+00	1 73E-02	3 46E-02
Cl-36	1.2261E-06	75.00	149 99	0 00E+00	9.20E-05	1 84E-04
Cm-243	3 5824E-10	75 00	149 99	0 00E+00	2 69E-08	5 37E-08
Cm-244	4 1131E-09	75 00	149 99	0 00E+00	3 08E-07	6 17E-07
Co-60	5 0882E-01	75 00	149 99	0 00E+00	3 82E+01	7 63E+01
Cs-134	4 6705E-04	75 00	149 99	0 00E+00	3 50E-02	7 01E-02
Cs-135	3 0316E-05	75 00	149 99	0 00E+00	2.27E-03	4 55E-03
Cs-137	2 0516E+00	75 00	149 99	0 00E+00	1.54E+02	3 08E+02
Eu-154	2 2413E-03	75 00	149 99	0 00E+00	1 68E-01	3 36E-01
Eu-155	5 6772E-03	75 00	149 99	0 00E+00	4.26E-01	8 52E-01
Fe-55	6 6988E-02	75 00	149 99	0 00E+00	5 02E+00	1 00E+01
H-3	5 8303E-03	75 00	149 99	0 00E+00	4 37E-01	8 75E-01
I-129	7 3195E-07	75 00	149 99	0 00E+00	5 49E-05	1 10E-04
Kr-85	1 0880E-01	75 00	149 99	0 00E+00	8 16E+00	1 63E+01
Np-237	1 1481E-06	75 00	149 99	0 00E+00	8 61E-05	1 72E-04
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
Tl-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

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg MeV	
0 0150	1 615E+13
0 0250	3 357E+12
0 0375	2 893E+12
0 0575	3 120E+12
0 0850	1 889E+12
0 1250	1.227E+12
0.2250	1 615E+12
0.3750	7 064E+11
0 5750	1 147E+13
0 8500	1.234E+11
1.2500	5 694E+12
1 7500	3 139E+09
2.2500	3.036E+07
2.7500	2.310E+05
3 5000	8 733E+02
5 0000	5 350E+00
7 0000	5.981E-01
11 0000	6 761E-02

Thermal Power

Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
2.35E+00	4 69E+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	NONE	SST
BOL HM Constituents	U	U
BOL Enrichment %	48.34531901	60 to 100

Basis for Parameter Drfferences:

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)

Burnup Summary (MWd)[2]

	From SFD	Estimated
Nominal		75 00
Bounding		149 99

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 40	
Bounding	0 81	

Estimated EOL HM/Given EOL HM: 0 98

[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 CANADA
SNF ID #: 671
Fuel Units & Descr: 5952 - PARTICULATE
Heavy Metal Mass: BOL=492.23kg EOL=492.23kg
ROD Storage Site: SRS

[1]Fuel decay start date: 2010
Estimates as of: 2030
Template: Pathfinder (Light Water SST 60 to 100‰ U)
[2]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

	m	x_n	x_b	b	y_n	y_b
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	8 0233E-09	9,299 68	18,599 37	0 00E+00	7 46E-05	1 49E-04
Am-241	8 8502E-05	9,299 68	18,599 37	0 00E+00	8 23E-01	1 65E+00
Am-242m	9 1098E-09	9,299 68	18,599 37	0 00E+00	8 47E-05	1.69E-04
Am-243	9 8652E-10	9,299 68	18 599 37	0 00E+00	9 17E-06	1 83E-05
C-14	2.3062E-04	9,299 68	18,599 37	0 00E+00	2 14E+00	4.29E+00
Cl-36	1.2261E-06	9,299 68	18,599 37	0 00E+00	1 14E-02	2.28E-02
Cm-243	3 5824E-10	9,299 68	18,599 37	0 00E+00	3 33E-06	6 66E-06
Cm-244	4 1131E-09	9,299 68	18,599 37	0 00E+00	3 83E-05	7 65E-05
Co-60	5 0882E-01	9,299 68	18,599 37	0 00E+00	4 73E+03	9 46E+03
Cs-134	4 6705E-04	9,299 68	18,599 37	0 00E+00	4 34E+00	8 69E+00
Cs-135	3 0316E-05	9,299 68	18,599.37	0 00E+00	2 82E-01	5 64E-01
Cs-137	2 0516E+00	9,299 68	18,599.37	0 00E+00	1 91E+04	3 82E+04
Eu-154	2.2413E-03	9,299 68	18,599 37	0 00E+00	2 08E+01	4 17E+01
Eu-155	5 6772E-03	9,299 68	18,599 37	0 00E+00	5 28E+01	1 06E+02
Fe-55	6 6988E-02	9,299 68	18,599 37	0 00E+00	6 23E+02	1.25E+03
H-3	5.8303E-03	9,299 68	18,599 37	0 00E+00	5 42E+01	1.08E+02
I-129	7.3195E-07	9,299 68	18,599 37	0 00E+00	6 81E-03	1.36E-02
Kr-85	1 0880E-01	9,299 68	18,599 37	0 00E+00	1.01E+03	2 02E+03
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
Tl-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

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg MeV	
0 0150	2 003E+15
0 0250	4 162E+14
0 0375	3.587E+14
0.0575	3.868E+14
0 0850	2.342E+14
0 1250	1.521E+14
0.2250	2 002E+14
0 3750	8 760E+13
0 5750	1.422E+15
0 8500	1.530E+13
1.2500	7 060E+14
1 7500	3 892E+11
2.2500	3 765E+09
2.7500	2.864E+07
3.5000	1 083E+05
5 0000	6 634E+02
7 0000	7 416E+01
11 0000	8.384E+00

Thermal Power

Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
2.91E+02	5.82E+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	NONE	SST
BOL HM Constituents	U	U
BOL Enrichment %	48 34531901	60 to 100

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)

Burnup Summary (MWd)[2]

	From SFD	Estimated
Nominal		9,299 68
Bounding		18,599.37

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 40	
Bounding	0 81	-

Estimated EOL HM/Given EOL HM: 0 98

[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

[1]Fuel decay start date: 2010
Estimates as of: 2030
Template: Pathfinder (Light Water, SST, 60 to 100%, U)
[2]Template 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_n	x_b	b	y_n	y_b
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd)[2]	Bounding Fuel Burnup (MWd)[2]	Initial Activity (Ci)	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventones(Ci)
Ac-227	8 0233E-09	75 00	149 99	0 00E+00	6 02E-07	1 20E-06
Am-241	8 8502E-05	75 00	149 99	0 00E+00	6 64E-03	1 33E-02
Am-242m	9.1098E-09	75 00	149 99	0 00E+00	6 83E-07	1 37E-06
Am-243	9 8652E-10	75.00	149 99	0 00E+00	7 40E-08	1 48E-07
C-14	2.3062E-04	75.00	149 99	0 00E+00	1 73E-02	3 46E-02
Cl-36	1.2261E-06	75 00	149 99	0 00E+00	9.20E-05	1 84E-04
Cm-243	3 5824E-10	75.00	149 99	0 00E+00	2 69E-08	5 37E-08
Cm-244	4 1131E-09	75 00	149 99	0 00E+00	3 08E-07	6 17E-07
Co-60	5 0882E-01	75 00	149 99	0 00E+00	3.82E+01	7 63E+01
Cs-134	4 6705E-04	75 00	149 99	0 00E+00	3 50E-02	7 01E-02
Cs-135	3 0316E-05	75 00	149 99	0 00E+00	2.27E-03	4 55E-03
Cs-137	2 0516E+00	75 00	149 99	0 00E+00	1.54E+02	3 08E+02
Eu-154	2 2413E-03	75 00	149 99	0 00E+00	1 68E-01	3 36E-01
Eu-155	5 6772E-03	75 00	149 99	0 00E+00	4.26E-01	8 52E-01
Fe-55	6 6988E-02	75 00	149 99	0 00E+00	5 02E+00	1 00E+01
H-3	5 8303E-03	75 00	149 99	0.00E+00	4.37E-01	8 75E-01
I-129	7 3195E-07	75 00	149 99	0 00E+00	5 49E-05	1 10E-04
Kr-85	1 0880E-01	75 00	149 99	0 00E+00	8 16E+00	1.63E+01
Np-237	1 1481E-06	75 00	149 99	0 00E+00	8 61E-05	1 72E-04
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
Tl-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

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg MeV	
0 0150	1 615E+13
0 0250	3.357E+12
0 0375	2.893E+12
0 0575	3 120E+12
0 0850	1.889E+12
0 1250	1.227E+12
0.2250	1 615E+12
0 3750	7.064E+11
0.5750	1 147E+13
0 8500	1.234E+11
1.2500	5 694E+12
1 7500	3 139E+09
2.2500	3 036E+07
2 7500	2.310E+05
3.5000	8.733E+02
5 0000	5.350E+00
7 0000	5 981E-01
11 0000	6 761E-02

Thermal Power

Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
2.35E+00	4 69E+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	NONE	SST
BOL HM Constituents	U	U
BOL Enrichment %	48.34531901	60 to 100

Basis for Parameter Drfferences:

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)

Burnup Summary (MWd)[2]

	From SFD	Estimated
Nominal		75 00
Bounding		149 99

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	0.40	
Bounding	0 81	

Estimated EOL HM/Given EOL HM: 0 98

[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 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

[1]Fuel decay start date: 2010
Estimates as of: 2030
Template: HFBR (Heavy Water, Alum , 10 to 20% U)
[2]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

Radionuclide	m: Ci/MWd From Template	x_n: Nominal Fuel Burnup (MWd)[2]	x_b: Bounding Fuel Burnup (MWd)[2]	b: Initial Activity (Ci)	y_n: Nominal Fuel Inventories(Ci)	y_b: Bounding Fuel Inventories(Ci)
Ac-227	8.5333E-10	21,843 20	43,686 40	0 00E+00	1 86E-05	3 73E-05
Am-241	2.2753E-02	21,843 20	43,686 40	0 00E+00	4 97E+02	9 94E+02
Am-242m	8 9133E-06	21,843 20	43,686 40	0 00E+00	1 95E-01	3 89E-01
Am-243	6 4007E-06	21,843 20	43,686 40	0 00E+00	1.40E-01	2 80E-01
C-14	2 9620E-08	21,843.20	43,686 40	0 00E+00	6 47E-04	1.29E-03
Cl-36	5 9513E-35	21,843.20	43,686 40	0.00E+00	1.30E-30	2 60E-30
Cm-243	2 2087E-06	21,843.20	43,686 40	0 00E+00	4 82E-02	9 65E-02
Cm-244	1 1007E-04	21,843.20	43,686 40	0 00E+00	2 40E+00	4 81E+00
Co-60	1 6340E-05	21,843 20	43,686 40	0 00E+00	3 57E-01	7 14E-01
Cs-134	2 1353E-03	21,843 20	43,686 40	0 00E+00	4 66E+01	9 33E+01
Cs-135	4 8607E-06	21,843 20	43,686 40	0 00E+00	1 06E-01	2 12E-01
Cs-137	2 0227E+00	21,843 20	43,686 40	0 00E+00	4 42E+04	8 84E+04
Eu-154	2 0887E-02	21,843 20	43,686 40	0 00E+00	4 56E+02	9 12E+02
Eu-155	4 0867E-03	21,843 20	43,686 40	0 00E+00	8 93E+01	1 79E+02
Fe-55	1 4167E-03	21,843 20	43,686 40	0 00E+00	3 09E+01	6 19E+01
H-3	4 6653E-03	21,843.20	43,686 40	0 00E+00	1.02E+02	2 04E+02
I-129	7 1600E-07	21,843.20	43,686 40	0.00E+00	1 56E-02	3 13E-02
Kr-85	1 0240E-01	21,843.20	43,686 40	0 00E+00	2.24E+03	4 47E+03
Np-237	3 7227E-06	21,843.20	43,686 40	0 00E+00	8 13E-02	1.63E-01
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
Tl-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
U-233	4 4013E-10	21,843.20	43,686 40	0 00E+00	9 61E-06	1 92E-05
U-234	4 6500E-07	21,843.20	43,686 40	0 00E+00	1 02E-02	2 03E-02
U-235	-2 5335E-06	21,843.20	0 00	7.16E-02	1 62E-02	7.16E-02
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

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg MeV	
0 0150	4 427E+15
0 0250	9 196E+14
0 0375	8 077E+14
0 0575	8 702E+14
0 0850	5 180E+14
0 1250	3 488E+14
0.2250	4 464E+14
0 3750	1 943E+14
0 5750	3 296E+15
0 8500	5 037E+13
1.2500	2.838E+13
1 7500	1.340E+12
2.2500	1.256E+08
2 7500	1 487E+07
3.5000	6 022E+05
5 0000	9 146E+04
7 0000	1 035E+04
11 0000	1 178E+03

Thermal Power

Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
5.22E+02	1.04E+03
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 %	20	10 to 20

Basis for Parameter Differences:

Burnup Summary (MWd)[2]

	From SFD	Estimated	Basis for burnup used in estimate
Nominal		21,843.20	Nominal burnup calculated from the heavy metal mass destroyed.
Bounding		43,686 40	Bounding burnup assumed to be twice nominal burnup

Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup
Nominal	3 01	
Bounding	6.02	

Estimated EOL HM/Given EOL HM: 1 04

[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 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

[1]Fuel decay start date: 2010
Estimates as of: 2030
Template: HFBR (Heavy Water, Alum., 10 to 20%, U)
[2]Template 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

Radionuclide	m: Ci/MWd From Template	x_n: Nominal Fuel Burnup (MWd)[2]	x_b: Bounding Fuel Burnup (MWd)[2]	b: Initial Activity (Ci)	y_n: Nominal Fuel Inventories(Ci)	y_b: Bounding Fuel Inventories(Ci)
Ac-227	8 5333E-10	11,548 15	23,096 29	0 00E+00	9 85E-06	1 97E-05
Am-241	2.2753E-02	11,548 15	23,096 29	0 00E+00	2 63E+02	5.26E+02
Am-242m	8 9133E-06	11,548 15	23,096 29	0 00E+00	1 03E-01	2 06E-01
Am-243	6 4007E-06	11,548 15	23,096 29	0 00E+00	7 39E-02	1 48E-01
C-14	2 9620E-08	11,548 15	23,096 29	0 00E+00	3 42E-04	6 84E-04
Cl-36	5 9513E-35	11,548 15	23,096 29	0 00E+00	6 87E-31	1 37E-30
Cm-243	2.2087E-06	11,548 15	23,096 29	0 00E+00	2 55E-02	5 10E-02
Cm-244	1.1007E-04	11,548 15	23,096.29	0 00E+00	1.27E+00	2.54E+00
Co-60	1 6340E-05	11,548 15	23,096.29	0 00E+00	1 89E-01	3.77E-01
Cs-134	2.1353E-03	11,548 15	23,096.29	0 00E+00	2 47E+01	4 93E+01
Cs-135	4 8607E-06	11,548 15	23,096.29	0 00E+00	5 61E-02	1.12E-01
Cs-137	2 0227E+00	11,548 15	23 096.29	0 00E+00	2 34E+04	4 67E+04
Eu-154	2.0887E-02	11,548 15	23,096.29	0 00E+00	2 41E+02	4 82E+02
Eu-155	4 0867E-03	11,548 15	23,096.29	0 00E+00	4 72E+01	9 44E+01
Fe-55	1.4167E-03	11,548 15	23,096.29	0 00E+00	1 64E+01	3 27E+01
H-3	4 6653E-03	11,548 15	23,096.29	0 00E+00	5 39E+01	1 08E+02
I-129	7 1600E-07	11,548 15	23,096.29	0 00E+00	8 27E-03	1 65E-02
Kr-85	1 0240E-01	11,548 15	23,096.29	0 00E+00	1.18E+03	2 37E+03
Np-237	3 7227E-06	11,548 15	23,096.29	0 00E+00	4 30E-02	8.60E-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

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg MeV	
0.0150	2 340E+15
0.0250	4 862E+14
0.0375	4 270E+14
0.0575	4 601E+14
0 0850	2 738E+14
0 1250	1 844E+14
0.2250	2.360E+14
0 3750	1 027E+14
0 5750	1 742E+15
0 8500	2 663E+13
1.2500	1.501E+13
1 7500	7 082E+11
2.2500	6 642E+07
2.7500	7.859E+06
3 5000	3 184E+05
5 0000	4 837E+04
7 0000	5 473E+03
11 0000	6.228E+02

Thermal Power

Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
2.76E+02	5 52E+02
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 %	20	10 to 20

Basis for Parameter Differences:

Burnup Summary (MWd)[2]

	From SFD	Estimated	Basis for burnup used in estimate:
Nominal		11,548 15	Nominal burnup calculated from the heavy metal mass destroyed.
Bounding		23,096.29	Bounding burnup assumed to be twice nominal burnup

Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup	Estimated EOL HM/Given EOL HM
Nominal	2 17		1 02
Bounding	4.34		

[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 TUBES (U3SI2 LEU) GERMANY
SNF ID #: 674
Fuel Units & Descr: 18 - ASSEMBLY
Heavy Metal Mass: BOL=18kg EOL=16 2kg
ROD Storage Site: SRS

[1]Fuel decay start date: 2010
Estimates as of: 2030
Template: HFBR (Heavy Water Alum , 10 to 20%, U)
[2]Template 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

Radionuclide	m Ci/MWd From Template	x_n Nominal Fuel Burnup (MWd)[2]	x_b Bounding Fuel Burnup (MWd)[2]	b Initial Activity (Ci)	y_n Nominal Fuel Inventories(Ci)	y_b Bounding Fuel Inventories(Ci)
Ac-227	8.5333E-10	1,710 84	3,421 67	0 00E+00	1.46E-06	2 92E-06
Am-241	2.2753E-02	1,710 84	3,421 67	0 00E+00	3.89E+01	7 79E+01
Am-242m	8 9133E-06	1,710 84	3,421 67	0 00E+00	1.52E-02	3 05E-02
Am-243	6 4007E-06	1,710 84	3,421 67	0 00E+00	1 10E-02	2.19E-02
C-14	2 9620E-08	1,710 84	3,421 67	0 00E+00	5 07E-05	1.01E-04
Cl-36	5 9513E-35	1,710 84	3,421.67	0 00E+00	1 02E-31	2.04E-31
Cm-243	2 2087E-06	1,710 84	3,421.67	0 00E+00	3 78E-03	7.56E-03
Cm-244	1 1007E-04	1,710 84	3,421 67	0 00E+00	1 88E-01	3 77E-01
Co-60	1 6340E-05	1,710 84	3,421 67	0 00E+00	2 80E-02	5 59E-02
Cs-134	2 1353E-03	1,710 84	3,421 67	0 00E+00	3 65E+00	7.31E+00
Cs-135	4 8607E-06	1,710 84	3,421 67	0 00E+00	8 32E-03	1 66E-02
Cs-137	2 0227E+00	1,710 84	3,421 67	0 00E+00	3 46E+03	6 92E+03
Eu-154	2 0887E-02	1,710 84	3,421 67	0 00E+00	3 57E+01	7 15E+01
Eu-155	4 0867E-03	1,710 84	3,421 67	0 00E+00	6 99E+00	1 40E+01
Fe-55	1.4167E-03	1,710 84	3,421 67	0 00E+00	2 42E+00	4 85E+00
H-3	4 6653E-03	1,710 84	3,421 67	0 00E+00	7.98E+00	1 60E+01
I-129	7 1600E-07	1,710 84	3,421 67	0 00E+00	1.22E-03	2 45E-03
Kr-85	1 0240E-01	1,710 84	3,421 67	0 00E+00	1.75E+02	3 50E+02
Np-237	3 7227E-06	1,710 84	3,421 67	0 00E+00	6 37E-03	1.27E-02
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
Tl-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

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg MeV	
0.0150	3 467E+14
0 0250	7.202E+13
0 0375	6.327E+13
0 0575	6 816E+13
0 0850	4 057E+13
0 1250	2 732E+13
0 2250	3 497E+13
0 3750	1.522E+13
0 5750	2.581E+14
0 8500	3 945E+12
1.2500	2.223E+12
1 7500	1 049E+11
2.2500	9.840E+06
2 7500	1 164E+06
3.5000	4 717E+04
5 0000	7 166E+03
7 0000	8 108E+02
11.0000	9.227E+01

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

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

Basis for Parameter Differences:

Burnup Summary (MWd)[2]

	From SFD	Estimated
Nominal		1,710.84
Bounding		3,421.67

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 17	
Bounding	4 34	

Estimated EOL HM/Given EOL HM: 1 02

[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 TUBES (U3Si2 LEU) GERMANY
SNF ID #: 675
Fuel Units & Descr: 135 - ASSEMBLY
Heavy Metal Mass: BOL=151 875kg; EOL=136 688kg
ROD Storage Site: SRS

[1]Fuel decay start date: 2010
Estimates as of: 2030
Template: HFBR (Heavy Water, Alum., 10 to 20%, U)
[2]Template 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	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	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		
Tl-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		

Thermal Power	
Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
3.45E+02	6.90E+02
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 %	20	10 to 20

Basis for Parameter Differences:

Burnup Summary (MWd)[2]

	From SFD	Estimated
Nominal		14,435 18
Bounding		28,870.37

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	2.17	
Bounding	4 34	

Estimated EOL HM/Given EOL HM: 1 02

[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 TUBES (UALX LEU) AUSTRALIA
SNF ID #: 299
Fuel Units & Descr: 289 - ASSEMBLY
Heavy Metal Mass BOL=289kg EOL=260 1kg
ROD Storage Site SRS

[1]Fuel decay start date 2010
Estimates as of 2030
Template HFBR (Heavy Water, Alum , 10 to 20%, U)
[2]Template 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

Radionuclide	m Ci/MWd From Template	x_n Nominal Fuel Burnup (MWd)[2]	x_b Bounding Fuel Burnup (MWd)[2]	b Initial Activity (Ci)	y_n Nominal Fuel Inventories(Ci)	y_b Bounding Fuel Inventories(Ci)
Ac-227	8 5333E-10	27,468 45	54,936 90	0 00E+00	2 34E-05	4 69E-05
Am-241	2 2753E-02	27,468 45	54,936.90	0 00E+00	6.25E+02	1 25E+03
Am-242m	8 9133E-06	27,468 45	54,936.90	0 00E+00	2 45E-01	4 90E-01
Am-243	6 4007E-06	27,468 45	54,936 90	0 00E+00	1 76E-01	3 52E-01
C-14	2 9620E-08	27,468 45	54,936 90	0 00E+00	8 14E-04	1.63E-03
Cl-36	5 9513E-35	27,468 45	54,936 90	0 00E+00	1 63E-30	3.27E-30
Cm-243	2.2087E-06	27,468 45	54,936 90	0 00E+00	6 07E-02	1.21E-01
Cm-244	1 1007E-04	27,468 45	54,936 90	0 00E+00	3 02E+00	6 05E+00
Co-60	1 6340E-05	27,468 45	54,936 90	0 00E+00	4.49E-01	8 98E-01
Cs-134	2 1353E-03	27,468 45	54,936 90	0 00E+00	5 87E+01	1 17E+02
Cs-135	4 8607E-06	27,468 45	54,936 90	0 00E+00	1.34E-01	2 67E-01
Cs-137	2 0227E+00	27,468 45	54,936 90	0 00E+00	5 56E+04	1 11E+05
Eu-154	2 0887E-02	27,468 45	54,936 90	0 00E+00	5 74E+02	1 15E+03
Eu-155	4 0867E-03	27,468 45	54,936 90	0 00E+00	1 12E+02	2 25E+02
Fe-55	1 4167E-03	27,468 45	54,936 90	0 00E+00	3 89E+01	7.78E+01
H-3	4 6653E-03	27,468 45	54 936 90	0 00E+00	1 28E+02	2.56E+02
I-129	7.1600E-07	27,468 45	54,936 90	0 00E+00	1 97E-02	3 93E-02
Kr-85	1 0240E-01	27,468 45	54,936 90	0 00E+00	2 81E+03	5 63E+03
Np-237	3 7227E-06	27,468 45	54,936 90	0 00E+00	1.02E-01	2 05E-01
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
Tl-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

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg MeV	
0 0150	5.566E+15
0 0250	1 156E+15
0 0375	1 016E+15
0 0575	1 094E+15
0 0850	6 514E+14
0 1250	4 386E+14
0 2250	5 614E+14
0 3750	2 444E+14
0.5750	4 144E+15
0.8500	6.335E+13
1.2500	3.569E+13
1 7500	1.685E+12
2.2500	1.580E+08
2 7500	1.869E+07
3 5000	7.574E+05
5 0000	1 151E+05
7 0000	1 302E+04
11 0000	1 481E+03

Thermal Power

Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
6 57E+02	1.31E+03
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 %	20 0000003	10 to 20

Basis for Parameter Differences:

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

Burnup Summary (MWd)[2]

	From SFD	Estimated
Nominal		27,468.45
Bounding		54,936 90

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	2.17	
Bounding	4 34	

Estimated EOL HM/Given EOL HM: 1.02

[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 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

[1]Fuel decay start date: 2010
Estimates as of: 2030
Template: HFBR (Heavy Water, Alum., 40 to 100%, U)
[2]Template 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
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	3 1355E-10	14,945 82	29,891 64	0.00E+00	4 69E-06	9 37E-06
Am-241	8 0194E-03	14,945 82	29,891 64	0 00E+00	1.20E+02	2 40E+02
Am-242m	1 3694E-06	14,945 82	29,891 64	0 00E+00	2 05E-02	4 09E-02
Am-243	3 7096E-05	14,945 82	29,891 64	0 00E+00	5 54E-01	1 11E+00
C-14	2 6464E-08	14 945 82	29,891 64	0 00E+00	3 96E-04	7 91E-04
Cl-36	4 4441E-31	14,945 82	29,891 64	0 00E+00	6 64E-27	1 33E-26
Cm-243	5 7029E-06	14,945 82	29,891.64	0 00E+00	8.52E-02	1 70E-01
Cm-244	4 6555E-03	14,945 82	29,891 64	0 00E+00	6 96E+01	1 39E+02
Co-60	4 8663E-05	14,945 82	29,891 64	0 00E+00	7.27E-01	1 45E+00
Cs-134	1 0638E-02	14,945 82	29,891 64	0 00E+00	1 59E+02	3 18E+02
Cs-135	4 2564E-06	14,945 82	29,891 64	0 00E+00	6 36E-02	1 27E-01
Cs-137	2 0358E+00	14,945 82	29,891 64	0 00E+00	3 04E+04	6 09E+04
Eu-154	5.1956E-02	14,945 82	29,891 64	0 00E+00	7 77E+02	1 55E+03
Eu-155	1.4295E-02	14,945 82	29,891 64	0 00E+00	2 14E+02	4.27E+02
Fe-55	1 3560E-03	14,945 82	29,891 64	0.00E+00	2 03E+01	4 05E+01
H-3	4 6258E-03	14,945 82	29,891 64	0.00E+00	6 91E+01	1.38E+02
I-129	6 6403E-07	14,945 82	29,891 64	0 00E+00	9 92E-03	1.98E-02
Kr-85	1 0808E-01	14,945 82	29,891 64	0.00E+00	1 62E+03	3.23E+03
Np-237	3 1537E-05	14,945 82	29,891 64	0 00E+00	4 71E-01	9 43E-01
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
Tl-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

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg MeV	
0 0150	3 160E+15
0 0250	6.514E+14
0 0375	5 787E+14
0 0575	6 128E+14
0 0850	3 709E+14
0 1250	2 627E+14
0.2250	3 192E+14
0 3750	1 382E+14
0.5750	2.287E+15
0 8500	5 989E+13
1.2500	3 840E+13
1 7500	1 480E+12
2.2500	9 461E+07
2.7500	5.536E+07
3 5000	2.339E+06
5 0000	8 993E+05
7 0000	1 032E+05
11 0000	1 183E+04

Thermal Power

Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
4 32E+02	8 65E+02
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 %	80 00000311	40 to 100

Basis for Parameter Differences:

Burnup Summary (MWd)[2]

	From SFD	Estimated
Nominal		14 945 82
Bounding		29 891 64

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 79	

Estimated EOL HM/Given EOL HM: 1 01

[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 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

[1]Fuel decay start date 2010
Estimates as of 2030
Template HFBR (Heavy Water, Alum , 40 to 100% U)
[2]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

Radionuclide	m Ci/MWd From Template	x_n Nominal Fuel Burnup (MWd)[2]	x_b Bounding Fuel Burnup (MWd)[2]	b Initial Activity (Ci)	y_n Nominal Fuel Inventories(Ci)	y_b Bounding Fuel Inventories(Ci)
Ac-227	3.1355E-10	14,025.54	28,051.09	0.00E+00	4.40E-06	8.80E-06
Am-241	8.0194E-03	14,025.54	28,051.09	0.00E+00	1.12E+02	2.25E+02
Am-242m	1.3694E-06	14,025.54	28,051.09	0.00E+00	1.92E-02	3.84E-02
Am-243	3.7096E-05	14,025.54	28,051.09	0.00E+00	5.20E-01	1.04E+00
C-14	2.6464E-08	14,025.54	28,051.09	0.00E+00	3.71E-04	7.42E-04
Cl-36	4.4441E-31	14,025.54	28,051.09	0.00E+00	6.23E-27	1.25E-26
Cm-243	5.7029E-06	14,025.54	28,051.09	0.00E+00	8.00E-02	1.60E-01
Cm-244	4.6555E-03	14,025.54	28,051.09	0.00E+00	6.53E+01	1.31E+02
Co-60	4.8663E-05	14,025.54	28,051.09	0.00E+00	6.83E-01	1.37E+00
Cs-134	1.0638E-02	14,025.54	28,051.09	0.00E+00	1.49E+02	2.98E+02
Cs-135	4.2564E-06	14,025.54	28,051.09	0.00E+00	5.97E-02	1.19E-01
Cs-137	2.0358E+00	14,025.54	28,051.09	0.00E+00	2.86E+04	5.71E+04
Eu-154	5.1956E-02	14,025.54	28,051.09	0.00E+00	7.29E+02	1.46E+03
Eu-155	1.4295E-02	14,025.54	28,051.09	0.00E+00	2.00E+02	4.01E+02
Fe-55	1.3560E-03	14,025.54	28,051.09	0.00E+00	1.90E+01	3.80E+01
H-3	4.6258E-03	14,025.54	28,051.09	0.00E+00	6.49E+01	1.30E+02
I-129	6.6403E-07	14,025.54	28,051.09	0.00E+00	9.31E-03	1.86E-02
Kr-85	1.0808E-01	14,025.54	28,051.09	0.00E+00	1.52E+03	3.03E+03
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
Tl-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

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg MeV	
0.0150	2.966E+15
0.0250	6.113E+14
0.0375	5.431E+14
0.0575	5.750E+14
0.0850	3.481E+14
0.1250	2.465E+14
0.2250	2.996E+14
0.3750	1.297E+14
0.5750	2.146E+15
0.8500	5.620E+13
1.2500	3.603E+13
1.7500	1.388E+12
2.2500	8.879E+07
2.7500	5.195E+07
3.5000	2.195E+06
5.0000	8.440E+05
7.0000	9.688E+04
11.0000	1.110E+04

Thermal Power

Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
4.06E+02	8.11E+02
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 %	60.00000706	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

[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 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

[1]Fuel decay start date: 2010
Estimates as of: 2030
Template: HFBR (Heavy Water, Alum , 40 to 100%, U)
[2]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

	m	x_n	x_b	b	y_n	y_b
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	3 1355E-10	279 55	559 11	0 00E+00	8.77E-08	1.75E-07
Am-241	8 0194E-03	279 55	559 11	0 00E+00	2 24E+00	4 48E+00
Am-242m	1 3694E-06	279 55	559 11	0 00E+00	3 83E-04	7 66E-04
Am-243	3 7096E-05	279 55	559 11	0 00E+00	1 04E-02	2 07E-02
C-14	2 6464E-08	279 55	559 11	0 00E+00	7 40E-06	1 48E-05
Cl-36	4 4441E-31	279 55	559 11	0 00E+00	1 24E-28	2 48E-28
Cm-243	5 7029E-06	279 55	559.11	0 00E+00	1 59E-03	3 19E-03
Cm-244	4 6555E-03	279 55	559 11	0 00E+00	1 30E+00	2 60E+00
Co-60	4 8663E-05	279 55	559 11	0 00E+00	1 36E-02	2 72E-02
Cs-134	1 0638E-02	279 55	559 11	0 00E+00	2.97E+00	5 95E+00
Cs-135	4 2564E-06	279 55	559 11	0 00E+00	1.19E-03	2 38E-03
Cs-137	2 0358E+00	279 55	559 11	0 00E+00	5 69E+02	1.14E+03
Eu-154	5 1956E-02	279 55	559 11	0 00E+00	1 45E+01	2.90E+01
Eu-155	1 4295E-02	279.55	559 11	0 00E+00	4 00E+00	7 99E+00
Fe-55	1 3560E-03	279 55	559 11	0.00E+00	3 79E-01	7.58E-01
H-3	4 6258E-03	279 55	559 11	0 00E+00	1 29E+00	2 59E+00
I-129	6 6403E-07	279 55	559.11	0 00E+00	1 86E-04	3 71E-04
Kr-85	1 0808E-01	279 55	559.11	0 00E+00	3 02E+01	6 04E+01
Np-237	3 1537E-05	279 55	559 11	0 00E+00	8 82E-03	1 76E-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
Tl-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

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg MeV	
0 0150	5 911E+13
0 0250	1.218E+13
0 0375	1 082E+13
0 0575	1 146E+13
0.0850	6.937E+12
0 1250	4 913E+12
0.2250	5.971E+12
0 3750	2.584E+12
0 5750	4 278E+13
0 8500	1 120E+12
1.2500	7 182E+11
1 7500	2 767E+10
2.2500	1 770E+06
2 7500	1 036E+06
3 5000	4.376E+04
5 0000	1 682E+04
7 0000	1 931E+03
11 0000	2.213E+02

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 99999218	40 to 100

Basis for Parameter Drfferences:

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

[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 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

[1]Fuel decay start date: 2010
Estimates as of: 2030
Template: HFBR (Heavy Water Alum , 40 to 100% U)
[2]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

Radionuclide	m Ci/MWd From Template	x_n Nominal Fuel Burnup (MWd)[2]	x_b Bounding Fuel Burnup (MWd)[2]	b Initial Activity (Ci)	y_n Nominal Fuel Inventories(Ci)	y_b Bounding Fuel Inventories(Ci)
Ac-227	3 1355E-10	338 51	677 01	0 00E+00	1 06E-07	2 12E-07
Am-241	8 0194E-03	338 51	677 01	0 00E+00	2 71E+00	5 43E+00
Am-242m	1.3694E-06	338 51	677 01	0 00E+00	4 64E-04	9 27E-04
Am-243	3.7096E-05	338 51	677 01	0 00E+00	1.26E-02	2 51E-02
C-14	2 6464E-08	338 51	677 01	0 00E+00	8 96E-06	1 79E-05
Cl-36	4 4441E-31	338 51	677 01	0 00E+00	1.50E-28	3 01E-28
Cm-243	5 7029E-06	338 51	677 01	0 00E+00	1 93E-03	3 86E-03
Cm-244	4 6555E-03	338 51	677 01	0 00E+00	1.58E+00	3 15E+00
Co-60	4 8663E-05	338 51	677.01	0 00E+00	1 65E-02	3.29E-02
Cs-134	1 0638E-02	338 51	677.01	0 00E+00	3 60E+00	7.20E+00
Cs-135	4 2564E-06	338 51	677 01	0 00E+00	1 44E-03	2 88E-03
Cs-137	2 0358E+00	338 51	677 01	0 00E+00	6 89E+02	1.38E+03
Eu-154	5.1956E-02	338 51	677 01	0 00E+00	1 76E+01	3 52E+01
Eu-155	1 4295E-02	338 51	677 01	0 00E+00	4 84E+00	9 68E+00
Fe-55	1.3560E-03	338 51	677 01	0 00E+00	4 59E-01	9 18E-01
H-3	4 6258E-03	338 51	677 01	0 00E+00	1 57E+00	3 13E+00
I-129	6 6403E-07	338 51	677 01	0 00E+00	2.25E-04	4.50E-04
Kr-85	1 0808E-01	338.51	677 01	0 00E+00	3 66E+01	7.32E+01
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
Tl-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

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg MeV	
0 0150	7 158E+13
0 0250	1 475E+13
0 0375	1.311E+13
0.0575	1.388E+13
0 0850	8 400E+12
0 1250	5 950E+12
0.2250	7.230E+12
0 3750	3 129E+12
0 5750	5 180E+13
0 8500	1.356E+12
1.2500	8 696E+11
1 7500	3.351E+10
2.2500	2 143E+06
2 7500	1.254E+06
3.5000	5.298E+04
5 0000	2 037E+04
7 0000	2.338E+03
11 0000	2 679E+02

Thermal Power

Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
9 79E+00	1.96E+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 %	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

[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 TUBES (UALX-HEU) GERMANY
SNF ID #: 683
Fuel Units & Descr: 105 - ASSEMBLY
Heavy Metal Mass: BOL=19 688kg; EOL=13 388kg
ROD Storage Site: SRS

[1]Fuel decay start date: 2010
Estimates as of: 2030
Template: HFBR (Heavy Water, Alum., 40 to 100%, U)
[2]Template 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

Radionuclide	m Ci/MWd From Template	x_n Nominal Fuel Burnup (MWd)[2]	x_b Bounding Fuel Burnup (MWd)[2]	b Initial Activity (Ci)	y_n Nominal Fuel Inventories(Ci)	y_b Bounding Fuel Inventories(Ci)
Ac-227	3 1355E-10	5,802 95	11,605 90	0 00E+00	1 82E-06	3 64E-06
Am-241	8 0194E-03	5,802 95	11,605 90	0 00E+00	4 65E+01	9.31E+01
Am-242m	1 3694E-06	5,802 95	11,605 90	0 00E+00	7.95E-03	1 59E-02
Am-243	3 7096E-05	5,802 95	11,605 90	0 00E+00	2.15E-01	4 31E-01
C-14	2 6464E-08	5,802 95	11,605 90	0 00E+00	1.54E-04	3 07E-04
Cl-36	4 4441E-31	5,802 95	11,605 90	0 00E+00	2.58E-27	5 16E-27
Cm-243	5 7029E-06	5,802 95	11,605 90	0 00E+00	3.31E-02	6 62E-02
Cm-244	4 6555E-03	5,802 95	11,605 90	0 00E+00	2 70E+01	5 40E+01
Co-60	4 8663E-05	5,802 95	11,605 90	0 00E+00	2 82E-01	5 65E-01
Cs-134	1 0638E-02	5,802 95	11,605 90	0 00E+00	6 17E+01	1 23E+02
Cs-135	4 2564E-06	5,802 95	11,605 90	0 00E+00	2 47E-02	4 94E-02
Cs-137	2 0358E+00	5,802 95	11,605 90	0 00E+00	1 18E+04	2 36E+04
Eu-154	5 1956E-02	5,802 95	11,605 90	0 00E+00	3 01E+02	6 03E+02
Eu-155	1 4295E-02	5,802 95	11,605 90	0 00E+00	8 30E+01	1 66E+02
Fe-55	1 3560E-03	5,802 95	11,605 90	0 00E+00	7 87E+00	1 57E+01
H-3	4 6258E-03	5,802 95	11,605 90	0 00E+00	2 68E+01	5 37E+01
I-129	6 6403E-07	5,802 95	11,605 90	0 00E+00	3 85E-03	7.71E-03
Kr-85	1 0808E-01	5,802 95	11,605 90	0 00E+00	6 27E+02	1.25E+03
Np-237	3 1537E-05	5,802 95	11,605 90	0 00E+00	1 83E-01	3.66E-01
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
Tl-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

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg MeV	
0 0150	1 227E+15
0 0250	2 529E+14
0 0375	2 247E+14
0 0575	2.379E+14
0 0850	1 440E+14
0 1250	1 020E+14
0.2250	1 240E+14
0 3750	5 364E+13
0 5750	8.879E+14
0 8500	2 325E+13
1.2500	1 491E+13
1 7500	5 745E+11
2.2500	3 674E+07
2 7500	2 149E+07
3 5000	9 083E+05
5 0000	3 492E+05
7 0000	4 008E+04
11 0000	4.593E+03

Thermal Power

Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
1 68E+02	3 36E+02
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 %	80	40 to 100

Basis for Parameter Differences:

Burnup Summary (MWd)[2]

	From SFD	Estimated
Nominal		5,802.95
Bounding		11 605.90

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

[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 TUBES (UALX-HEU) GERMANY
SNF ID # 685
Fuel Units & Descr 130 - ASSEMBLY
Heavy Metal Mass BOL=27 625kg, EOL=18 785kg
ROD Storage Site SRS

[1]Fuel decay start date 2010
Estimates as of 2030
Template HFBR (Heavy Water Alum , 40 to 100%, U)
[2]Template 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_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 1355E-10	8,142 55	16,285 10	0 00E+00	2 55E-06	5 11E-06	Avg MeV	
Am-241	8 0194E-03	8,142 55	16,285.10	0 00E+00	6 53E+01	1 31E+02	0 0150	1 722E+15
Am-242m	1.3694E-06	8,142 55	16,285.10	0 00E+00	1.12E-02	2 23E-02	0 0250	3 549E+14
Am-243	3 7096E-05	8,142 55	16,285 10	0 00E+00	3 02E-01	6 04E-01	0 0375	3 153E+14
C-14	2 6464E-08	8,142 55	16,285 10	0 00E+00	2 15E-04	4 31E-04	0 0575	3 338E+14
Cl-36	4 4441E-31	8,142 55	16,285 10	0 00E+00	3 62E-27	7.24E-27	0 0850	2 021E+14
Cm-243	5 7029E-06	8,142.55	16,285 10	0 00E+00	4 64E-02	9.29E-02	0 1250	1 431E+14
Cm-244	4 6555E-03	8,142 55	16,285 10	0 00E+00	3 79E+01	7 58E+01	0.2250	1 739E+14
Co-60	4 8663E-05	8,142.55	16,285 10	0 00E+00	3 96E-01	7.92E-01	0 3750	7.527E+13
Cs-134	1 0638E-02	8,142 55	16,285 10	0 00E+00	8 66E+01	1.73E+02	0 5750	1.246E+15
Cs-135	4 2564E-06	8,142.55	16,285 10	0 00E+00	3 47E-02	6 93E-02	0 8500	3.263E+13
Cs-137	2 0358E+00	8,142.55	16,285 10	0 00E+00	1 66E+04	3.32E+04	1.2500	2 092E+13
Eu-154	5 1956E-02	8,142.55	16,285 10	0.00E+00	4 23E+02	8 46E+02	1 7500	8 061E+11
Eu-155	1 4295E-02	8,142 55	16,285 10	0 00E+00	1.16E+02	2 33E+02	2.2500	5 155E+07
Fe-55	1.3560E-03	8,142 55	16,285.10	0 00E+00	1.10E+01	2 21E+01	2.7500	3 016E+07
H-3	4 6258E-03	8,142 55	16,285.10	0 00E+00	3.77E+01	7 53E+01	3.5000	1.274E+06
I-129	6 6403E-07	8,142 55	16,285 10	0 00E+00	5 41E-03	1 08E-02	5 0000	4 900E+05
Kr-85	1 0808E-01	8,142 55	16,285 10	0 00E+00	8.80E+02	1 76E+03	7 0000	5 624E+04
Np-237	3 1537E-05	8,142 55	16,285 10	0 00E+00	2 57E-01	5.14E-01	11 0000	6 445E+03
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		
Tl-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		

Thermal Power	
Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
2.35E+02	4 71E+02
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 %	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

[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: 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

[1]Fuel decay start date: 1960
Estimates as of: 2030
Template: Pathfinder (Light Water, SST, 60 to 100%, U)
[2]Template 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
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	4.5940E-08	638.77	1,277.54	0.00E+00	2.93E-05	5.87E-05
Am-241	1.1471E-04	638.77	1,277.54	0.00E+00	7.33E-02	1.47E-01
Am-242m	7.4210E-09	638.77	1,277.54	0.00E+00	4.74E-06	9.48E-06
Am-243	9.8236E-10	638.77	1,277.54	0.00E+00	6.28E-07	1.26E-06
C-14	2.2928E-04	638.77	1,277.54	0.00E+00	1.46E-01	2.93E-01
Cl-36	1.2260E-06	638.77	1,277.54	0.00E+00	7.83E-04	1.57E-03
Cm-243	1.2000E-10	638.77	1,277.54	0.00E+00	7.67E-08	1.53E-07
Cm-244	7.3577E-10	638.77	1,277.54	0.00E+00	4.70E-07	9.40E-07
Co-60	1.3732E-03	638.77	1,277.54	0.00E+00	8.77E-01	1.75E+00
Cs-134	1.2709E-10	638.77	1,277.54	0.00E+00	8.12E-08	1.62E-07
Cs-135	3.0316E-05	638.77	1,277.54	0.00E+00	1.94E-02	3.87E-02
Cs-137	7.2579E-01	638.77	1,277.54	0.00E+00	4.64E+02	9.27E+02
Eu-154	5.9750E-05	638.77	1,277.54	0.00E+00	3.82E-02	7.63E-02
Eu-155	1.0577E-05	638.77	1,277.54	0.00E+00	6.76E-03	1.35E-02
Fe-55	4.1631E-07	638.77	1,277.54	0.00E+00	2.66E-04	5.32E-04
H-3	4.6722E-04	638.77	1,277.54	0.00E+00	2.98E-01	5.97E-01
I-129	7.3195E-07	638.77	1,277.54	0.00E+00	4.68E-04	9.35E-04
Kr-85	5.9418E-03	638.77	1,277.54	0.00E+00	3.80E+00	7.59E+00
Np-237	1.1499E-06	638.77	1,277.54	0.00E+00	7.35E-04	1.47E-03
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
Tl-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

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg MeV	
0.0150	4.663E+13
0.0250	9.688E+12
0.0375	8.419E+12
0.0575	9.035E+12
0.0850	5.457E+12
0.1250	3.539E+12
0.2250	4.705E+12
0.3750	2.051E+12
0.5750	3.451E+13
0.8500	3.351E+11
1.2500	2.426E+11
1.7500	8.621E+09
2.2500	1.630E+06
2.7500	7.302E+05
3.5000	8.581E+01
5.0000	3.554E+01
7.0000	3.940E+00
11.0000	4.432E-01

Thermal Power

Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
5.20E+00	1.04E+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	HASTELLOY	SST
BOL HM Constituents	U	U
BOL Enrichment %:	92.20234775	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		638.77
Bounding		1,277.54

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	0.23	
Bounding	0.45	

Estimated EOL HM/Given EOL HM: 1.00

[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 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

[1]Fuel decay start date: 1960
Estimates as of: 2030
Template: Pathfinder (Light Water SST, 60 to 100%, U)
[2]Template 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

Radionuclide	m: Ci/MWd From Template	x_n: Nominal Fuel Burnup (MWd)[2]	x_b: Bounding Fuel Burnup (MWd)[2]	b: Initial Activity (Ci)	y_n: Nominal Fuel Inventories(Ci)	y_b: Bounding Fuel Inventories(Ci)
Ac-227	4 5940E-08	46 19	92.39	0 00E+00	2 12E-06	4.24E-06
Am-241	1 1471E-04	46 19	92.39	0 00E+00	5 30E-03	1 06E-02
Am-242m	7 4210E-09	46 19	92.39	0 00E+00	3 43E-07	6 86E-07
Am-243	9 8236E-10	46 19	92.39	0 00E+00	4 54E-08	9 08E-08
C-14	2.2928E-04	46 19	92.39	0 00E+00	1 06E-02	2.12E-02
Cl-36	1.2260E-06	46 19	92 39	0 00E+00	5 66E-05	1 13E-04
Cm-243	1.2000E-10	46 19	92 39	0 00E+00	5 54E-09	1 11E-08
Cm-244	7.3577E-10	46 19	92 39	0 00E+00	3 40E-08	6 80E-08
Co-60	1.3732E-03	46 19	92 39	0 00E+00	6.34E-02	1 27E-01
Cs-134	1.2709E-10	46 19	92 39	0 00E+00	5.87E-09	1 17E-08
Cs-135	3 0316E-05	46 19	92 39	0 00E+00	1.40E-03	2 80E-03
Cs-137	7.2579E-01	46 19	92 39	0 00E+00	3 35E+01	6 71E+01
Eu-154	5 9750E-05	46 19	92.39	0 00E+00	2 76E-03	5.52E-03
Eu-155	1 0577E-05	46 19	92.39	0 00E+00	4 89E-04	9 77E-04
Fe-55	4 1631E-07	46 19	92 39	0 00E+00	1 92E-05	3 85E-05
H-3	4 6722E-04	46.19	92.39	0 00E+00	2 16E-02	4.32E-02
I-129	7 3195E-07	46.19	92.39	0 00E+00	3 38E-05	6 76E-05
Kr-85	5 9418E-03	46 19	92.39	0 00E+00	2 74E-01	5 49E-01
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

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg MeV	
0 0150	3 372E+12
0 0250	7 006E+11
0.0375	6 089E+11
0.0575	6 534E+11
0 0850	3.946E+11
0 1250	2.559E+11
0.2250	3 401E+11
0 3750	1 483E+11
0 5750	2.495E+12
0 8500	2 424E+10
1 2500	1 754E+10
1 7500	6.234E+08
2.2500	1 179E+05
2.7500	5 280E+04
3.5000	5 494E+00
5.0000	2 270E+00
7.0000	2.510E-01
11.0000	2.819E-02

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
Reactor Moderator	LIGHT WATER	LIGHT WATER
Fuel Cladding	SST	SST
BOL HM Constituents	U	U
BOL Enrichment %:	93.671	60 to 100

Basis for Parameter Differences:

Burnup Summary (MWd)[2]

	From SFD	Estimated	Basis for burnup used in estimate
Nominal		46 19	Nominal burnup calculated from the heavy metal mass destroyed.
Bounding		92 39	Bounding burnup assumed to be twice nominal burnup

Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup
Nominal	0 93	
Bounding	1 86	

Estimated EOL HM/Given EOL HM: 1 00

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

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

Estimated Canister usage: 18"x10' = 0 44

II. Estimates

Radionuclide	m: Ci/MWd From Template	x_n: Nominal Fuel Burnup (MWd)[2]	x_b: Bounding Fuel Burnup (MWd)[2]	b: Initial Activity (Ci)	y_n: Nominal Fuel Inventories(Ci)	y_b: Bounding Fuel Inventories(Ci)
Ac-227	1 4545E-10	7 58	15.15	0 00E+00	1 10E-09	2 20E-09
Am-241	1.1190E-03	7 58	15.15	0 00E+00	8 48E-03	1 70E-02
Am-242m	4 5425E-07	7 58	15.15	0 00E+00	3 44E-06	6 88E-06
Am-243	1 4921E-06	7 58	15 15	0.00E+00	1.13E-05	2 26E-05
C-14	5 7244E-09	7 58	15 15	0 00E+00	4 34E-08	8 67E-08
Cl-36	1.3124E-32	7 58	15 15	0 00E+00	9 94E-32	1 99E-31
Cm-243	2 3676E-07	7 58	15 15	0 00E+00	1 79E-06	3 59E-06
Cm-244	5 2042E-05	7 58	15 15	0 00E+00	3 94E-04	7 89E-04
Co-60	3.8208E-05	7 58	15 15	0 00E+00	2 89E-04	5 79E-04
Cs-134	4 8693E-01	7.58	15 15	0 00E+00	3 69E+00	7.38E+00
Cs-135	3 4477E-06	7.58	15 15	0 00E+00	2 61E-05	5.22E-05
Cs-137	2 8731E+00	7.58	15 15	0 00E+00	2 18E+01	4 35E+01
Eu-154	8 2053E-02	7.58	15 15	0 00E+00	6 22E-01	1.24E+00
Eu-155	3 9134E-02	7.58	15 15	0 00E+00	2 96E-01	5 93E-01
Fe-55	6 7429E-03	7.58	15 15	0 00E+00	5 11E-02	1 02E-01
H-3	1 0599E-02	7.58	15 15	0 00E+00	8 03E-02	1 61E-01
I-129	7 5300E-07	7 58	15 15	0 00E+00	5 70E-06	1.14E-05
Kr-85	2 8595E-01	7 58	15 15	0 00E+00	2.17E+00	4 33E+00
Np-237	9 5479E-06	7 58	15 15	0 00E+00	7.23E-05	1 45E-04
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 6329E-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
Tl-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

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg MeV	
0 0150	2 923E+12
0 0250	6.298E+11
0 0375	5 812E+11
0 0575	5 714E+11
0.0850	3 643E+11
0 1250	3 155E+11
0.2250	3.089E+11
0 3750	1 495E+11
0 5750	2 053E+12
0 8500	2.875E+11
1.2500	5.349E+10
1 7500	2.243E+09
2.2500	4 705E+09
2.7500	2.707E+07
3 5000	3 002E+06
5 0000	9.270E+00
7 0000	1 034E+00
11 0000	1 165E-01

Thermal Power

Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
3.84E-01	7 68E-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 93787575	60 to 100

Basis for Parameter Drifferences:

Burnup Summary (MWd)[2]

	From SFD	Estimated
Nominal		7 58
Bounding		15 15

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

Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup
Nominal	0 01	
Bounding	0 01	

Estimated EOL HM/Given EOL HM: 1 00

[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: 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

[1]Fuel decay start date: 1993
Estimates as of: 2030
Template: ATR (Light Water, Alum , 60 to 100%, U)
[2]Template Burnup(MWd): 367.2
Template BOL Heavy Metal Mass (MT): 0 00116689
Template Decay Time: 35 years

Estimated Canister usage:

18"x10'
3 00

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	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		
Tl-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

	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		3,825.20
Bounding		7 650 40

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

[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: 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

[1]Fuel decay start date: 1993
Estimates as of: 2030
Template: ATR (Light Water, Alum 60 to 100%, U)
[2]Template Burnup(MWd): 367.2
Template BOL Heavy Metal Mass (MT): 0 00116689
Template Decay Time 35 years

Estimated Canister usage 18"x10": 1.28

II. Estimates

Radionuclide	m Ci/MWd From Template	x_n Nominal Fuel Burnup (MWd)[2]	x_b Bounding Fuel Burnup (MWd)[2]	b Initial Activity (Ci)	y_n Nominal Fuel Inventories(Ci)	y_b Bounding Fuel Inventories(Ci)
Ac-227	2 0068E-09	1,629 25	3,258 50	0 00E+00	3 27E-06	6 54E-06
Am-241	2 5251E-03	1,629 25	3,258 50	0 00E+00	4 11E+00	8.23E+00
Am-242m	3 9624E-07	1,629 25	3,258 50	0 00E+00	6 46E-04	1 29E-03
Am-243	1 4880E-06	1,629 25	3,258 50	0 00E+00	2 42E-03	4 85E-03
C-14	5 7053E-09	1,629 25	3,258 50	0 00E+00	9 30E-06	1 86E-05
Cl-36	1 3124E-32	1,629.25	3,258 50	0 00E+00	2.14E-29	4 28E-29
Cm-243	1 1419E-07	1,629.25	3,258 50	0 00E+00	1 86E-04	3 72E-04
Cm-244	1 6522E-05	1,629.25	3,258.50	0 00E+00	2 69E-02	5.38E-02
Co-60	7 4047E-07	1,629.25	3,258 50	0 00E+00	1.21E-03	2 41E-03
Cs-134	2 0455E-05	1,629.25	3,258 50	0 00E+00	3.33E-02	6 67E-02
Cs-135	3.4477E-06	1,629 25	3,258 50	0 00E+00	5 62E-03	1 12E-02
Cs-137	1 4365E+00	1,629 25	3,258 50	0 00E+00	2 34E+03	4 68E+03
Eu-154	7 3230E-03	1,629 25	3,258 50	0 00E+00	1 19E+01	2 39E+01
Eu-155	5 9259E-04	1,629 25	3,258 50	0 00E+00	9 65E-01	1 93E+00
Fe-55	2 2791E-06	1,629 25	3,258 50	0 00E+00	3 71E-03	7 43E-03
H-3	1 9698E-03	1,629 25	3,258 50	0 00E+00	3.21E+00	6 42E+00
I-129	7 5300E-07	1,629 25	3,258 50	0 00E+00	1.23E-03	2 45E-03
Kr-85	4 1176E-02	1,629.25	3,258.50	0 00E+00	6.71E+01	1.34E+02
Np-237	9 5752E-06	1,629.25	3,258.50	0 00E+00	1.56E-02	3 12E-02
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
Tl-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

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg MeV	
0 0150	2.400E+14
0 0250	4 983E+13
0 0375	4 332E+13
0 0575	4 662E+13
0 0850	2 809E+13
0 1250	1 856E+13
0.2250	2 425E+13
0 3750	1 055E+13
0 5750	1 744E+14
0 8500	2 130E+12
1 2500	1 030E+12
1 7500	5 798E+10
2.2500	4 848E+06
2 7500	4 627E+06
3.5000	2 681E+03
5 0000	1 096E+03
7 0000	1 199E+02
11 0000	1 337E+01

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

[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: GTRR
SNF ID #: 87
Fuel Units & Descr: 25 - ASSEMBLY
Heavy Metal Mass: BOL=5 05kg EOL=4 47kg
ROD Storage Site: SRS

[1]Fuel decay start date: 1996
Estimates as of: 2030
Template: HFBR (Heavy Water, Alum 40 to 100% U)
[2]Template Burnup(MWd): 164 6
Template BOL Heavy Metal Mass (MT): 0 000377
Template Decay Time: 25 years

Estimated Canister usage: 18"x10" = 0 69

II. Estimates

Radionuclide	m Ci/MWd From Template	x_n Nominal Fuel Burnup (MWd)[2]	x_b Bounding Fuel Burnup (MWd)[2]	b Initial Activity (Ci)	y_n Nominal Fuel Inventories(Ci)	y_b Bounding Fuel Inventories(Ci)
Ac-227	5 4520E-10	534 24	1,068 48	0 00E+00	2 91E-07	5 83E-07
Am-241	9 2284E-03	534.24	1,068 48	0 00E+00	4 93E+00	9 86E+00
Am-242m	1 3390E-06	534.24	1,068 48	0 00E+00	7.15E-04	1 43E-03
Am-243	3 7084E-05	534.24	1,068 48	0 00E+00	1 98E-02	3 96E-02
C-14	2 6452E-08	534.24	1,068 48	0 00E+00	1 41E-05	2 83E-05
Cl-36	4 4441E-31	534 24	1,068 48	0 00E+00	2 37E-28	4 75E-28
Cm-243	5 0498E-06	534 24	1,068 48	0 00E+00	2 70E-03	5 40E-03
Cm-244	3 8451E-03	534 24	1,068 48	0 00E+00	2 05E+00	4 11E+00
Co-60	2 5225E-05	534.24	1,068.48	0 00E+00	1.35E-02	2 70E-02
Cs-134	1 9830E-03	534.24	1,068 48	0 00E+00	1 06E+00	2 12E+00
Cs-135	4.2564E-06	534.24	1,068 48	0 00E+00	2.27E-03	4 55E-03
Cs-137	1 8141E+00	534.24	1,068 48	0 00E+00	9 69E+02	1 94E+03
Eu-154	3 4733E-02	534.24	1,068 48	0 00E+00	1 86E+01	3 71E+01
Eu-155	7 1081E-03	534.24	1,068 48	0 00E+00	3 80E+00	7 59E+00
Fe-55	3 5790E-04	534 24	1,068 48	0 00E+00	1 91E-01	3 82E-01
H-3	3 4945E-03	534 24	1,068 48	0 00E+00	1 87E+00	3 73E+00
I-129	6 6403E-07	534.24	1,068.48	0 00E+00	3 55E-04	7.10E-04
Kr-85	7 8250E-02	534.24	1,068 48	0 00E+00	4 18E+01	8 36E+01
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
Tl-208	4 7272E-08	534.24	1,068 48	0 00E+00	2 53E-05	5 05E-05
U-232	1.2855E-07	534.24	1,068 48	0 00E+00	6 67E-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

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg MeV	
0 0150	1 002E+14
0 0250	2 062E+13
0 0375	1.820E+13
0 0575	1.942E+13
0 0850	1 169E+13
0 1250	8 110E+12
0.2250	1 009E+13
0.3750	4 367E+12
0 5750	7.240E+13
0 8500	1 426E+12
1.2500	9 625E+11
1 7500	3 984E+10
2.2500	2 147E+06
2 7500	1 846E+06
3.5000	6 337E+04
5 0000	2 686E+04
7 0000	3 081E+03
11 0000	3.529E+02

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
Reactor Moderator	HEAVY WATER	HEAVY WATER
Fuel Cladding	ALUM	ALUM
BOL HM Constituents	U	U
BOL Enrichment %:	93 06930693	40 to 100

Basis for Parameter Differences:

Burnup Summary (MWd)[2]

	From SFD	Estimated
Nominal		534.24
Bounding		1 068.48

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	0.24	
Bounding	0 48	

Estimated EOL HM/Given EOL HM: 1 00

[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: 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

[1]Fuel decay start date: 1966
Estimates as of: 2030
Template: (Worst Case)
[2]Template 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
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 5200E-06	25 85	51 70	0 00E+00	6 51E-05	1.30E-04
Am-241	8 6432E+00	25 85	51.70	0 00E+00	2 23E+02	4 47E+02
Am-242m	1.5728E-02	25 85	51.70	0 00E+00	4 07E-01	8 13E-01
Am-243	1 6288E-02	25 85	51 70	0 00E+00	4 21E-01	8 42E-01
C-14	1.2068E-01	25 85	51 70	0 00E+00	3 12E+00	6 24E+00
Cl-36	2 2849E-03	25 85	51 70	0 00E+00	5 91E-02	1 18E-01
Cm-243	6 0144E-04	25 85	51 70	0 00E+00	1 55E-02	3 11E-02
Cm-244	9 4880E-02	25 85	51 70	0 00E+00	2.45E+00	4 91E+00
Co-60	3 9052E+00	25 85	51 70	0 00E+00	1 01E+02	2 02E+02
Cs-134	2 2139E-06	25 85	51 70	0 00E+00	5.72E-05	1 14E-04
Cs-135	4 3976E-04	25 85	51 70	0 00E+00	1.14E-02	2.27E-02
Cs-137	1 4887E+01	25 85	51 70	0 00E+00	3 85E+02	7 70E+02
Eu-154	3 7342E-01	25 85	51.70	0 00E+00	9 65E+00	1 93E+01
Eu-155	8 4893E-03	25 85	51 70	0 00E+00	2 19E-01	4 39E-01
Fe-55	5.3750E-03	25 85	51 70	0 00E+00	1 39E-01	2 78E-01
H-3	1 0472E-01	25 85	51 70	0 00E+00	2.71E+00	5 41E+00
I-129	1 0618E-05	25 85	51 70	0 00E+00	2 74E-04	5 49E-04
Kr-85	2 2717E-01	25 85	51 70	0 00E+00	5 87E+00	1 17E+01
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
Tl-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

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg MeV	
0 0150	4 428E+13
0 0250	8 654E+12
0 0375	7 317E+12
0 0575	1.382E+13
0 0850	4 633E+12
0 1250	3.278E+12
0 2250	4 009E+12
0 3750	1 735E+12
0 5750	2.872E+13
0 8500	6.290E+11
1.2500	1 542E+13
1 7500	1 853E+10
2.2500	8 014E+07
2 7500	1 379E+08
3.5000	8 338E+04
5.0000	3.523E+04
7 0000	4 010E+03
11 0000	4.573E+02

Thermal Power

Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
1.55E+01	3.08E+01
Total	Total

III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary

	From SFD	Used
Reactor Moderator:	LIGHT WATER	(Worst Case)
Fuel Cladding	ZIRC	SST/Inconel
BOL HM Constituents	Pu and U	U, Th, & Pu
BOL Enrichment %	2.897	0 to 100

Basis for Parameter Differences:

This fuel didn't closely match any existing templates, therefore the worst case template was used.

Burnup Summary (MWd)[2]

	From SFD	Estimated
Nominal		25 85
Bounding	16 42	51 70

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 41	
Bounding	2.82	3 15

Estimated EOL HM/Given EOL HM: 31 56

[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 HFBR
SNF ID # 706
Fuel Units & Descr: 1050 - 18 CURVED PLATES
Heavy Metal Mass BOL=394 8kg EOL=282.24kg
ROD Storage Site SRS

[1]Fuel decay start date 1982
Estimates as of: 2030
Template HFBR (Heavy Water, Alum , 40 to 100%, U)
[2]Template 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

Radionuclide	m Ci/MWd From Template	x_n Nominal Fuel Burnup (MWd)[2]	x_b Bounding Fuel Burnup (MWd)[2]	b Initial Activity (Ci)	y_n Nominal Fuel Inventories(Ci)	y_b Bounding Fuel Inventories(Ci)
Ac-227	9 5869E-10	103,679.35	207,358 71	0 00E+00	9 94E-05	1 99E-04
Am-241	1 0109E-02	103,679 35	207,358 71	0 00E+00	1 05E+03	2.10E+03
Am-242m	1 2789E-06	103,679 35	207,358 71	0 00E+00	1 33E-01	2 65E-01
Am-243	3 7047E-05	103,679 35	207,358 71	0 00E+00	3 84E+00	7 68E+00
C-14	2 6416E-08	103,679 35	207,358 71	0 00E+00	2.74E-03	5 48E-03
Cl-36	4 4441E-31	103,679 35	207,358 71	0 00E+00	4 61E-26	9 22E-26
Cm-243	3 9605E-06	103,679 35	207,358 71	0 00E+00	4 11E-01	8.21E-01
Cm-244	2 6227E-03	103,679 35	207,358 71	0 00E+00	2 72E+02	5 44E+02
Co-60	6 7740E-06	103,679 35	207,358 71	0 00E+00	7 02E-01	1 40E+00
Cs-134	6 8894E-05	103,679 35	207,358 71	0 00E+00	7 14E+00	1 43E+01
Cs-135	4.2564E-06	103,679.35	207,358 71	0 00E+00	4 41E-01	8 83E-01
Cs-137	1 4399E+00	103,679 35	207,358 71	0 00E+00	1 49E+05	2 99E+05
Eu-154	1 5522E-02	103,679 35	207,358 71	0 00E+00	1 61E+03	3 22E+03
Eu-155	1 7588E-03	103,679 35	207,358 71	0 00E+00	1 82E+02	3 65E+02
Fe-55	2 4933E-05	103,679 35	207,358 71	0 00E+00	2.59E+00	5 17E+00
H-3	1 9945E-03	103,679 35	207,358 71	0 00E+00	2 07E+02	4 14E+02
I-129	6 6403E-07	103,679 35	207,358 71	0 00E+00	6 88E-02	1.38E-01
Kr-85	4.1002E-02	103,679 35	207,358 71	0 00E+00	4 25E+03	8.50E+03
Np-237	3 1610E-05	103,679 35	207,358 71	0 00E+00	3 28E+00	6 55E+00
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 8056E-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
Tl-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
U-233	7.2175E-09	103,679 35	207,358 71	0 00E+00	7 48E-04	1.50E-03
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
U-236	1 6701E-05	103,679 35	207,358 71	0 00E+00	1 73E+00	3 46E+00
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

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg MeV	
0 0150	1.532E+16
0 0250	3 147E+15
0 0375	2 758E+15
0 0575	2 967E+15
0 0850	1 776E+15
0 1250	1 198E+15
0 2250	1 534E+15
0 3750	6.660E+14
0.5750	1 112E+16
0.8500	1.648E+14
1.2500	9 844E+13
1 7500	4 657E+12
2.2500	3 224E+08
2 7500	3.241E+08
3.5000	8 616E+06
5 0000	3.661E+06
7.0000	4 192E+05
11.0000	4 797E+04

Thermal Power

Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
2.19E+03	4.37E+03
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 %	93 08510638	40 to 100

Basis for Parameter Differences

Burnup Summary (MWd)[2]

	From SFD	Estimated
Nominal		103 679 35
Bounding		207,358 71

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 60	
Bounding	1.20	

Estimated EOL HM/Given EOL HM: 1 01

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

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

Estimated Canister usage
18"x10'
147 33

II. Estimates

	m	x_a	x_b	b	y_a	y_b
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	389,072 50	778,145 01	0 00E+00	7.81E-04	1 56E-03
Am-241	2 5251E-03	389,072 50	778,145 01	0 00E+00	9 82E+02	1 96E+03
Am-242m	3 9624E-07	389,072 50	778,145 01	0 00E+00	1 54E-01	3 08E-01
Am-243	1 4880E-06	389,072 50	778,145 01	0 00E+00	5 79E-01	1 16E+00
C-14	5 7053E-09	389,072 50	778,145 01	0 00E+00	2 22E-03	4 44E-03
Cl-36	1 3124E-32	389,072.50	778,145 01	0 00E+00	5 11E-27	1 02E-26
Cm-243	1.1419E-07	389,072.50	778,145 01	0 00E+00	4 44E-02	8 89E-02
Cm-244	1 6522E-05	389,072.50	778,145.01	0 00E+00	6 43E+00	1.29E+01
Co-60	7.4047E-07	389,072 50	778,145 01	0 00E+00	2 88E-01	5.76E-01
Cs-134	2 0455E-05	389,072 50	778,145 01	0 00E+00	7 96E+00	1 59E+01
Cs-135	3 4477E-06	389,072 50	778,145 01	0 00E+00	1.34E+00	2 68E+00
Cs-137	1 4365E+00	389,072 50	778,145 01	0 00E+00	5 59E+05	1 12E+06
Eu-154	7 3230E-03	389,072 50	778,145 01	0 00E+00	2 85E+03	5 70E+03
Eu-155	5 9259E-04	389,072 50	778,145 01	0 00E+00	2 31E+02	4 61E+02
Fe-55	2 2791E-06	389,072.50	778,145 01	0 00E+00	8 87E-01	1 77E+00
H-3	1 9698E-03	389,072 50	778,145 01	0 00E+00	7 66E+02	1 53E+03
I-129	7 5300E-07	389,072.50	778,145 01	0 00E+00	2 93E-01	5 86E-01
Kr-85	4 1176E-02	389,072.50	778,145.01	0 00E+00	1 60E+04	3.20E+04
Np-237	9 5752E-06	389,072 50	778,145 01	0 00E+00	3 73E+00	7 45E+00
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
Se-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
Tl-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

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg. MeV	
0.0150	5 731E+16
0 0250	1 190E+16
0 0375	1 034E+16
0 0575	1 113E+16
0 0850	6 709E+15
0 1250	4.431E+15
0 2250	5 791E+15
0 3750	2.520E+15
0 5750	4 164E+16
0.8500	5 086E+14
1.2500	2 460E+14
1 7500	1 385E+13
2.2500	1 158E+09
2.7500	1 105E+09
3.5000	6 402E+05
5 0000	2 616E+05
7 0000	2.862E+04
11 0000	3 192E+03

Thermal Power

Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
6.51E+03	1.30E+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	283 936.38	389,072 50
Bounding		778,145 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	1 00	1 37
Bounding	2 00	

Estimated EOL HM/Given EOL HM: 1 03

[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: 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

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

Estimated Canister usage: 18"x10' = 18 00

II. Estimates

Radionuclide	m: Ci/MWd From Template	x_n: Nominal Fuel Burnup (MWd)[2]	x_b: Bounding Fuel Burnup (MWd)[2]	b: Initial Activity (Ci)	y_n: Nominal Fuel Inventories(Ci)	y_b: Bounding Fuel Inventories(Ci)
Ac-227	2 0068E-09	34,142 58	68,285 16	0 00E+00	6 85E-05	1.37E-04
Am-241	2 5251E-03	34,142 58	68,285.16	0 00E+00	8 62E+01	1 72E+02
Am-242m	3.9624E-07	34,142 58	68,285 16	0 00E+00	1 35E-02	2 71E-02
Am-243	1 4880E-06	34,142 58	68,285 16	0 00E+00	5 08E-02	1 02E-01
C-14	5 7053E-09	34,142.58	68,285 16	0 00E+00	1.95E-04	3 90E-04
Cl-36	1 3124E-32	34,142.58	68,285 16	0 00E+00	4 48E-28	8 96E-28
Cm-243	1 1419E-07	34,142.58	68,285 16	0 00E+00	3 90E-03	7.80E-03
Cm-244	1 6522E-05	34,142 58	68,285.16	0 00E+00	5 64E-01	1.13E+00
Co-60	7.4047E-07	34,142 58	68,285 16	0 00E+00	2 53E-02	5 06E-02
Cs-134	2 0455E-05	34,142.58	68,285 16	0 00E+00	6 98E-01	1 40E+00
Cs-135	3 4477E-06	34,142.58	68,285 16	0 00E+00	1.18E-01	2 35E-01
Cs-137	1 4365E+00	34,142.58	68,285 16	0 00E+00	4 90E+04	9 81E+04
Eu-154	7 3230E-03	34,142.58	68,285 16	0 00E+00	2.50E+02	5 00E+02
Eu-155	5 9259E-04	34,142 58	68,285.16	0 00E+00	2 02E+01	4 05E+01
Fe-55	2.2791E-06	34,142 58	68,285 16	0 00E+00	7 78E-02	1 56E-01
H-3	1 9698E-03	34,142 58	68,285 16	0 00E+00	6 73E+01	1 35E+02
I-129	7.5300E-07	34,142.58	68,285 16	0 00E+00	2.57E-02	5 14E-02
Kr-85	4 1176E-02	34,142.58	68,285 16	0 00E+00	1.41E+03	2 81E+03
Np-237	9 5752E-06	34,142 58	68,285 16	0 00E+00	3 27E-01	6 54E-01
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
Tl-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
U-233	3 6275E-09	34,142 58	68,285 16	0 00E+00	1.24E-04	2 48E-04
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
U-238	-4 2851E-09	34,142 58	0 00	3 42E-03	3.28E-03	3.42E-03
Y-90	1.3475E+00	34,142 58	68,285 16	0 00E+00	4 60E+04	9.20E+04
Other Radionuclides					4 67E+04	9.34E+04

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg MeV	
0 0150	5 029E+15
0 0250	1.044E+15
0 0375	9 077E+14
0 0575	9 771E+14
0 0850	5 887E+14
0 1250	3.889E+14
0 2250	5 082E+14
0 3750	2.211E+14
0 5750	3 654E+15
0.8500	4 464E+13
1.2500	2 159E+13
1 7500	1 215E+12
2.2500	1 016E+08
2.7500	9 697E+07
3.5000	5 618E+04
5 0000	2.296E+04
7 0000	2 512E+03
11 0000	2.801E+02

Thermal Power

Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
5 71E+02	1 14E+03
Total	Total

III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary

	From SFD	Used
Reactor Moderator	LIGHT WATER	LIGHT WATER
Fuel Cladding	ALUM	ALUM
BOL HM Constituents	U	U
BOL Enrichment %	93 141	60 to 100

Basis for Parameter Differences:

Burnup Summary (MWd)[2]

	From SFD	Estimated	Basis for burnup used in estimate
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

	Burnup Multiplier	Estimated Burnup/ Given Burnup
Nominal	0 73	0 92
Bounding	1 46	

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: 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

[1]Fuel decay start date: 1988
Estimates as of: 2030
Template: ATR (Light Water, Alum., 60 to 100%, U)
[2]Template Burnup(MWd): 367.2
Template BOL Heavy Metal Mass (MT): 0 00116689
Template Decay Time: 35 years

Estimated Canister usage: 24"x10" 18 00

II. Estimates

	m	x_n	x_b	b	y_n	y_b
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	89,397 92	178,795 84	0 00E+00	1 79E-04	3 59E-04
Am-241	2 5251E-03	89,397 92	178,795 84	0 00E+00	2 26E+02	4 51E+02
Am-242m	3 9624E-07	89,397 92	178,795 84	0 00E+00	3 54E-02	7 08E-02
Am-243	1 4880E-06	89,397 92	178,795 84	0 00E+00	1 33E-01	2 66E-01
C-14	5 7053E-09	89,397 92	178,795 84	0 00E+00	5 10E-04	1 02E-03
Cl-36	1 3124E-32	89,397.92	178,795 84	0.00E+00	1 17E-27	2 35E-27
Cm-243	1 1419E-07	89,397.92	178,795 84	0 00E+00	1 02E-02	2 04E-02
Cm-244	1 6522E-05	89,397 92	178,795 84	0 00E+00	1 48E+00	2 95E+00
Co-60	7 4047E-07	89,397 92	178,795 84	0 00E+00	6 62E-02	1.32E-01
Cs-134	2 0455E-05	89,397 92	178,795 84	0 00E+00	1 83E+00	3 66E+00
Cs-135	3 4477E-06	89,397 92	178,795 84	0 00E+00	3 08E-01	6.16E-01
Cs-137	1 4365E+00	89,397 92	178,795 84	0 00E+00	1.28E+05	2 57E+05
Eu-154	7.3230E-03	89,397 92	178,795 84	0 00E+00	6 55E+02	1 31E+03
Eu-155	5 9259E-04	89,397 92	178,795 84	0 00E+00	5 30E+01	1 06E+02
Fe-55	2 2791E-06	89,397 92	178,795 84	0 00E+00	2 04E-01	4 08E-01
H-3	1 9698E-03	89,397 92	178,795 84	0 00E+00	1 76E+02	3 52E+02
I-129	7 5300E-07	89,397 92	178,795 84	0 00E+00	6 73E-02	1 35E-01
Kr-85	4 1176E-02	89,397 92	178,795.84	0 00E+00	3 68E+03	7 36E+03
Np-237	9 5752E-06	89,397.92	178,795 84	0.00E+00	8 56E-01	1 71E+00
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
Tl-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

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg MeV	
0 0150	1 317E+16
0 0250	2 734E+15
0 0375	2.377E+15
0 0575	2.558E+15
0 0850	1.541E+15
0 1250	1 018E+15
0.2250	1 331E+15
0 3750	5 789E+14
0 5750	9 568E+15
0 8500	1 169E+14
1 2500	5 653E+13
1 7500	3 181E+12
2 2500	2 660E+08
2 7500	2 539E+08
3 5000	1 471E+05
5 0000	6 011E+04
7 0000	6.578E+03
11 0000	7.334E+02

Thermal Power

Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
1.50E+03	2.99E+03
Total	Total

III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary

	From SFD	Used
Reactor Moderator	LIGHT WATER	LIGHT WATER
Fuel Cladding	ALUM	ALUM
BOL HM Constituents	U	U
BOL Enrichment %	93 141	60 to 100

Basis for Parameter Drfferences:

Burnup Summary (MWd)[2]

	From SFD	Estimated
Nominal	89 397 92	62 808 98
Bounding		178,795 84

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 73	0 70
Bounding	1 46	

Estimated EOL HM/Given EOL HM: 0 93

[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: 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

[1]Fuel decay start date: 1986
Estimates as of: 2030
Template: ATR (Light Water, Alum , 60 to 100%, U)
[2]Template Burnup(MWd): 367 2
Template BOL Heavy Metal Mass (MT): 0 00116689
Template Decay Time: 35 years

Estimated Canister usage: 24"x10' = 147 33

II. Estimates

Radionuclide	m: Ci/MWd From Template	x_n: Nominal Fuel Burnup (MWd)[2]	x_b: Bounding Fuel Burnup (MWd)[2]	b: Initial Activity (Ci)	y_n: Nominal Fuel Inventories(Ci)	y_b: Bounding Fuel Inventories(Ci)
Ac-227	2.0068E-09	879,986 15	1,759,972.29	0 00E+00	1.77E-03	3 53E-03
Am-241	2.5251E-03	879,986 15	1,759,972.29	0 00E+00	2.22E+03	4 44E+03
Am-242m	3 9624E-07	879,986 15	1,759,972 29	0 00E+00	3 49E-01	6 97E-01
Am-243	1 4880E-06	879,986 15	1,759,972 29	0 00E+00	1.31E+00	2 62E+00
C-14	5 7053E-09	879,986 15	1,759,972 29	0 00E+00	5 02E-03	1 00E-02
Cl-36	1 3124E-32	879,986 15	1,759,972 29	0 00E+00	1 15E-26	2 31E-26
Cm-243	1 1419E-07	879,986 15	1,759,972 29	0.00E+00	1 00E-01	2 01E-01
Cm-244	1 6522E-05	879,986.15	1,759,972.29	0 00E+00	1 45E+01	2 91E+01
Co-60	7 4047E-07	879,986.15	1,759,972.29	0 00E+00	6 52E-01	1.30E+00
Cs-134	2 0455E-05	879,986 15	1,759,972.29	0 00E+00	1 80E+01	3 60E+01
Cs-135	3 4477E-06	879,986 15	1,759,972.29	0 00E+00	3 03E+00	6 07E+00
Cs-137	1 4365E+00	879,986 15	1,759,972.29	0 00E+00	1 26E+06	2.53E+06
Eu-154	7.3230E-03	879,986 15	1,759,972.29	0 00E+00	6 44E+03	1.29E+04
Eu-155	5 9259E-04	879,986 15	1,759,972.29	0 00E+00	5.21E+02	1 04E+03
Fe-55	2.2791E-06	879,986 15	1,759,972.29	0 00E+00	2 01E+00	4 01E+00
H-3	1 9698E-03	879,986 15	1,759,972 29	0 00E+00	1 73E+03	3 47E+03
I-129	7 5300E-07	879,986 15	1,759,972 29	0 00E+00	6 63E-01	1 33E+00
Kr-85	4 1176E-02	879,986 15	1,759,972 29	0 00E+00	3 62E+04	7.25E+04
Np-237	9 5752E-06	879,986 15	1,759 972 29	0 00E+00	8 43E+00	1 69E+01
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
Tl-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

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg MeV	
0 0150	1.296E+17
0 0250	2 692E+16
0 0375	2.340E+16
0 0575	2.518E+16
0 0850	1.517E+16
0 1250	1.002E+16
0.2250	1.310E+16
0.3750	5 699E+15
0 5750	9 418E+16
0.8500	1 150E+15
1.2500	5 564E+14
1 7500	3 132E+13
2.2500	2 618E+09
2.7500	2.499E+09
3.5000	1 448E+06
5.0000	5.917E+05
7.0000	6 475E+04
11 0000	7.219E+03

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

[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: 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

[1]Fuel decay start date: 1998
Estimates as of: 2030
Template: HFBR (Heavy Water, Alum , 40 to 100%, U)
[2]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

Radionuclide	m: Ci/MWd From Template	x_n: Nominal Fuel Burnup (MWd)[2]	x_b: Bounding Fuel Burnup (MWd)[2]	b: Initial Activity (Ci)	y_n: Nominal Fuel Inventories(Ci)	y_b: Bounding Fuel Inventories(Ci)
Ac-227	5 4520E-10	10,655 32	21,310 64	0 00E+00	5 81E-06	1 16E-05
Am-241	9.2284E-03	10,655.32	21,310 64	0 00E+00	9 83E+01	1.97E+02
Am-242m	1 3390E-06	10,655.32	21,310 64	0 00E+00	1 43E-02	2 85E-02
Am-243	3.7084E-05	10,655.32	21,310 64	0 00E+00	3 95E-01	7.90E-01
C-14	2 6452E-08	10,655 32	21,310 64	0 00E+00	2 82E-04	5 64E-04
Cl-36	4 4441E-31	10,655 32	21,310 64	0 00E+00	4 74E-27	9 47E-27
Cm-243	5 0498E-06	10,655 32	21,310 64	0 00E+00	5 38E-02	1 08E-01
Cm-244	3 8451E-03	10,655 32	21,310 64	0 00E+00	4 10E+01	8 19E+01
Co-60	2 5225E-05	10,655 32	21,310 64	0 00E+00	2 69E-01	5 38E-01
Cs-134	1 9830E-03	10,655 32	21,310 64	0 00E+00	2 11E+01	4 23E+01
Cs-135	4 2564E-06	10,655 32	21,310 64	0 00E+00	4 54E-02	9 07E-02
Cs-137	1 8141E+00	10,655 32	21,310 64	0 00E+00	1 93E+04	3 87E+04
Eu-154	3 4733E-02	10,655 32	21,310 64	0 00E+00	3 70E+02	7 40E+02
Eu-155	7 1081E-03	10,655 32	21,310 64	0 00E+00	7 57E+01	1 51E+02
Fe-55	3 5790E-04	10,655 32	21,310 64	0 00E+00	3 81E+00	7 63E+00
H-3	3 4945E-03	10,655 32	21,310 64	0 00E+00	3 72E+01	7 45E+01
I-129	6 6403E-07	10,655 32	21,310 64	0 00E+00	7 08E-03	1 42E-02
Kr-85	7 8250E-02	10,655.32	21,310 64	0 00E+00	8.34E+02	1 67E+03
Np-237	3.1567E-05	10,655.32	21,310 64	0 00E+00	3.36E-01	6 73E-01
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 8056E-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
Tl-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

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg MeV	
0 0150	1 998E+15
0 0250	4 112E+14
0 0375	3 631E+14
0 0575	3.872E+14
0 0850	2.331E+14
0 1250	1 617E+14
0.2250	2.012E+14
0.3750	8 710E+13
0.5750	1 444E+15
0.8500	2 844E+13
1.2500	1 920E+13
1 7500	7 945E+11
2.2500	4 283E+07
2.7500	3 682E+07
3 5000	1.264E+06
5 0000	5 358E+05
7 0000	6 146E+04
11 0000	7 039E+03

Thermal Power

Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
2.76E+02	5.53E+02
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 %	79 82555621	40 to 100

Basis for Parameter Differences:

Burnup Summary (MWd)[2]

	From SFD	Estimated
Nominal		10 655.32
Bounding		21,310 64

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	0.54	
Bounding	1.08	

Estimated EOL HM/Given EOL HM: 1 01

[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 HOR (NETHERLANDS)
SNF ID # 713
Fuel Units & Descr 33 - ASSEMBLY
Heavy Metal Mass BOL=6.55kg, EOL=4 01kg
ROD Storage Site SRS

[1]Fuel decay start date: 1988
Estimates as of 2030
Template ATR (Light Water, Alum , 60 to 100°s, U)
[2]Template Burnup(MWd) 367.2
Template BOL Heavy Metal Mass (MT) 0.00116689
Template Decay Time 35 years

Estimated Canister usage
18"x10'
1 38

II. Estimates

Radionuclide	m Ci/MWd From Template	x_n Nominal Fuel Burnup (MWd)[2]	x_b Bounding Fuel Burnup (MWd)[2]	b Initial Activity (Ci)	y_n Nominal Fuel Inventories(Ci)	y_b Bounding Fuel Inventories(Ci)
Ac-227	2 0068E-09	2,406 38	4,812.75	0 00E+00	4 83E-06	9 66E-06
Am-241	2 5251E-03	2,406 38	4,812 75	0 00E+00	6 08E+00	1 22E+01
Am-242m	3 9624E-07	2,406 38	4,812 75	0 00E+00	9 54E-04	1.91E-03
Am-243	1 4880E-06	2,406 38	4,812 75	0 00E+00	3 58E-03	7.16E-03
C-14	5 7053E-09	2,406 38	4,812 75	0 00E+00	1.37E-05	2 75E-05
Cl-36	1.3124E-32	2,406.38	4,812 75	0 00E+00	3.16E-29	6 32E-29
Cm-243	1 1419E-07	2,406.38	4,812 75	0 00E+00	2 75E-04	5 50E-04
Cm-244	1 6522E-05	2,406 38	4,812 75	0 00E+00	3 98E-02	7 95E-02
Co-60	7 4047E-07	2,406 38	4,812.75	0 00E+00	1 78E-03	3 56E-03
Cs-134	2 0455E-05	2,406 38	4,812.75	0 00E+00	4 92E-02	9 84E-02
Cs-135	3 4477E-06	2,406 38	4,812 75	0 00E+00	8 30E-03	1 66E-02
Cs-137	1 4365E+00	2,406 38	4,812 75	0 00E+00	3 46E+03	6 91E+03
Eu-154	7.3230E-03	2,406 38	4,812 75	0 00E+00	1 76E+01	3 52E+01
Eu-155	5 9259E-04	2,406.38	4,812 75	0 00E+00	1 43E+00	2 85E+00
Fe-55	2 2791E-06	2,406 38	4,812 75	0 00E+00	5 48E-03	1 10E-02
H-3	1.9698E-03	2,406 38	4,812 75	0 00E+00	4 74E+00	9 48E+00
I-129	7.5300E-07	2,406 38	4,812.75	0 00E+00	1 81E-03	3 62E-03
Kr-85	4.1176E-02	2,406 38	4,812.75	0 00E+00	9 91E+01	1.98E+02
Np-237	9 5752E-06	2,406 38	4,812 75	0 00E+00	2 30E-02	4 61E-02
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
Tl-208	4 0414E-08	2,406.38	4,812 75	0 00E+00	9 73E-05	1 95E-04
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

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg MeV	
0 0150	3 545E+14
0 0250	7 360E+13
0.0375	6.398E+13
0 0575	6 886E+13
0 0850	4 149E+13
0 1250	2 741E+13
0 2250	3.582E+13
0 3750	1.558E+13
0.5750	2.575E+14
0.8500	3 146E+12
1.2500	1.522E+12
1 7500	8.564E+10
2 2500	7 160E+06
2.7500	6 834E+06
3.5000	3 959E+03
5 0000	1 618E+03
7 0000	1 770E+02
11 0000	1 974E+01

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 Drfferences·

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

[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: 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

[1]Fuel decay start date: 1961
Estimates as of: 2030
Template: Pathfinder (Light Water, SST, 60 to 100%, U)
[2]Template 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
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	4 5940E-08	482.62	965 24	0 00E+00	2 22E-05	4 43E-05
Am-241	1 1471E-04	482 62	965.24	0 00E+00	5 54E-02	1.11E-01
Am-242m	7 4210E-09	482 62	965.24	0 00E+00	3 58E-06	7.16E-06
Am-243	9 8236E-10	482 62	965.24	0 00E+00	4 74E-07	9 48E-07
C-14	2.2928E-04	482 62	965.24	0 00E+00	1 11E-01	2.21E-01
Cl-36	1.2260E-06	482 62	965 24	0 00E+00	5 92E-04	1 18E-03
Cm-243	1.2000E-10	482 62	965 24	0 00E+00	5 79E-08	1 16E-07
Cm-244	7 3577E-10	482 62	965 24	0 00E+00	3 55E-07	7 10E-07
Co-60	1 3732E-03	482 62	965 24	0 00E+00	6 63E-01	1 33E+00
Cs-134	1 2709E-10	482 62	965 24	0 00E+00	6.13E-08	1 23E-07
Cs-135	3 0316E-05	482 62	965 24	0 00E+00	1 46E-02	2 93E-02
Cs-137	7 2579E-01	482 62	965 24	0 00E+00	3 50E+02	7 01E+02
Eu-154	5 9750E-05	482 62	965 24	0 00E+00	2 88E-02	5 77E-02
Eu-155	1 0577E-05	482 62	965 24	0 00E+00	5 10E-03	1 02E-02
Fe-55	4 1631E-07	482 62	965.24	0 00E+00	2 01E-04	4 02E-04
H-3	4 6722E-04	482 62	965.24	0 00E+00	2 25E-01	4 51E-01
I-129	7 3195E-07	482 62	965 24	0 00E+00	3 53E-04	7 07E-04
Kr-85	5 9418E-03	482 62	965.24	0 00E+00	2 87E+00	5 74E+00
Np-237	1 1499E-06	482 62	965 24	0 00E+00	5 55E-04	1.11E-03
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
Tl-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

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg MeV	
0 0150	3.523E+13
0 0250	7.320E+12
0 0375	6.361E+12
0 0575	6 826E+12
0 0850	4 123E+12
0 1250	2 673E+12
0 2250	3 553E+12
0 3750	1 550E+12
0 5750	2 607E+13
0 8500	2 532E+11
1.2500	1 833E+11
1 7500	6 513E+09
2.2500	1.232E+06
2 7500	5 517E+05
3.5000	5 624E+01
5.0000	2 323E+01
7 0000	2 568E+00
11 0000	2.884E-01

Thermal Power

Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
3 93E+00	7 86E+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	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

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

[1]Fuel decay start date: 1964
Estimates as of: 2030
Template: HFBR (Heavy Water, Zirc , 0 to 5%, U)
[2]Template 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

Radionuclide	m: Ci/MWd From Template	x_n: Nominal Fuel Burnup (MWd)[2]	x_b: Bounding Fuel Burnup (MWd)[2]	b: Initial Activity (Ci)	y_n: Nominal Fuel Inventories(Ci)	y_b: Bounding Fuel Inventories(Ci)
Ac-227	7 7980E-09	7,772 05	7,772 05	0 00E+00	6 06E-05	6 06E-05
Am-241	2 3560E-02	7,772 05	7,772 05	0 00E+00	1 83E+02	1 83E+02
Am-242m	3 0880E-06	7,772.05	7,772 05	0 00E+00	2.40E-02	2 40E-02
Am-243	2 0520E-06	7,772 05	7,772 05	0 00E+00	1.59E-02	1 59E-02
C-14	1 1222E-03	7,772 05	7,772.05	0 00E+00	8 72E+00	8 72E+00
Cl-36	8 3760E-11	7,772 05	7,772 05	0 00E+00	6 51E-07	6 51E-07
Cm-243	2 4260E-07	7,772 05	7,772 05	0 00E+00	1 89E-03	1 89E-03
Cm-244	3 3140E-06	7,772 05	7,772 05	0 00E+00	2.58E-02	2 58E-02
Co-60	1.2454E-03	7,772.05	7,772 05	0 00E+00	9 68E+00	9 68E+00
Cs-134	3.3040E-10	7,772.05	7,772 05	0 00E+00	2.57E-06	2 57E-06
Cs-135	7 9140E-06	7,772 05	7,772 05	0 00E+00	6 15E-02	6 15E-02
Cs-137	7 1580E-01	7,772 05	7,772.05	0 00E+00	5 56E+03	5 56E+03
Eu-154	6 0500E-04	7,772 05	7,772 05	0 00E+00	4 70E+00	4 70E+00
Eu-155	9 4860E-06	7,772 05	7,772 05	0 00E+00	7.37E-02	7 37E-02
Fe-55	1 9322E-08	7,772 05	7,772 05	0 00E+00	1.50E-04	1 50E-04
H-3	4 4180E-03	7,772.05	7,772 05	0 00E+00	3 43E+01	3 43E+01
I-129	7.5020E-07	7,772 05	7,772 05	0 00E+00	5 83E-03	5 83E-03
Kr-85	5 4940E-03	7,772 05	7,772 05	0.00E+00	4.27E+01	4.27E+01
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
Tl-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

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg MeV	
0 0150	2 660E+14
0 0250	5 494E+13
0 0375	4 837E+13
0 0575	5.357E+13
0 0850	3.082E+13
0 1250	2 003E+13
0.2250	2 653E+13
0.3750	1 155E+13
0.5750	2 066E+14
0.8500	1 974E+12
1.2500	1.426E+12
1 7500	5 100E+10
2.2500	9 178E+06
2.7500	9 536E+06
3.5000	3 886E+04
5 0000	1 631E+04
7 0000	1.834E+03
11 0000	2 080E+02

Thermal Power

Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
7.38E+01	7.38E+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	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		7 772 05
Bounding		7,772 05

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

[1]Fuel decay start date: 1964
Estimates as of: 2030
Template: HFBR (Heavy Water, Zirc., 0 to 5%, U)
[2]Template 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_b	b	y_n	y_b
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	7 7980E-09	34,632.91	34,632 91	0 00E+00	2.70E-04	2 70E-04
Am-241	2.3560E-02	34,632.91	34,632 91	0 00E+00	8.16E+02	8.16E+02
Am-242m	3 0880E-06	34,632.91	34,632.91	0 00E+00	1.07E-01	1 07E-01
Am-243	2 0520E-06	34,632 91	34,632 91	0 00E+00	7.11E-02	7.11E-02
C-14	1 1222E-03	34,632 91	34,632 91	0 00E+00	3 89E+01	3 89E+01
Cl-36	8 3760E-11	34,632 91	34,632 91	0 00E+00	2 90E-06	2 90E-06
Cm-243	2 4260E-07	34,632 91	34,632 91	0 00E+00	8 40E-03	8 40E-03
Cm-244	3 3140E-06	34,632 91	34,632 91	0 00E+00	1 15E-01	1 15E-01
Co-60	1 2454E-03	34,632 91	34,632 91	0 00E+00	4 31E+01	4 31E+01
Cs-134	3 3040E-10	34,632 91	34,632 91	0 00E+00	1 14E-05	1 14E-05
Cs-135	7 9140E-06	34,632 91	34,632 91	0 00E+00	2 74E-01	2 74E-01
Cs-137	7 1580E-01	34,632 91	34,632 91	0 00E+00	2 48E+04	2.48E+04
Eu-154	6 0500E-04	34,632 91	34,632 91	0 00E+00	2.10E+01	2.10E+01
Eu-155	9 4860E-06	34,632.91	34,632 91	0 00E+00	3.29E-01	3.29E-01
Fe-55	1 9322E-08	34,632.91	34,632.91	0 00E+00	6 69E-04	6 69E-04
H-3	4 4180E-03	34,632.91	34,632.91	0 00E+00	1 53E+02	1.53E+02
I-129	7 5020E-07	34,632 91	34,632.91	0 00E+00	2 60E-02	2.60E-02
Kr-85	5 4940E-03	34,632 91	34,632 91	0 00E+00	1 90E+02	1 90E+02
Np-237	5 8040E-06	34,632 91	34,632 91	0 00E+00	2 01E-01	2 01E-01
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

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg. MeV	
0 0150	1 185E+15
0 0250	2 448E+14
0 0375	2 155E+14
0 0575	2.387E+14
0 0850	1.373E+14
0 1250	8.926E+13
0.2250	1 182E+14
0 3750	5 148E+13
0 5750	9 208E+14
0 8500	8 796E+12
1.2500	6 356E+12
1 7500	2.273E+11
2.2500	4 090E+07
2 7500	4.249E+07
3.5000	1 732E+05
5.0000	7.267E+04
7 0000	8 171E+03
11 0000	9.270E+02

Thermal Power

Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
3.29E+02	3.29E+02
Total	Total

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		34 632 91
Bounding		34 632 91

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

Estimated Canister usage: 18"x15" = 0.27

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

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

II. Estimates

Radionuclide	m: Ci/MWd From Template	x_n: Nominal Fuel Burnup (MWd)[2]	x_b: Bounding Fuel Burnup (MWd)[2]	b: Initial Activity (Ci)	y_n: Nominal Fuel Inventories(Ci)	y_b: Bounding Fuel Inventories(Ci)
Ac-227	7.7980E-09	43,572.00	43,572.00	0.00E+00	3.40E-04	3.40E-04
Am-241	2.3560E-02	43,572.00	43,572.00	0.00E+00	1.03E+03	1.03E+03
Am-242m	3.0880E-06	43,572.00	43,572.00	0.00E+00	1.35E-01	1.35E-01
Am-243	2.0520E-06	43,572.00	43,572.00	0.00E+00	8.94E-02	8.94E-02
C-14	1.1222E-03	43,572.00	43,572.00	0.00E+00	4.89E+01	4.89E+01
Cl-36	8.3760E-11	43,572.00	43,572.00	0.00E+00	3.65E-06	3.65E-06
Cm-243	2.4260E-07	43,572.00	43,572.00	0.00E+00	1.06E-02	1.06E-02
Cm-244	3.3140E-06	43,572.00	43,572.00	0.00E+00	1.44E-01	1.44E-01
Co-60	1.2454E-03	43,572.00	43,572.00	0.00E+00	5.43E+01	5.43E+01
Cs-134	3.3040E-10	43,572.00	43,572.00	0.00E+00	1.44E-05	1.44E-05
Cs-135	7.9140E-06	43,572.00	43,572.00	0.00E+00	3.45E-01	3.45E-01
Cs-137	7.1580E-01	43,572.00	43,572.00	0.00E+00	3.12E+04	3.12E+04
Eu-154	6.0500E-04	43,572.00	43,572.00	0.00E+00	2.64E+01	2.64E+01
Eu-155	9.4860E-06	43,572.00	43,572.00	0.00E+00	4.13E-01	4.13E-01
Fe-55	1.9322E-08	43,572.00	43,572.00	0.00E+00	8.42E-04	8.42E-04
H-3	4.4180E-03	43,572.00	43,572.00	0.00E+00	1.93E+02	1.93E+02
I-129	7.5020E-07	43,572.00	43,572.00	0.00E+00	3.27E-02	3.27E-02
Kr-85	5.4940E-03	43,572.00	43,572.00	0.00E+00	2.39E+02	2.39E+02
Np-237	5.8040E-06	43,572.00	43,572.00	0.00E+00	2.53E-01	2.53E-01
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
Tl-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	0.00	9.83E-03	0.00E+00	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	0.00	2.87E-02	2.29E-02	2.87E-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

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg MeV	
0.0150	1.491E+15
0.0250	3.080E+14
0.0375	2.712E+14
0.0575	3.003E+14
0.0850	1.728E+14
0.1250	1.123E+14
0.2250	1.487E+14
0.3750	6.477E+13
0.5750	1.159E+15
0.8500	1.107E+13
1.2500	7.997E+12
1.7500	2.859E+11
2.2500	5.145E+07
2.7500	5.346E+07
3.5000	2.179E+05
5.0000	9.143E+04
7.0000	1.028E+04
11.0000	1.166E+03

Thermal Power

Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
4.14E+02	4.14E+02
Total	Total

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		43,572.00
Bounding		43,572.00

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

[1]Fuel decay start date: 1964
Estimates as of: 2030
Template: HFBR (Heavy Water, SST, 0 to 5% U)
[2]Template 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

Radionuclide	m: Ci/MWd From Template	x_n: Nominal Fuel Burnup (MWd)[2]	x_b: Bounding Fuel Burnup (MWd)[2]	b: Initial Activity (Ci)	y_n: Nominal Fuel Inventories(Ci)	y_b: Bounding Fuel Inventories(Ci)
Ac-227	9 2380E-09	88,573 24	88,573 24	0 00E+00	8 18E-04	8.18E-04
Am-241	2 2020E-01	88,573 24	88,573 24	0 00E+00	1 95E+04	1 95E+04
Am-242m	8 9860E-05	88,573 24	88,573 24	0 00E+00	7 96E+00	7 96E+00
Am-243	5 2240E-05	88,573 24	88,573 24	0 00E+00	4 63E+00	4 63E+00
C-14	2 2080E-02	88,573 24	88,573 24	0 00E+00	1 96E+03	1 96E+03
Cl-36	4 1880E-04	88,573 24	88,573.24	0 00E+00	3 71E+01	3 71E+01
Cm-243	8 0820E-06	88,573 24	88,573.24	0 00E+00	7.16E-01	7 16E-01
Cm-244	2 3260E-04	88,573 24	88,573.24	0 00E+00	2.06E+01	2 06E+01
Co-60	9 9520E-02	88,573 24	88,573.24	0 00E+00	8 81E+03	8 81E+03
Cs-134	7 2160E-10	88,573 24	88,573.24	0 00E+00	6.39E-05	6 39E-05
Cs-135	3 7460E-06	88 573 24	88,573.24	0 00E+00	3.32E-01	3 32E-01
Cs-137	7 2140E-01	88,573.24	88,573.24	0 00E+00	6 39E+04	6 39E+04
Eu-154	8 2120E-04	88,573.24	88,573.24	0 00E+00	7 27E+01	7.27E+01
Eu-155	1.2284E-05	88,573.24	88,573.24	0 00E+00	1 09E+00	1 09E+00
Fe-55	1 8062E-05	88,573.24	88,573.24	0 00E+00	1 60E+00	1 60E+00
H-3	8.2700E-03	88,573.24	88,573 24	0 00E+00	7 33E+02	7.33E+02
I-129	9.1660E-07	88,573.24	88,573 24	0 00E+00	8 12E-02	8 12E-02
Kr-85	4 6540E-03	88,573.24	88,573 24	0 00E+00	4 12E+02	4 12E+02
Np-237	2.1800E-05	88,573 24	88,573 24	0 00E+00	1 93E+00	1 93E+00
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
Tl-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
U-233	4 1460E-07	88,573 24	88,573 24	0 00E+00	3 67E-02	3 67E-02
U-234	2 1720E-03	88,573 24	88,573.24	0 00E+00	1 92E+02	1 92E+02
U-235	-1.7016E-06	88,573 24	0 00	2 01E-02	0 00E+00	2 01E-02
U-236	2 6100E-05	88,573 24	88,573.24	0 00E+00	2.31E+00	2 31E+00
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

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg. MeV	
0 0150	2 835E+15
0 0250	5 483E+14
0 0375	4 892E+14
0 0575	7 546E+14
0 0850	2 925E+14
0 1250	1 900E+14
0.2250	2 497E+14
0.3750	1 084E+14
0.5750	2.360E+15
0 8500	2 002E+13
1.2500	6 595E+14
1 7500	4 938E+11
2.2500	3.511E+09
2.7500	3.689E+08
3 5000	1 862E+06
5 0000	7 734E+05
7 0000	8 611E+04
11 0000	9 708E+03

Thermal Power

Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
1.97E+03	1 97E+03
Total	Total

III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary

	From SFD	Used
Reactor Moderator	HEAVY WATER	HEAVY WATER
Fuel Cladding	SST	SST
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		88,573.24
Bounding		88,573.24

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	32.70	
Bounding	32 70	

Estimated EOL HM/Given EOL HM: 2.26

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

[1]Fuel decay start date: 1964
Estimates as of: 2030
Template: HFBR (Heavy Water, Zirc , 0 to 5% U)
[2]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_n x_b b y_n y_b

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	7 7980E-09	5,183 09	5,183 09	0 00E+00	4 04E-05	4 04E-05
Am-241	2 3560E-02	5,183 09	5,183 09	0 00E+00	1 22E+02	1.22E+02
Am-242m	3 0880E-06	5,183 09	5,183 09	0 00E+00	1 60E-02	1 60E-02
Am-243	2 0520E-06	5,183 09	5,183 09	0 00E+00	1 06E-02	1 06E-02
C-14	1.1222E-03	5,183 09	5,183 09	0 00E+00	5 82E+00	5 82E+00
Cl-36	8 3760E-11	5,183 09	5,183 09	0 00E+00	4 34E-07	4 34E-07
Cm-243	2 4260E-07	5,183 09	5,183 09	0 00E+00	1.26E-03	1.26E-03
Cm-244	3 3140E-06	5,183 09	5,183 09	0 00E+00	1 72E-02	1.72E-02
Co-60	1.2454E-03	5,183 09	5,183 09	0 00E+00	6 46E+00	6 46E+00
Cs-134	3.3040E-10	5,183 09	5,183 09	0 00E+00	1 71E-06	1 71E-06
Cs-135	7 9140E-06	5,183 09	5,183 09	0 00E+00	4 10E-02	4 10E-02
Cs-137	7.1580E-01	5,183 09	5,183 09	0 00E+00	3 71E+03	3 71E+03
Eu-154	6 0500E-04	5,183 09	5,183 09	0 00E+00	3 14E+00	3 14E+00
Eu-155	9 4860E-06	5,183 09	5,183 09	0.00E+00	4 92E-02	4 92E-02
Fe-55	1.9322E-08	5,183 09	5,183 09	0 00E+00	1 00E-04	1 00E-04
H-3	4 4180E-03	5,183 09	5,183 09	0 00E+00	2.29E+01	2.29E+01
I-129	7.5020E-07	5,183 09	5,183 09	0 00E+00	3 89E-03	3 89E-03
Kr-85	5 4940E-03	5,183 09	5,183 09	0 00E+00	2 85E+01	2 85E+01
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
Tl-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	0 00	1 17E-03	0 00E+00	1 17E-03
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
Other Radionuclides					3 55E+03	3.55E+03

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg MeV	
0 0150	1 774E+14
0 0250	3 664E+13
0 0375	3 226E+13
0.0575	3 572E+13
0 0850	2.055E+13
0 1250	1.336E+13
0 2250	1 769E+13
0.3750	7 705E+12
0.5750	1 378E+14
0.8500	1 316E+12
1.2500	9 513E+11
1 7500	3 401E+10
2.2500	6 121E+06
2.7500	6.360E+06
3.5000	2 592E+04
5 0000	1 088E+04
7 0000	1.223E+03
11 0000	1.387E+02

Thermal Power

Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
4 92E+01	4.92E+01
Total	Total

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

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

[1]Fuel decay start date: 1964
Estimates as of: 2030
Template: HFBR (Heavy Water, Zirc., 0 to 5%. U)
[2]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
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	7.7980E-09	15,122.23	15,122 23	0 00E+00	1 18E-04	1.18E-04
Am-241	2 3560E-02	15,122.23	15,122 23	0 00E+00	3 56E+02	3.56E+02
Am-242m	3 0880E-06	15,122.23	15,122.23	0 00E+00	4 67E-02	4 67E-02
Am-243	2 0520E-06	15,122.23	15,122.23	0 00E+00	3 10E-02	3.10E-02
C-14	1 1222E-03	15,122.23	15,122.23	0 00E+00	1 70E+01	1 70E+01
Cl-36	8 3760E-11	15,122 23	15,122.23	0 00E+00	1 27E-06	1.27E-06
Cm-243	2 4260E-07	15,122.23	15,122.23	0 00E+00	3 67E-03	3 67E-03
Cm-244	3 3140E-06	15,122 23	15,122.23	0 00E+00	5 01E-02	5 01E-02
Co-60	1.2454E-03	15,122 23	15,122.23	0 00E+00	1 88E+01	1 88E+01
Cs-134	3.3040E-10	15,122 23	15,122 23	0 00E+00	5 00E-06	5 00E-06
Cs-135	7 9140E-06	15,122 23	15,122 23	0 00E+00	1.20E-01	1 20E-01
Cs-137	7.1580E-01	15,122.23	15,122 23	0 00E+00	1 08E+04	1.08E+04
Eu-154	6.0500E-04	15,122.23	15,122 23	0 00E+00	9 15E+00	9 15E+00
Eu-155	9 4860E-06	15,122.23	15,122.23	0 00E+00	1 43E-01	1.43E-01
Fe-55	1 9322E-08	15,122.23	15,122.23	0 00E+00	2 92E-04	2 92E-04
H-3	4 4180E-03	15,122.23	15,122.23	0 00E+00	6 68E+01	6 68E+01
I-129	7 5020E-07	15,122.23	15,122.23	0 00E+00	1 13E-02	1.13E-02
Kr-85	5 4940E-03	15,122.23	15,122.23	0 00E+00	8 31E+01	8 31E+01
Np-237	5 8040E-06	15,122 23	15,122 23	0 00E+00	8 78E-02	8 78E-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

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg MeV	
0 0150	5 176E+14
0 0250	1 069E+14
0 0375	9 411E+13
0 0575	1 042E+14
0 0850	5 996E+13
0 1250	3 897E+13
0.2250	5 162E+13
0.3750	2.248E+13
0.5750	4 021E+14
0.8500	3.841E+12
1.2500	2.775E+12
1 7500	9 923E+10
2.2500	1 786E+07
2.7500	1 856E+07
3 5000	7 562E+04
5 0000	3 173E+04
7 0000	3 568E+03
11 0000	4 048E+02

Thermal Power

Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
1 44E+02	1 44E+02
Total	Total

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 Drfferences:

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		15,122.23
Bounding		15 122.23

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

[1]Fuel decay start date: 1963
Estimates as of: 2030
Template: PWR (Light Water, Zirc 0 to 5%, U)
[2]Template 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

Radionuclide	m Ci/MWd From Template	x_n Nominal Fuel Burnup (MWd)[2]	x_b Bounding Fuel Burnup (MWd)[2]	b Initial Activity (Ci)	y_n Nominal Fuel Inventories(Ci)	y_b Bounding Fuel Inventories(Ci)
Ac-227	1 2581E-09	209 63	209 63	0 00E+00	2 64E-07	2 64E-07
Am-241	1 4761E-01	209 63	209 63	0 00E+00	3 09E+01	3 09E+01
Am-242m	2.5032E-04	209 63	209 63	0 00E+00	5.25E-02	5.25E-02
Am-243	6.2387E-04	209 63	209 63	0 00E+00	1.31E-01	1.31E-01
C-14	4 7739E-05	209 63	209 63	0 00E+00	1 00E-02	1 00E-02
Cl-36	8 0297E-07	209 63	209 63	0 00E+00	1 68E-04	1 68E-04
Cm-243	1 2099E-04	209 63	209 63	0.00E+00	2 54E-02	2 54E-02
Cm-244	1 5560E-02	209 63	209 63	0 00E+00	3.26E+00	3 26E+00
Co-60	4 9580E-05	209 63	209 63	0 00E+00	1 04E-02	1.04E-02
Cs-134	1 7022E-09	209 63	209 63	0 00E+00	3 57E-07	3 57E-07
Cs-135	1 4433E-05	209 63	209 63	0 00E+00	3 03E-03	3 03E-03
Cs-137	6 9929E-01	209 63	209 63	0 00E+00	1 47E+02	1 47E+02
Eu-154	1 8023E-03	209 63	209 63	0 00E+00	3 78E-01	3 78E-01
Eu-155	2 6793E-05	209 63	209 63	0 00E+00	5 62E-03	5 62E-03
Fe-55	1.4580E-08	209 63	209 63	0 00E+00	3 06E-06	3 06E-06
H-3	3 8566E-03	209 63	209 63	0 00E+00	8 08E-01	8 08E-01
I-129	9 8288E-07	209 63	209 63	0 00E+00	2 06E-04	2 06E-04
Kr-85	4 0617E-03	209 63	209 63	0 00E+00	8 51E-01	8 51E-01
Np-237	1 2645E-05	209 63	209 63	0 00E+00	2 65E-03	2 65E-03
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
Tl-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
Other Radionuclides					1 42E+02	1 42E+02

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg MeV	
0 0150	5 676E+12
0 0250	1 127E+12
0 0375	1 054E+12
0 0575	1 446E+12
0 0850	6 169E+11
0 1250	4 024E+11
0.2250	5.248E+11
0.3750	2.271E+11
0 5750	5 405E+12
0 8500	4.333E+10
1.2500	2.026E+10
1 7500	1 165E+09
2.2500	2.057E+05
2 7500	1.021E+06
3 5000	5 090E+04
5 0000	2 174E+04
7.0000	2.503E+03
11 0000	2.872E+02

Thermal Power

Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
3 08E+00	3.08E+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:	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		209 63
Bounding		209 63

Basis for burnup used in estimate:
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
Nominal	0 04	
Bounding	0 04	

Estimated EOL HM/Given EOL HM: 1 00

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

[1]Fuel decay start date: 1964
Estimates as of: 2030
Template: HFBR (Heavy Water, Zirc., 0 to 5% U)
[2]Template 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

Radionuclide	m Ci/MWd From Template	x_n Nominal Fuel Burnup (MWd)[2]	x_b Bounding Fuel Burnup (MWd)[2]	b Initial Activity (Ci)	y_n Nominal Fuel Inventories(Ci)	y_b Bounding Fuel Inventories(Ci)
Ac-227	7.7980E-09	61,103 94	61,103 94	0 00E+00	4 76E-04	4.76E-04
Am-241	2.3560E-02	61,103 94	61,103 94	0 00E+00	1 44E+03	1 44E+03
Am-242m	3 0880E-06	61,103.94	61,103 94	0 00E+00	1 89E-01	1.89E-01
Am-243	2 0520E-06	61,103 94	61,103 94	0 00E+00	1.25E-01	1.25E-01
C-14	1 1222E-03	61,103 94	61,103 94	0 00E+00	6.86E+01	6 86E+01
Cl-36	8 3760E-11	61,103 94	61,103 94	0 00E+00	5 12E-06	5 12E-06
Cm-243	2 4260E-07	61,103 94	61,103 94	0 00E+00	1 48E-02	1 48E-02
Cm-244	3 3140E-06	61,103 94	61,103 94	0 00E+00	2.02E-01	2 02E-01
Co-60	1 2454E-03	61,103 94	61,103 94	0 00E+00	7 61E+01	7 61E+01
Cs-134	3 3040E-10	61,103 94	61,103 94	0 00E+00	2 02E-05	2 02E-05
Cs-135	7 9140E-06	61,103 94	61,103.94	0 00E+00	4 84E-01	4 84E-01
Cs-137	7 1580E-01	61,103 94	61,103.94	0 00E+00	4 37E+04	4.37E+04
Eu-154	6 0500E-04	61,103 94	61,103.94	0 00E+00	3 70E+01	3 70E+01
Eu-155	9 4860E-06	61,103.94	61,103 94	0 00E+00	5 80E-01	5 80E-01
Fe-55	1 9322E-08	61,103 94	61,103 94	0 00E+00	1 18E-03	1 18E-03
H-3	4 4180E-03	61,103 94	61,103 94	0 00E+00	2.70E+02	2.70E+02
I-129	7.5020E-07	61,103 94	61,103 94	0 00E+00	4 58E-02	4 58E-02
Kr-85	5 4940E-03	61,103 94	61,103 94	0 00E+00	3.36E+02	3 36E+02
Np-237	5 8040E-06	61,103 94	61,103 94	0 00E+00	3 55E-01	3.55E-01
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
Tl-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

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg. MeV	
0 0150	2 091E+15
0 0250	4 319E+14
0 0375	3 803E+14
0.0575	4 212E+14
0.0850	2 423E+14
0 1250	1 575E+14
0.2250	2 086E+14
0 3750	9 083E+13
0.5750	1 625E+15
0 8500	1.552E+13
1.2500	1 121E+13
1 7500	4 010E+11
2.2500	7.216E+07
2.7500	7 498E+07
3 5000	3 055E+05
5 0000	1 282E+05
7 0000	1 442E+04
11 0000	1 636E+03

Thermal Power

Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
5.80E+02	5.80E+02
Total	Total

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

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

[1]Fuel decay start date: 1964
Estimates as of: 2030
Template: HFBR (Heavy Water, Zirc , 0 to 5% U)
[2]Template 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

Radionuclide	m: Ci/MWd From Template	x_n: Nominal Fuel Burnup (MWd)[2]	x_b: Bounding Fuel Burnup (MWd)[2]	b: Initial Activity (Ci)	y_n: Nominal Fuel Inventories(Ci)	y_b: Bounding Fuel Inventories(Ci)
Ac-227	7 7980E-09	239,374 53	239,374 53	0 00E+00	1 87E-03	1 87E-03
Am-241	2 3560E-02	239,374 53	239,374 53	0 00E+00	5 64E+03	5 64E+03
Am-242m	3 0880E-06	239,374.53	239,374 53	0 00E+00	7.39E-01	7.39E-01
Am-243	2 0520E-06	239,374 53	239,374 53	0 00E+00	4 91E-01	4 91E-01
C-14	1.1222E-03	239,374 53	239,374 53	0 00E+00	2 69E+02	2 69E+02
Cl-36	8 3760E-11	239,374 53	239,374.53	0 00E+00	2 01E-05	2 01E-05
Cm-243	2 4260E-07	239,374 53	239,374 53	0 00E+00	5 81E-02	5 81E-02
Cm-244	3.3140E-06	239 374 53	239,374 53	0 00E+00	7 93E-01	7 93E-01
Co-60	1.2454E-03	239,374 53	239,374.53	0 00E+00	2 98E+02	2 98E+02
Cs-134	3 3040E-10	239,374 53	239,374 53	0 00E+00	7 91E-05	7 91E-05
Cs-135	7 9140E-06	239,374 53	239,374 53	0 00E+00	1 89E+00	1 89E+00
Cs-137	7 1580E-01	239,374.53	239,374 53	0 00E+00	1 71E+05	1 71E+05
Eu-154	6 0500E-04	239,374.53	239,374 53	0 00E+00	1 45E+02	1 45E+02
Eu-155	9 4860E-06	239,374.53	239,374 53	0 00E+00	2.27E+00	2.27E+00
Fe-55	1.9322E-08	239,374 53	239,374.53	0 00E+00	4 63E-03	4 63E-03
H-3	4 4180E-03	239,374 53	239,374.53	0 00E+00	1 06E+03	1 06E+03
I-129	7.5020E-07	239,374 53	239,374.53	0 00E+00	1 80E-01	1 80E-01
Kr-85	5 4940E-03	239,374 53	239,374 53	0 00E+00	1.32E+03	1.32E+03
Np-237	5 8040E-06	239,374 53	239,374 53	0 00E+00	1 39E+00	1 39E+00
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
Tl-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

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg MeV	
0 0150	8 193E+15
0 0250	1 692E+15
0 0375	1 490E+15
0 0575	1 650E+15
0 0850	9 492E+14
0 1250	6 169E+14
0.2250	8 170E+14
0 3750	3.558E+14
0 5750	6 365E+15
0 8500	6 080E+13
1.2500	4 393E+13
1 7500	1 571E+12
2.2500	2.827E+08
2 7500	2.937E+08
3 5000	1 197E+06
5 0000	5 023E+05
7 0000	5 648E+04
11 0000	6 407E+03

Thermal Power

Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
2.27E+03	2.27E+03
Total	Total

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		239,374.53
Bounding		239,374.53

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

[1]Fuel decay start date: 1964
Estimates as of: 2030
Template: HFBR (Heavy Water, Zirc. 0 to 5%, U)
[2]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

Radionuclide	m Ci/MWd From Template	x_n Nominal Fuel Burnup (MWd)[2]	x_b Bounding Fuel Burnup (MWd)[2]	b Initial Activity (Ci)	y_n Nominal Fuel Inventories(Ci)	y_b Bounding Fuel Inventories(Ci)
Ac-227	7 7980E-09	419,538 84	419,538 84	0 00E+00	3.27E-03	3 27E-03
Am-241	2 3560E-02	419,538 84	419,538 84	0 00E+00	9 88E+03	9 88E+03
Am-242m	3 0880E-06	419,538 84	419,538 84	0 00E+00	1 30E+00	1.30E+00
Am-243	2 0520E-06	419,538 84	419,538 84	0 00E+00	8 61E-01	8.61E-01
C-14	1 1222E-03	419,538 84	419,538 84	0 00E+00	4 71E+02	4 71E+02
Cl-36	8.3760E-11	419,538 84	419,538 84	0 00E+00	3 51E-05	3 51E-05
Cm-243	2 4260E-07	419,538 84	419,538 84	0 00E+00	1 02E-01	1 02E-01
Cm-244	3 3140E-06	419,538 84	419,538 84	0 00E+00	1 39E+00	1 39E+00
Co-60	1 2454E-03	419,538 84	419,538 84	0 00E+00	5.22E+02	5 22E+02
Cs-134	3 3040E-10	419,538 84	419,538 84	0 00E+00	1 39E-04	1 39E-04
Cs-135	7 9140E-06	419,538 84	419,538 84	0 00E+00	3.32E+00	3 32E+00
Cs-137	7 1580E-01	419,538 84	419,538 84	0 00E+00	3 00E+05	3 00E+05
Eu-154	6 0500E-04	419,538 84	419,538 84	0 00E+00	2 54E+02	2.54E+02
Eu-155	9 4860E-06	419,538 84	419,538 84	0 00E+00	3 98E+00	3 98E+00
Fe-55	1 9322E-08	419,538 84	419,538 84	0 00E+00	8.11E-03	8.11E-03
H-3	4 4180E-03	419,538 84	419,538 84	0 00E+00	1 85E+03	1 85E+03
I-129	7.5020E-07	419,538 84	419,538 84	0 00E+00	3 15E-01	3.15E-01
Kr-85	5 4940E-03	419,538 84	419,538 84	0.00E+00	2 30E+03	2 30E+03
Np-237	5 8040E-06	419,538 84	419,538 84	0 00E+00	2 44E+00	2 44E+00
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
Tl-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

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg MeV	
0 0150	1 436E+16
0 0250	2 965E+15
0 0375	2 611E+15
0 0575	2.892E+15
0 0850	1 664E+15
0 1250	1.081E+15
0.2250	1 432E+15
0 3750	6.237E+14
0 5750	1 115E+16
0 8500	1 066E+14
1 2500	7 700E+13
1 7500	2.753E+12
2.2500	4 954E+08
2 7500	5 148E+08
3 5000	2 098E+06
5 0000	8.803E+05
7.0000	9.898E+04
11 0000	1 123E+04

Thermal Power

Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
3 98E+03	3 98E+03
Total	Total

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		419 538.84
Bounding		419,538 84

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

Estimated Canister usage: 18"x10" 0 08

I. Fuel and Template Information

Fuel Name HWCTR SPRO (U02) ALUM LEU
SNF ID # 115
Fuel Units & Descr 3 - TUBE
Heavy Metal Mass BOL= , EOL=6 499kg
ROD Storage Site SRS

[1]Fuel decay start date 1964
Estimates as of 2030
Template HFBR (Heavy Water Alum , 10 to 20%, U)
[2]Template Burnup(MWd) 15
Template BOL Heavy Metal Mass (MT) 0 00034251
Template Decay Time 65 years

II. Estimates

Radionuclide	m Ci/MWd From Template	x_n Nominal Fuel Burnup (MWd)[2]	x_b Bounding Fuel Burnup (MWd)[2]	b Initial Activity (Ci)	y_n Nominal Fuel Inventories(Ci)	y_b Bounding Fuel Inventories(Ci)
Ac-227	5 3460E-09	6,176 98	6,176 98	0 00E+00	3.30E-05	3 30E-05
Am-241	2 9433E-02	6,176 98	6,176 98	0 00E+00	1.82E+02	1 82E+02
Am-242m	7.2600E-06	6,176 98	6,176 98	0 00E+00	4 48E-02	4 48E-02
Am-243	6.3740E-06	6,176 98	6,176 98	0 00E+00	3 94E-02	3 94E-02
C-14	2.9460E-08	6,176 98	6,176 98	0 00E+00	1 82E-04	1 82E-04
Cl-36	5 9507E-35	6,176 98	6,176 98	0 00E+00	3 68E-31	3 68E-31
Cm-243	7.3933E-07	6,176 98	6,176 98	0 00E+00	4.57E-03	4 57E-03
Cm-244	1 9660E-05	6,176 98	6,176 98	0 00E+00	1.21E-01	1.21E-01
Co-60	4 3927E-08	6,176 98	6,176 98	0 00E+00	2 71E-04	2.71E-04
Cs-134	5 7507E-10	6,176 98	6,176 98	0 00E+00	3 55E-06	3 55E-06
Cs-135	4 8607E-06	6,176 98	6,176.98	0 00E+00	3 00E-02	3 00E-02
Cs-137	7 1533E-01	6,176 98	6,176 98	0 00E+00	4 42E+03	4 42E+03
Eu-154	5 5553E-04	6,176 98	6,176 98	0 00E+00	3 43E+00	3 43E+00
Eu-155	7 5800E-06	6,176 98	6,176 98	0 00E+00	4 68E-02	4 68E-02
Fe-55	8 7333E-09	6,176 98	6,176 98	0 00E+00	5 39E-05	5.39E-05
H-3	3 7313E-04	6,176 98	6,176 98	0 00E+00	2 30E+00	2.30E+00
I-129	7.1600E-07	6,176 98	6,176 98	0 00E+00	4 42E-03	4 42E-03
Kr-85	5.5793E-03	6,176 98	6,176 98	0 00E+00	3 45E+01	3 45E+01
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
Tl-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

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg MeV	
0 0150	2 149E+14
0 0250	4 444E+13
0 0375	3 892E+13
0.0575	4 378E+13
0 0850	2 493E+13
0 1250	1.620E+13
0.2250	2 147E+13
0 3750	9.351E+12
0.5750	1 642E+14
0.8500	1 575E+12
1.2500	5.673E+11
1 7500	4 106E+10
2.2500	4.340E+06
2.7500	1 108E+06
3.5000	2.271E+04
5.0000	9 495E+03
7.0000	1 064E+03
11 0000	1.204E+02

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

Basis for Parameter Drfferences.

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		6 176 98
Bounding		6 176 98

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	10 85	
Bounding	10 85	

Estimated EOL HM/Given EOL HM: 2 01

[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 SPRO (U02) SST LEU
SNF ID #: 978
Fuel Units & Descr: 5 - TUBE
Heavy Metal Mass BOL= , EOL=89 362kg
ROD Storage Site: INEEL

[1]Fuel decay start date. 1964
Estimates as of: 2030
Template: HFBR (Heavy Water, SST, 0 to 5%, U)
[2]Template 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_n	x_b	b	y_n	y_b
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	9 2380E-09	85,315 00	85,315 00	0 00E+00	7 88E-04	7.88E-04
Am-241	2 2020E-01	85,315 00	85,315 00	0 00E+00	1 88E+04	1 88E+04
Am-242m	8 9860E-05	85,315.00	85,315 00	0 00E+00	7 67E+00	7 67E+00
Am-243	5.2240E-05	85,315 00	85,315 00	0 00E+00	4 46E+00	4 46E+00
C-14	2 2080E-02	85,315 00	85,315 00	0 00E+00	1 88E+03	1 88E+03
Cl-36	4 1880E-04	85,315 00	85,315 00	0 00E+00	3 57E+01	3 57E+01
Cm-243	8 0820E-06	85,315 00	85,315 00	0 00E+00	6 90E-01	6 90E-01
Cm-244	2 3260E-04	85,315 00	85,315 00	0 00E+00	1 98E+01	1 98E+01
Co-60	9 9520E-02	85,315 00	85,315.00	0 00E+00	8 49E+03	8 49E+03
Cs-134	7.2160E-10	85,315 00	85,315 00	0 00E+00	6.16E-05	6 16E-05
Cs-135	3 7460E-06	85,315 00	85,315 00	0 00E+00	3 20E-01	3 20E-01
Cs-137	7 2140E-01	85,315 00	85,315 00	0 00E+00	6 15E+04	6 15E+04
Eu-154	8 2120E-04	85,315 00	85,315 00	0 00E+00	7 01E+01	7 01E+01
Eu-155	1 2284E-05	85,315 00	85,315 00	0 00E+00	1 05E+00	1.05E+00
Fe-55	1 8062E-05	85 315 00	85,315 00	0 00E+00	1 54E+00	1 54E+00
H-3	8 2700E-03	85,315 00	85,315 00	0 00E+00	7 06E+02	7 06E+02
I-129	9 1660E-07	85,315 00	85,315 00	0 00E+00	7 82E-02	7 82E-02
Kr-85	4 6540E-03	85,315 00	85,315 00	0 00E+00	3 97E+02	3 97E+02
Np-237	2 1800E-05	85,315 00	85,315 00	0 00E+00	1 86E+00	1 86E+00
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
Tl-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

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg. MeV	
0 0150	2.731E+15
0 0250	5.281E+14
0 0375	4 712E+14
0 0575	7.268E+14
0 0850	2 818E+14
0.1250	1 830E+14
0.2250	2 405E+14
0 3750	1 044E+14
0 5750	2.274E+15
0 8500	1 928E+13
1 2500	6 352E+14
1 7500	4 757E+11
2.2500	3 381E+09
2 7500	3 553E+08
3 5000	1 794E+06
5 0000	7 450E+05
7 0000	8.295E+04
11 0000	9.351E+03

Thermal Power

Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
1 90E+03	1.90E+03
Total	Total

III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary

	From SFD	Used
Reactor Moderator	HEAVY WATER	HEAVY WATER
Fuel Cladding	SST	SST
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		85,315 00
Bounding		85,315 00

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 70	
Bounding	32 70	

Estimated EOL HM/Given EOL HM: 2.26

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

[1]Fuel decay start date: 1964
Estimates as of: 2030
Template: HFBR (Heavy Water, Zirc , 0 to 5% U)
[2]Template 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

	m	x_n	x_b	b	y_n	y_b
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	7 7980E-09	173,423 00	173,423 00	0 00E+00	1.35E-03	1.35E-03
Am-241	2 3560E-02	173,423 00	173,423 00	0 00E+00	4 09E+03	4 09E+03
Am-242m	3 0880E-06	173,423 00	173,423 00	0 00E+00	5 36E-01	5.36E-01
Am-243	2 0520E-06	173,423 00	173,423.00	0 00E+00	3 56E-01	3 56E-01
C-14	1 1222E-03	173,423 00	173,423 00	0 00E+00	1 95E+02	1.95E+02
Cl-36	8 3760E-11	173,423 00	173,423 00	0 00E+00	1 45E-05	1 45E-05
Cm-243	2 4260E-07	173,423 00	173,423 00	0 00E+00	4 21E-02	4 21E-02
Cm-244	3 3140E-06	173,423 00	173,423 00	0 00E+00	5 75E-01	5 75E-01
Co-60	1.2454E-03	173,423 00	173,423 00	0 00E+00	2 16E+02	2 16E+02
Cs-134	3.3040E-10	173,423 00	173,423 00	0 00E+00	5 73E-05	5 73E-05
Cs-135	7.9140E-06	173,423 00	173,423 00	0 00E+00	1 37E+00	1 37E+00
Cs-137	7 1580E-01	173,423 00	173,423 00	0 00E+00	1 24E+05	1 24E+05
Eu-154	6 0500E-04	173,423 00	173,423 00	0 00E+00	1 05E+02	1 05E+02
Eu-155	9 4860E-06	173,423 00	173,423 00	0 00E+00	1 65E+00	1 65E+00
Fe-55	1 9322E-08	173,423 00	173,423 00	0 00E+00	3.35E-03	3.35E-03
H-3	4 4180E-03	173,423.00	173,423 00	0 00E+00	7.66E+02	7 66E+02
I-129	7 5020E-07	173,423 00	173,423 00	0 00E+00	1.30E-01	1.30E-01
Kr-85	5 4940E-03	173,423 00	173,423 00	0 00E+00	9 53E+02	9.53E+02
Np-237	5 8040E-06	173,423 00	173,423 00	0 00E+00	1 01E+00	1.01E+00
Pa-231	1 1096E-08	173,423 00	173,423 00	0 00E+00	1 92E-03	1 92E-03
Pb-210	1 4712E-08	173,423 00	173,423 00	0 00E+00	2 55E-03	2 55E-03
Pm-147	3 5920E-07	173,423 00	173,423 00	0 00E+00	6 23E-02	6 23E-02
Pu-238	5 0700E-03	173,423 00	173,423 00	0 00E+00	8 79E+02	8 79E+02
Pu-239	1 8728E-02	173,423 00	173 423 00	0.00E+00	3 25E+03	3 25E+03
Pu-240	8 3280E-03	173,423 00	173,423 00	0 00E+00	1 44E+03	1 44E+03
Pu-241	3 4460E-02	173,423 00	173,423 00	0 00E+00	5 98E+03	5 98E+03
Pu-242	2 0380E-06	173,423 00	173,423 00	0 00E+00	3 53E-01	3 53E-01
Ra-226	2 9640E-08	173,423 00	173,423 00	0 00E+00	5.14E-03	5 14E-03
Ra-228	1 1922E-09	173,423 00	173,423 00	0 00E+00	2 07E-04	2 07E-04
Ru-106	3 5780E-19	173,423 00	173,423 00	0 00E+00	6.21E-14	6.21E-14
Se-79	1 2520E-05	173,423 00	173,423 00	0 00E+00	2.17E+00	2 17E+00
Sn-126	1 2050E-05	173,423.00	173,423 00	0 00E+00	2 09E+00	2 09E+00
Sr-90	6 1880E-01	173,423.00	173,423 00	0 00E+00	1.07E+05	1 07E+05
Tc-99	4 4120E-04	173,423 00	173,423 00	0 00E+00	7.65E+01	7 65E+01
Th-229	6 9280E-09	173,423 00	173,423 00	0 00E+00	1 20E-03	1.20E-03
Th-230	1 7084E-06	173,423 00	173,423 00	0 00E+00	2 96E-01	2 96E-01
Th-232	1.1926E-09	173,423 00	173,423 00	0 00E+00	2 07E-04	2 07E-04
Tl-208	3.4740E-08	173,423 00	173,423 00	0 00E+00	6 02E-03	6 02E-03
U-232	9.2940E-08	173,423 00	173,423.00	0 00E+00	1 61E-02	1.61E-02
U-233	9 1680E-07	173,423 00	173,423 00	0 00E+00	1.59E-01	1.59E-01
U-234	2 3440E-03	173,423 00	173,423.00	0 00E+00	4 07E+02	4 07E+02
U-235	-2.3296E-06	173,423 00	0 00	3.91E-02	0 00E+00	3 91E-02
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

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg MeV	
0 0150	5.936E+15
0 0250	1.226E+15
0 0375	1 079E+15
0.0575	1 195E+15
0 0850	6 877E+14
0 1250	4 470E+14
0.2250	5 919E+14
0 3750	2.578E+14
0 5750	4 611E+15
0 8500	4 405E+13
1.2500	3 183E+13
1 7500	1 138E+12
2.2500	2.048E+08
2.7500	2 128E+08
3.5000	8 672E+05
5 0000	3 639E+05
7.0000	4 092E+04
11 0000	4 642E+03

Thermal Power

Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
1 65E+03	1.65E+03
Total	Total

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		173 423 00
Bounding		173 423 00

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

[1]Fuel decay start date: 1964
Estimates as of: 2030
Template: HFBR (Heavy Water, Zirc , 0 to 5%, U)
[2]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

Radionuclide	m Ci/MWd From Template	x_n Nominal Fuel Burnup (MWd)[2]	x_b Bounding Fuel Burnup (MWd)[2]	b Initial Activity (Ci)	y_n Nominal Fuel Inventories(Ci)	y_b Bounding Fuel Inventories(Ci)
Ac-227	7 7980E-09	155,363 95	155,363 95	0 00E+00	1.21E-03	1.21E-03
Am-241	2 3560E-02	155,363 95	155,363 95	0 00E+00	3 66E+03	3 66E+03
Am-242m	3 0880E-06	155,363 95	155,363 95	0 00E+00	4 80E-01	4 80E-01
Am-243	2 0520E-06	155,363 95	155,363 95	0 00E+00	3 19E-01	3.19E-01
C-14	1 1222E-03	155,363.95	155,363 95	0 00E+00	1 74E+02	1 74E+02
Cl-36	8 3760E-11	155,363.95	155,363 95	0 00E+00	1 30E-05	1.30E-05
Cm-243	2 4260E-07	155,363.95	155,363 95	0 00E+00	3 77E-02	3.77E-02
Cm-244	3 3140E-06	155,363 95	155,363 95	0 00E+00	5 15E-01	5 15E-01
Co-60	1 2454E-03	155,363 95	155,363 95	0 00E+00	1 93E+02	1 93E+02
Cs-134	3 3040E-10	155,363 95	155,363 95	0 00E+00	5 13E-05	5 13E-05
Cs-135	7 9140E-06	155,363 95	155,363 95	0 00E+00	1.23E+00	1.23E+00
Cs-137	7 1580E-01	155,363 95	155,363.95	0 00E+00	1.11E+05	1 11E+05
Eu-154	6 0500E-04	155,363 95	155,363.95	0 00E+00	9 40E+01	9 40E+01
Eu-155	9 4860E-06	155,363 95	155,363.95	0 00E+00	1 47E+00	1 47E+00
Fe-55	1 9322E-08	155,363 95	155,363 95	0 00E+00	3 00E-03	3 00E-03
H-3	4 4180E-03	155,363 95	155,363 95	0 00E+00	6 86E+02	6 86E+02
I-129	7.5020E-07	155,363 95	155,363 95	0 00E+00	1.17E-01	1 17E-01
Kr-85	5 4940E-03	155,363 95	155,363 95	0 00E+00	8 54E+02	8.54E+02
Np-237	5 8040E-06	155,363 95	155,363 95	0 00E+00	9 02E-01	9 02E-01
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
Tl-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

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg MeV	
0 0150	5 318E+15
0.0250	1 098E+15
0.0375	9 669E+14
0 0575	1 071E+15
0 0850	6 160E+14
0 1250	4 004E+14
0.2250	5.303E+14
0 3750	2.310E+14
0 5750	4 131E+15
0 8500	3 946E+13
1 2500	2 851E+13
1 7500	1 019E+12
2 2500	1 835E+08
2 7500	1 906E+08
3 5000	7 769E+05
5 0000	3.260E+05
7 0000	3 665E+04
11 0000	4 159E+03

Thermal Power

Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
1 47E+03	1 47E+03
Total	Total

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

[1]Fuel decay start date: 1964
Estimates as of: 2030
Template: (Worst Case)
[2]Template 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

Radionuclide	m Ci/MWd From Template	x_n Nominal Fuel Burnup (MWd)[2]	x_b Bounding Fuel Burnup (MWd)[2]	b Initial Activity (Ci)	y_n Nominal Fuel Inventories(Ci)	y_b Bounding Fuel Inventories(Ci)
Ac-227	2 6528E-06	273 69	547 39	0 00E+00	7 26E-04	1 45E-03
Am-241	8 6432E+00	273 69	547 39	0 00E+00	2 37E+03	4 73E+03
Am-242m	1 4688E-02	273 69	547 39	0 00E+00	4 02E+00	8 04E+00
Am-243	1 6272E-02	273 69	547 39	0 00E+00	4 45E+00	8 91E+00
C-14	1.2046E-01	273 69	547 39	0 00E+00	3 30E+01	6 59E+01
Cl-36	2.2849E-03	273 69	547.39	0 00E+00	6.25E-01	1 25E+00
Cm-243	4 1760E-04	273.69	547.39	0 00E+00	1 14E-01	2.29E-01
Cm-244	5.3440E-02	273 69	547.39	0 00E+00	1.46E+01	2 93E+01
Co-60	5 4296E-01	273 69	547.39	0 00E+00	1 49E+02	2 97E+02
Cs-134	1 4346E-08	273 69	547 39	0 00E+00	3 93E-06	7 85E-06
Cs-135	4 3976E-04	273 69	547.39	0 00E+00	1 20E-01	2 41E-01
Cs-137	1 0528E+01	273 69	547 39	0 00E+00	2 88E+03	5 76E+03
Eu-154	1 1156E-01	273 69	547 39	0 00E+00	3 05E+01	6 11E+01
Eu-155	1 0445E-03	273 69	547 39	0 00E+00	2.86E-01	5 72E-01
Fe-55	9 8542E-05	273 69	547.39	0 00E+00	2 70E-02	5 39E-02
H-3	4 5119E-02	273 69	547.39	0 00E+00	1.23E+01	2 47E+01
I-129	1.0618E-05	273 69	547.39	0 00E+00	2 91E-03	5 81E-03
Kr-85	8 6191E-02	273 69	547.39	0 00E+00	2.36E+01	4 72E+01
Np-237	2 0592E-04	273 69	547.39	0 00E+00	5 64E-02	1 13E-01
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
Tl-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
U-233	3 6128E-04	273 69	547.39	0 00E+00	9 89E-02	1 98E-01
U-234	1 2788E-02	273 69	547.39	0 00E+00	3 50E+00	7 00E+00
U-235	5 7486E-04	273 69	547.39	3 36E-02	1.91E-01	3.48E-01
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

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg MeV	
0 0150	3 426E+14
0 0250	6.503E+13
0 0375	5.347E+13
0 0575	1.215E+14
0 0850	3 424E+13
0 1250	2 301E+13
0.2250	2 944E+13
0.3750	1.281E+13
0.5750	2.147E+14
0.8500	3.212E+12
1 2500	2.391E+13
1 7500	8 930E+10
2.2500	1.237E+08
2 7500	1.262E+09
3.5000	6 505E+05
5 0000	2 731E+05
7 0000	3 086E+04
11 0000	3 505E+03

Thermal Power

Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
1 45E+02	2.90E+02
Total	Total

III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary

	From SFD	Used
Reactor Moderator	HEAVY WATER	(Worst Case)
Fuel Cladding	ZIRC	SST/Inconel
BOL HM Constituents	Th and U	U Th, & Pu
BOL Enrichment %		0 to 100

Basis for Parameter Differences:

This fuel didn't closely match any existing templates therefore the worst case template was used.

Burnup Summary (MWd)[2]

	From SFD	Estimated
Nominal		273.69
Bounding		547.39

Basis for burnup used in estimate:

Nominal burnup taken from SFD and converted to MWd using BOL=78 196kg
Bounding burnup assumed to be twice nominal burnup

Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup
Nominal	0 10	
Bounding	0.21	

Estimated EOL HM/Given EOL HM: 2 74

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

[1]Fuel decay start date: 1964
Estimates as of: 2030
Template: HFBR (Heavy Water, Zirc , 0 to 5% U)
[2]Template 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

Radionuclide	m Ci/MWd From Template	x_n Nominal Fuel Burnup (MWd)[2]	x_b Bounding Fuel Burnup (MWd)[2]	b Initial Activity (Ci)	y_n Nominal Fuel Inventories(Ci)	y_b Bounding Fuel Inventories(Ci)
Ac-227	7 7980E-09	308,482 10	308,482 10	0 00E+00	2 41E-03	2 41E-03
Am-241	2 3560E-02	308,482.10	308,482 10	0 00E+00	7 27E+03	7 27E+03
Am-242m	3 0880E-06	308,482.10	308,482 10	0 00E+00	9 53E-01	9 53E-01
Am-243	2 0520E-06	308,482 10	308,482.10	0 00E+00	6 33E-01	6 33E-01
C-14	1 1222E-03	308,482.10	308,482 10	0 00E+00	3 46E+02	3 46E+02
Cl-36	8 3760E-11	308,482.10	308,482.10	0 00E+00	2 58E-05	2 58E-05
Cm-243	2 4260E-07	308,482.10	308,482.10	0.00E+00	7 48E-02	7 48E-02
Cm-244	3 3140E-06	308,482 10	308,482.10	0.00E+00	1.02E+00	1 02E+00
Co-60	1 2454E-03	308,482 10	308,482.10	0 00E+00	3 84E+02	3 84E+02
Cs-134	3 3040E-10	308,482 10	308,482 10	0 00E+00	1.02E-04	1 02E-04
Cs-135	7 9140E-06	308,482 10	308,482 10	0 00E+00	2 44E+00	2 44E+00
Cs-137	7.1580E-01	308,482 10	308,482 10	0 00E+00	2.21E+05	2.21E+05
Eu-154	6.0500E-04	308,482 10	308,482 10	0 00E+00	1 87E+02	1.87E+02
Eu-155	9 4860E-06	308,482 10	308,482 10	0 00E+00	2 93E+00	2.93E+00
Fe-55	1 9322E-08	308,482 10	308,482 10	0 00E+00	5 96E-03	5 96E-03
H-3	4 4180E-03	308,482 10	308,482 10	0 00E+00	1 36E+03	1.36E+03
I-129	7 5020E-07	308,482 10	308,482 10	0 00E+00	2 31E-01	2.31E-01
Kr-85	5 4940E-03	308,482 10	308,482 10	0 00E+00	1 69E+03	1 69E+03
Np-237	5 8040E-06	308,482.10	308,482 10	0 00E+00	1 79E+00	1 79E+00
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
Tl-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
U-233	9 1680E-07	308,482.10	308,482 10	0 00E+00	2.83E-01	2 83E-01
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
U-236	2 6620E-05	308,482 10	308,482 10	0 00E+00	8 21E+00	8.21E+00
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

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg. MeV	
0 0150	1 056E+16
0 0250	2.180E+15
0 0375	1 920E+15
0 0575	2 126E+15
0 0850	1.223E+15
0 1250	7 950E+14
0.2250	1 053E+15
0 3750	4 586E+14
0 5750	8.202E+15
0 8500	7 835E+13
1.2500	5 662E+13
1 7500	2 024E+12
2.2500	3 643E+08
2 7500	3 785E+08
3 5000	1 543E+06
5 0000	6 473E+05
7 0000	7.278E+04
11 0000	8 257E+03

Thermal Power

Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
2 93E+03	2.93E+03
Total	Total

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

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

Estimated Canister usage
18"x10'
0 67

II. Estimates

Radionuclide	m Ci/MWd From Template	x_n Nominal Fuel Burnup (MWd)[2]	x_b Bounding Fuel Burnup (MWd)[2]	b Initial Activity (Ci)	y_n Nominal Fuel Inventories(Ci)	y_b Bounding Fuel Inventories(Ci)
Ac-227	2 0068E-09	104.55	209 10	0 00E+00	2.10E-07	4 20E-07
Am-241	2 5251E-03	104 55	209 10	0 00E+00	2.64E-01	5 28E-01
Am-242m	3 9624E-07	104 55	209 10	0 00E+00	4 14E-05	8 29E-05
Am-243	1 4880E-06	104.55	209 10	0.00E+00	1 56E-04	3 11E-04
C-14	5 7053E-09	104 55	209 10	0 00E+00	5 96E-07	1.19E-06
Cl-36	1.3124E-32	104 55	209 10	0 00E+00	1 37E-30	2 74E-30
Cm-243	1 1419E-07	104 55	209 10	0 00E+00	1.19E-05	2 39E-05
Cm-244	1 6522E-05	104 55	209 10	0 00E+00	1.73E-03	3 45E-03
Co-60	7 4047E-07	104 55	209 10	0 00E+00	7.74E-05	1 55E-04
Cs-134	2 0455E-05	104.55	209 10	0 00E+00	2 14E-03	4 28E-03
Cs-135	3 4477E-06	104.55	209 10	0 00E+00	3 60E-04	7.21E-04
Cs-137	1 4365E+00	104 55	209 10	0 00E+00	1 50E+02	3 00E+02
Eu-154	7 3230E-03	104.55	209 10	0 00E+00	7 66E-01	1.53E+00
Eu-155	5 9259E-04	104 55	209 10	0 00E+00	6 20E-02	1.24E-01
Fe-55	2.2791E-06	104 55	209 10	0 00E+00	2 38E-04	4 77E-04
H-3	1.9698E-03	104 55	209.10	0 00E+00	2 06E-01	4 12E-01
I-129	7 5300E-07	104 55	209 10	0 00E+00	7.87E-05	1 57E-04
Kr-85	4 1176E-02	104 55	209 10	0 00E+00	4.31E+00	8 61E+00
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
Tl-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

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg MeV	
0 0150	1 540E+13
0 0250	3 198E+12
0 0375	2 780E+12
0 0575	2.992E+12
0 0850	1.803E+12
0 1250	1 191E+12
0 2250	1.556E+12
0 3750	6 771E+11
0 5750	1 119E+13
0 8500	1.367E+11
1.2500	6 611E+10
1 7500	3 721E+09
2.2500	3 111E+05
2 7500	2 969E+05
3.5000	1 724E+02
5 0000	7 047E+01
7.0000	7 712E+00
11 0000	8 599E-01

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

	From SFD	Used
Reactor Moderator	LIGHT WATER	LIGHT WATER
Fuel Cladding	ALUM	ALUM
BOL HM Constituents	U	U
BOL Enrichment %	93.20235261	60 to 100

Basis for Parameter Differences

Burnup Summary (MWd)[2]

	From SFD	Estimated
Nominal		104.55
Bounding		209 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 13	
Bounding	0.26	

Estimated EOL HM/Given EOL HM: 1 00

[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 #: 803
Fuel Units & Descr: 5 - MTR TYPE
Heavy Metal Mass: BOL=0 685kg; EOL=0 685kg
ROD Storage Site: SRS

[1]Fuel decay start date: 1996
Estimates as of: 2030
Template: ATR (Light Water, Alum , 60 to 100%, U)
[2]Template Burnup(MWd): 367.2
Template BOL Heavy Metal Mass (MT): 0 00116689
Template Decay Time: 25 years

Estimated Canister usage 18"x10'
0 21

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	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 0575	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		
Tl-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		

Thermal Power	
Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
2.74E-01	5 49E-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 %	92 95939437	60 to 100

Basis for Parameter Differences:

Burnup Summary (MWd)[2]

	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

[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: 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

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

Estimated Canister usage

18"x10'
1.19

II. Estimates

Radionuclide	m Ci/MWd From Template	x_n Nominal Fuel Burnup (MWd)[2]	x_b Bounding Fuel Burnup (MWd)[2]	b Initial Activity (Ci)	y_n Nominal Fuel Inventories(Ci)	y_b Bounding Fuel Inventories(Ci)
Ac-227	1.1465E-09	3,143.73	6,287.45	0.00E+00	3.60E-06	7.21E-06
Am-241	2.3056E-03	3,143.73	6,287.45	0.00E+00	7.25E+00	1.45E+01
Am-242m	4.1476E-07	3,143.73	6,287.45	0.00E+00	1.30E-03	2.61E-03
Am-243	1.4894E-06	3,143.73	6,287.45	0.00E+00	4.68E-03	9.36E-03
C-14	5.7108E-09	3,143.73	6,287.45	0.00E+00	1.80E-05	3.59E-05
Cl-36	1.3124E-32	3,143.73	6,287.45	0.00E+00	4.13E-29	8.25E-29
Cm-243	1.4562E-07	3,143.73	6,287.45	0.00E+00	4.58E-04	9.16E-04
Cm-244	2.4221E-05	3,143.73	6,287.45	0.00E+00	7.61E-02	1.52E-01
Co-60	2.7560E-06	3,143.73	6,287.45	0.00E+00	8.66E-03	1.73E-02
Cs-134	5.8851E-04	3,143.73	6,287.45	0.00E+00	1.85E+00	3.70E+00
Cs-135	3.4477E-06	3,143.73	6,287.45	0.00E+00	1.08E-02	2.17E-02
Cs-137	1.8099E+00	3,143.73	6,287.45	0.00E+00	5.69E+03	1.14E+04
Eu-154	1.6386E-02	3,143.73	6,287.45	0.00E+00	5.15E+01	1.03E+02
Eu-155	2.3957E-03	3,143.73	6,287.45	0.00E+00	7.53E+00	1.51E+01
Fe-55	3.2707E-05	3,143.73	6,287.45	0.00E+00	1.03E-01	2.06E-01
H-3	3.4504E-03	3,143.73	6,287.45	0.00E+00	1.08E+01	2.17E+01
I-129	7.5300E-07	3,143.73	6,287.45	0.00E+00	2.37E-03	4.73E-03
Kr-85	7.8540E-02	3,143.73	6,287.45	0.00E+00	2.47E+02	4.94E+02
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
Tl-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

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg MeV	
0.0150	5.883E+14
0.0250	1.222E+14
0.0375	1.064E+14
0.0575	1.143E+14
0.0850	6.897E+13
0.1250	4.619E+13
0.2250	5.954E+13
0.3750	2.589E+13
0.5750	4.244E+14
0.8500	6.115E+12
1.2500	3.401E+12
1.7500	1.680E+11
2.2500	1.197E+07
2.7500	9.805E+06
3.5000	7.399E+03
5.0000	2.489E+03
7.0000	2.738E+02
11.0000	3.063E+01

Thermal Power

Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
6.65E+01	1.33E+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 %	93.10655847	60 to 100

Basis for Parameter Differences:

Burnup Summary (MWd)[2]

	From SFD	Estimated
Nominal		3,143.73
Bounding		6,287.45

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	1.20	
Bounding	2.41	

Estimated EOL HM/Given EOL HM: 1.04

[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: 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

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

Estimated Canister usage: 18"x10" = 3.50

II. Estimates

	m	x_n	x_b	b	y_n	y_b
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	1.1465E-09	1,726.23	3,452.45	0.00E+00	1.98E-06	3.96E-06
Am-241	2.3056E-03	1,726.23	3,452.45	0.00E+00	3.98E+00	7.96E+00
Am-242m	4.1476E-07	1,726.23	3,452.45	0.00E+00	7.16E-04	1.43E-03
Am-243	1.4894E-06	1,726.23	3,452.45	0.00E+00	2.57E-03	5.14E-03
C-14	5.7108E-09	1,726.23	3,452.45	0.00E+00	9.86E-06	1.97E-05
Cl-36	1.3124E-32	1,726.23	3,452.45	0.00E+00	2.27E-29	4.53E-29
Cm-243	1.4562E-07	1,726.23	3,452.45	0.00E+00	2.51E-04	5.03E-04
Cm-244	2.4221E-05	1,726.23	3,452.45	0.00E+00	4.18E-02	8.36E-02
Co-60	2.7560E-06	1,726.23	3,452.45	0.00E+00	4.76E-03	9.51E-03
Cs-134	5.8851E-04	1,726.23	3,452.45	0.00E+00	1.02E+00	2.03E+00
Cs-135	3.4477E-06	1,726.23	3,452.45	0.00E+00	5.95E-03	1.19E-02
Cs-137	1.8099E+00	1,726.23	3,452.45	0.00E+00	3.12E+03	6.25E+03
Eu-154	1.6386E-02	1,726.23	3,452.45	0.00E+00	2.83E+01	5.66E+01
Eu-155	2.3957E-03	1,726.23	3,452.45	0.00E+00	4.14E+00	8.27E+00
Fe-55	3.2707E-05	1,726.23	3,452.45	0.00E+00	5.65E-02	1.13E-01
H-3	3.4504E-03	1,726.23	3,452.45	0.00E+00	5.96E+00	1.19E+01
I-129	7.5300E-07	1,726.23	3,452.45	0.00E+00	1.30E-03	2.60E-03
Kr-85	7.8540E-02	1,726.23	3,452.45	0.00E+00	1.36E+02	2.71E+02
Np-237	9.5615E-06	1,726.23	3,452.45	0.00E+00	1.65E-02	3.30E-02
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
Tl-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

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg. MeV	
0.0150	3.231E+14
0.0250	6.711E+13
0.0375	5.845E+13
0.0575	6.276E+13
0.0850	3.787E+13
0.1250	2.537E+13
0.2250	3.270E+13
0.3750	1.421E+13
0.5750	2.330E+14
0.8500	3.358E+12
1.2500	1.867E+12
1.7500	9.226E+10
2.2500	6.576E+06
2.7500	5.384E+06
3.5000	4.154E+03
5.0000	1.406E+03
7.0000	1.549E+02
11.0000	1.734E+01

Thermal Power

Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
3.65E+01	7.30E+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 %:	19.66156126	60 to 100

Basis for Parameter Drfferences:

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		1,726.23
Bounding		3,452.45

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

[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 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

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

Estimated Canister usage
18"x10'
1.63

II. Estimates

Radionuclide	m Ci/MWd From Template	x_n Nominal Fuel Burnup (MWd)[2]	x_b Bounding Fuel Burnup (MWd)[2]	b Initial Activity (Ci)	y_n Nominal Fuel Inventories(Ci)	y_b Bounding Fuel Inventories(Ci)
Ac-227	1.1465E-09	801.46	1,602.93	0.00E+00	9.19E-07	1.84E-06
Am-241	2.3056E-03	801.46	1,602.93	0.00E+00	1.85E+00	3.70E+00
Am-242m	4.1476E-07	801.46	1,602.93	0.00E+00	3.32E-04	6.65E-04
Am-243	1.4894E-06	801.46	1,602.93	0.00E+00	1.19E-03	2.39E-03
C-14	5.7108E-09	801.46	1,602.93	0.00E+00	4.58E-06	9.15E-06
Cl-36	1.3124E-32	801.46	1,602.93	0.00E+00	1.05E-29	2.10E-29
Cm-243	1.4562E-07	801.46	1,602.93	0.00E+00	1.17E-04	2.33E-04
Cm-244	2.4221E-05	801.46	1,602.93	0.00E+00	1.94E-02	3.88E-02
Co-60	2.7560E-06	801.46	1,602.93	0.00E+00	2.21E-03	4.42E-03
Cs-134	5.8851E-04	801.46	1,602.93	0.00E+00	4.72E-01	9.43E-01
Cs-135	3.4477E-06	801.46	1,602.93	0.00E+00	2.76E-03	5.53E-03
Cs-137	1.8099E+00	801.46	1,602.93	0.00E+00	1.45E+03	2.90E+03
Eu-154	1.6386E-02	801.46	1,602.93	0.00E+00	1.31E+01	2.63E+01
Eu-155	2.3957E-03	801.46	1,602.93	0.00E+00	1.92E+00	3.84E+00
Fe-55	3.2707E-05	801.46	1,602.93	0.00E+00	2.62E-02	5.24E-02
H-3	3.4504E-03	801.46	1,602.93	0.00E+00	2.77E+00	5.53E+00
I-129	7.5300E-07	801.46	1,602.93	0.00E+00	6.03E-04	1.21E-03
Kr-85	7.8540E-02	801.46	1,602.93	0.00E+00	6.29E+01	1.26E+02
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
Tl-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
U-233	3.0011E-09	801.46	1,602.93	0.00E+00	2.41E-06	4.81E-06
U-234	1.8497E-04	801.46	1,602.93	0.00E+00	1.48E-01	2.96E-01
U-235	-2.7235E-06	801.46	0.00	1.25E-02	1.04E-02	1.25E-02
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

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg MeV	
0.0150	1.500E+14
0.0250	3.116E+13
0.0375	2.714E+13
0.0575	2.914E+13
0.0850	1.758E+13
0.1250	1.178E+13
0.2250	1.518E+13
0.3750	6.599E+12
0.5750	1.082E+14
0.8500	1.559E+12
1.2500	8.670E+11
1.7500	4.283E+10
2.2500	3.053E+06
2.7500	2.500E+06
3.5000	1.929E+03
5.0000	6.527E+02
7.0000	7.191E+01
11.0000	8.050E+00

Thermal Power

Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
1.70E+01	3.39E+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 %	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

[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: 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

[1]Fuel decay start date: 1996
Estimates as of: 2030
Template: ATR (Light Water, Alum., 60 to 100%, U)
[2]Template Burnup(MWd): 367.2
Template BOL Heavy Metal Mass (MT): 0 00116689
Template Decay Time: 25 years

Estimated Canister usage: 18"x10' = 0 61

II. Estimates

Radionuclide	m: Ci/MWd From Template	x_a: Nominal Fuel Burnup (MWd)[2]	x_b: Bounding Fuel Burnup (MWd)[2]	b: Initial Activity (Ci)	y_a: Nominal Fuel Inventories(Ci)	y_b: Bounding Fuel Inventories(Ci)
Ac-227	1 1465E-09	4 17	8 33	0 00E+00	4 78E-09	9 55E-09
Am-241	2 3056E-03	4 17	8 33	0 00E+00	9 61E-03	1 92E-02
Am-242m	4 1476E-07	4 17	8 33	0 00E+00	1 73E-06	3 46E-06
Am-243	1 4894E-06	4 17	8 33	0 00E+00	6 21E-06	1.24E-05
C-14	5 7108E-09	4 17	8 33	0 00E+00	2 38E-08	4 76E-08
Cl-36	1 3124E-32	4 17	8 33	0 00E+00	5 47E-32	1 09E-31
Cm-243	1 4562E-07	4.17	8 33	0 00E+00	6 07E-07	1.21E-06
Cm-244	2 4221E-05	4 17	8 33	0 00E+00	1 01E-04	2 02E-04
Co-60	2.7560E-06	4.17	8 33	0 00E+00	1.15E-05	2.30E-05
Cs-134	5 8851E-04	4.17	8 33	0 00E+00	2 45E-03	4 90E-03
Cs-135	3.4477E-06	4 17	8 33	0 00E+00	1 44E-05	2 87E-05
Cs-137	1 8099E+00	4 17	8 33	0 00E+00	7 54E+00	1 51E+01
Eu-154	1 6386E-02	4 17	8.33	0 00E+00	6 83E-02	1 37E-01
Eu-155	2 3957E-03	4 17	8.33	0 00E+00	9 98E-03	2 00E-02
Fe-55	3.2707E-05	4 17	8.33	0 00E+00	1 36E-04	2 73E-04
H-3	3 4504E-03	4 17	8 33	0 00E+00	1 44E-02	2.88E-02
I-129	7 5300E-07	4 17	8 33	0 00E+00	3 14E-06	6.28E-06
Kr-85	7 8540E-02	4 17	8 33	0 00E+00	3 27E-01	6 55E-01
Np-237	9 5615E-06	4 17	8 33	0 00E+00	3 98E-05	7 97E-05
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
Tl-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

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg MeV	
0 0150	7.800E+11
0 0250	1 620E+11
0 0375	1 411E+11
0 0575	1.515E+11
0 0850	9 143E+10
0 1250	6 127E+10
0.2250	7 906E+10
0 3750	3 431E+10
0 5750	5 625E+11
0 8500	8 106E+09
1.2500	4 508E+09
1 7500	2.227E+08
2.2500	1 587E+04
2 7500	1 300E+04
3.5000	1 046E+01
5 0000	3 572E+00
7 0000	3 938E-01
11 0000	4.410E-02

Thermal Power

Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
8 83E-02	1 76E-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 %:	93.30981127	60 to 100

Basis for Parameter Differences:

Burnup Summary (MWd)[2]

	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

[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: IOWA STATE UNIVERSITY (U3Si2 LEU)
SNF ID #: 953
Fuel Units & Descr: 24 - 24 FLAT PLATES
Heavy Metal Mass: BOL=19.205kg EOL=19.195kg
ROD Storage Site: SRS

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

Estimated Canister usage: 18"x10' = 0.67

II. Estimates

Radionuclide	m Ci/MWd From Template	x_n Nominal Fuel Burnup (MWd)[2]	x_b Bounding Fuel Burnup (MWd)[2]	b Initial Activity (Ci)	y_n Nominal Fuel Inventories(Ci)	y_b Bounding Fuel Inventories(Ci)
Ac-227	1.1465E-09	9.09	18.18	0.00E+00	1.04E-08	2.08E-08
Am-241	2.3056E-03	9.09	18.18	0.00E+00	2.10E-02	4.19E-02
Am-242m	4.1476E-07	9.09	18.18	0.00E+00	3.77E-06	7.54E-06
Am-243	1.4894E-06	9.09	18.18	0.00E+00	1.35E-05	2.71E-05
C-14	5.7108E-09	9.09	18.18	0.00E+00	5.19E-08	1.04E-07
Cl-36	1.3124E-32	9.09	18.18	0.00E+00	1.19E-31	2.39E-31
Cm-243	1.4562E-07	9.09	18.18	0.00E+00	1.32E-06	2.65E-06
Cm-244	2.4221E-05	9.09	18.18	0.00E+00	2.20E-04	4.40E-04
Co-60	2.7560E-06	9.09	18.18	0.00E+00	2.51E-05	5.01E-05
Cs-134	5.8851E-04	9.09	18.18	0.00E+00	5.35E-03	1.07E-02
Cs-135	3.4477E-06	9.09	18.18	0.00E+00	3.13E-05	6.27E-05
Cs-137	1.8099E+00	9.09	18.18	0.00E+00	1.65E+01	3.29E+01
Eu-154	1.6386E-02	9.09	18.18	0.00E+00	1.49E-01	2.98E-01
Eu-155	2.3957E-03	9.09	18.18	0.00E+00	2.18E-02	4.36E-02
Fe-55	3.2707E-05	9.09	18.18	0.00E+00	2.97E-04	5.95E-04
H-3	3.4504E-03	9.09	18.18	0.00E+00	3.14E-02	6.27E-02
I-129	7.5300E-07	9.09	18.18	0.00E+00	6.85E-06	1.37E-05
Kr-85	7.8540E-02	9.09	18.18	0.00E+00	7.14E-01	1.43E+00
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
Tl-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

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg MeV	
0.0150	1.702E+12
0.0250	3.535E+11
0.0375	3.078E+11
0.0575	3.305E+11
0.0850	1.995E+11
0.1250	1.336E+11
0.2250	1.724E+11
0.3750	7.486E+10
0.5750	1.227E+12
0.8500	1.768E+10
1.2500	9.835E+09
1.7500	4.859E+08
2.2500	3.468E+04
2.7500	2.839E+04
3.5000	4.926E+01
5.0000	1.917E+01
7.0000	2.170E+00
11.0000	2.470E-01

Thermal Power

Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
1.93E-01	3.85E-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 %	19.76527712	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	0.02	9.09
Bounding		18.18

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	473.39
Bounding	0.00	

Estimated EOL HM/Given EOL HM: 1.00

[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: 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

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

Estimated Canister usage: 18"x10' 0 96

II. Estimates

	m	x_n	x_b	b	y_n	y_b
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	206 92	413 85	0 00E+00	4 15E-07	8 31E-07
Am-241	2 5251E-03	206 92	413 85	0 00E+00	5 22E-01	1 04E+00
Am-242m	3 9624E-07	206 92	413 85	0 00E+00	8 20E-05	1 64E-04
Am-243	1 4880E-06	206 92	413 85	0 00E+00	3 08E-04	6 16E-04
C-14	5 7053E-09	206.92	413 85	0 00E+00	1 18E-06	2 36E-06
Cl-36	1 3124E-32	206 92	413 85	0 00E+00	2 72E-30	5 43E-30
Cm-243	1 1419E-07	206.92	413 85	0 00E+00	2 36E-05	4 73E-05
Cm-244	1 6522E-05	206 92	413 85	0 00E+00	3 42E-03	6 84E-03
Co-60	7 4047E-07	206 92	413 85	0 00E+00	1 53E-04	3 06E-04
Cs-134	2 0455E-05	206 92	413.85	0 00E+00	4 23E-03	8 47E-03
Cs-135	3 4477E-06	206 92	413 85	0 00E+00	7.13E-04	1 43E-03
Cs-137	1 4365E+00	206 92	413 85	0 00E+00	2 97E+02	5 95E+02
Eu-154	7 3230E-03	206 92	413.85	0 00E+00	1 52E+00	3 03E+00
Eu-155	5 9259E-04	206 92	413 85	0 00E+00	1 23E-01	2 45E-01
Fe-55	2 2791E-06	206 92	413 85	0 00E+00	4 72E-04	9 43E-04
H-3	1 9698E-03	206 92	413 85	0 00E+00	4 08E-01	8 15E-01
I-129	7.5300E-07	206 92	413 85	0 00E+00	1 56E-04	3 12E-04
Kr-85	4.1176E-02	206 92	413 85	0 00E+00	8 52E+00	1 70E+01
Np-237	9 5752E-06	206 92	413 85	0.00E+00	1 98E-03	3 96E-03
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
Tl-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

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg MeV	
0 0150	3 048E+13
0 0250	6.329E+12
0 0375	5.501E+12
0 0575	5 922E+12
0 0850	3.568E+12
0 1250	2.357E+12
0 2250	3.080E+12
0 3750	1.340E+12
0 5750	2.215E+13
0 8500	2.705E+11
1.2500	1.308E+11
1 7500	7.364E+09
2.2500	6.157E+05
2 7500	5 877E+05
3 5000	3.422E+02
5.0000	1 398E+02
7.0000	1 531E+01
11 0000	1 707E+00

Thermal Power

Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
3.46E+00	6 93E+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 %	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

[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: 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

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

Estimated Canister usage

18"x10'
0 75

II. Estimates

Radionuclide	m: Ci/MWd From Template	x_n: Nominal Fuel Burnup (MWd)[2]	x_b: Bounding Fuel Burnup (MWd)[2]	b: Initial Activity (Ci)	y_n: Nominal Fuel Inventories(Ci)	y_b: Bounding Fuel Inventories(Ci)
Ac-227	2 0068E-09	182 40	364 79	0 00E+00	3 66E-07	7.32E-07
Am-241	2.5251E-03	182 40	364 79	0 00E+00	4 61E-01	9.21E-01
Am-242m	3 9624E-07	182.40	364 79	0 00E+00	7.23E-05	1.45E-04
Am-243	1 4880E-06	182 40	364 79	0 00E+00	2 71E-04	5 43E-04
C-14	5 7053E-09	182 40	364 79	0 00E+00	1 04E-06	2 08E-06
Cl-36	1 3124E-32	182 40	364 79	0 00E+00	2 39E-30	4 79E-30
Cm-243	1 1419E-07	182 40	364.79	0 00E+00	2 08E-05	4 17E-05
Cm-244	1 6522E-05	182 40	364 79	0 00E+00	3 01E-03	6 03E-03
Co-60	7 4047E-07	182 40	364 79	0 00E+00	1.35E-04	2 70E-04
Cs-134	2 0455E-05	182 40	364 79	0.00E+00	3.73E-03	7 46E-03
Cs-135	3 4477E-06	182 40	364 79	0 00E+00	6.29E-04	1.26E-03
Cs-137	1 4365E+00	182 40	364 79	0 00E+00	2 62E+02	5.24E+02
Eu-154	7.3230E-03	182.40	364 79	0 00E+00	1 34E+00	2 67E+00
Eu-155	5 9259E-04	182 40	364 79	0 00E+00	1 08E-01	2 16E-01
Fe-55	2 2791E-06	182 40	364 79	0 00E+00	4 16E-04	8 31E-04
H-3	1 9698E-03	182 40	364.79	0 00E+00	3 59E-01	7 19E-01
I-129	7.5300E-07	182 40	364 79	0 00E+00	1.37E-04	2 75E-04
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
Tl-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
U-233	3 6275E-09	182 40	364 79	0 00E+00	6 62E-07	1.32E-06
U-234	1 8562E-04	182 40	364 79	0 00E+00	3.39E-02	6 77E-02
U-235	-2.7235E-06	182 40	0 00	5.25E-03	4 75E-03	5 25E-03
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

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg MeV	
0 0150	2 687E+13
0 0250	5 579E+12
0 0375	4 849E+12
0 0575	5.220E+12
0 0850	3 145E+12
0 1250	2.077E+12
0 2250	2 715E+12
0 3750	1 181E+12
0 5750	1.952E+13
0 8500	2.384E+11
1.2500	1 153E+11
1 7500	6 491E+09
2.2500	5 427E+05
2 7500	5 180E+05
3 5000	3 185E+02
5 0000	1.305E+02
7.0000	1 433E+01
11.0000	1 601E+00

Thermal Power

Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
3 05E+00	6 11E+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 %	19.22438767	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		182.40
Bounding		364 79

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 09	

Estimated EOL HM/Given EOL HM: 1 00

[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	[1]Fuel decay start date	1983		Estimated Canister usage:
SNF ID #:	507	Estimates as of	2030		18"x10"
Fuel Units & Descr:	574 - ASSEMBLY	Template	ATR (Light Water, Alum	60 to 100%, U)	23 92
Heavy Metal Mass:	BOL=1176 7kg; EOL=1106 098kg	[2]Template Burnup(MWd):	367.2		
ROD Storage Site:	SRS	Template BOL Heavy Metal Mass (MT):	0 00116689		
		Template Decay Time:	35 years		

II. Estimates

	m	x_n	x_b	b	y_n	y_b
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	66,861 47	133,722.93	0 00E+00	1 34E-04	2 68E-04
Am-241	2 5251E-03	66,861 47	133,722.93	0 00E+00	1 69E+02	3 38E+02
Am-242m	3 9624E-07	66,861 47	133,722 93	0 00E+00	2 65E-02	5 30E-02
Am-243	1 4880E-06	66,861 47	133,722 93	0 00E+00	9 95E-02	1 99E-01
C-14	5 7053E-09	66,861 47	133,722 93	0 00E+00	3 81E-04	7 63E-04
Cl-36	1 3124E-32	66 861 47	133,722 93	0 00E+00	8.77E-28	1 75E-27
Cm-243	1 1419E-07	66,861 47	133,722 93	0 00E+00	7.63E-03	1 53E-02
Cm-244	1 6522E-05	66,861.47	133,722 93	0 00E+00	1 10E+00	2 21E+00
Co-60	7 4047E-07	66,861.47	133,722 93	0 00E+00	4 95E-02	9 90E-02
Cs-134	2 0455E-05	66,861 47	133,722 93	0 00E+00	1 37E+00	2 74E+00
Cs-135	3 4477E-06	66,861 47	133,722 93	0 00E+00	2 31E-01	4 61E-01
Cs-137	1 4365E+00	66,861 47	133,722 93	0 00E+00	9 60E+04	1 92E+05
Eu-154	7 3230E-03	66,861 47	133,722 93	0 00E+00	4 90E+02	9 79E+02
Eu-155	5 9259E-04	66,861 47	133,722 93	0 00E+00	3 96E+01	7 92E+01
Fe-55	2 2791E-06	66,861 47	133,722 93	0 00E+00	1 52E-01	3 05E-01
H-3	1 9698E-03	66,861 47	133,722 93	0 00E+00	1 32E+02	2 63E+02
I-129	7 5300E-07	66,861 47	133,722 93	0 00E+00	5 03E-02	1 01E-01
Kr-85	4.1176E-02	66,861 47	133,722 93	0 00E+00	2 75E+03	5 51E+03
Np-237,	9 5752E-06	66,861 47	133,722 93	0 00E+00	6 40E-01	1.28E+00
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
Tl-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

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg MeV	
0 0150	9 849E+15
0 0250	2 045E+15
0 0375	1 778E+15
0 0575	1 913E+15
0 0850	1 153E+15
0 1250	7 615E+14
0.2250	9 953E+14
0.3750	4 330E+14
0.5750	7 156E+15
0 8500	8 741E+13
1.2500	4.228E+13
1 7500	2.379E+12
2.2500	1 989E+08
2.7500	1 899E+08
3.5000	1 117E+05
5 0000	4 567E+04
7 0000	5 001E+03
11 0000	5.579E+02

Thermal Power

Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
1 12E+03	2.24E+03
Total	Total

III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary

	From SFD	Used
Reactor Moderator	LIGHT WATER	LIGHT WATER
Fuel Cladding	ALUM	ALUM
BOL HM Constituents	U	U
BOL Enrichment %	20 00000029	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

[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 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

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

Estimated Canister usage

18"x10'
15 83

II. Estimates

Radionuclide	m Ci/MWd From Template	x_n Nominal Fuel Burnup (MWd)[2]	x_b Bounding Fuel Burnup (MWd)[2]	b Initial Activity (Ci)	y_n Nominal Fuel Inventories(Ci)	y_b Bounding Fuel Inventories(Ci)
Ac-227	2 0068E-09	24,345 03	48,690 06	0 00E+00	4 89E-05	9 77E-05
Am-241	2 5251E-03	24,345 03	48,690 06	0 00E+00	6 15E+01	1.23E+02
Am-242m	3 9624E-07	24,345 03	48,690 06	0 00E+00	9 65E-03	1 93E-02
Am-243	1.4880E-06	24,345 03	48,690 06	0 00E+00	3 62E-02	7.25E-02
C-14	5 7053E-09	24,345 03	48,690 06	0 00E+00	1.39E-04	2 78E-04
Cl-36	1.3124E-32	24,345 03	48,690 06	0 00E+00	3 19E-28	6.39E-28
Cm-243	1 1419E-07	24,345 03	48,690 06	0 00E+00	2 78E-03	5 56E-03
Cm-244	1 6522E-05	24,345 03	48,690 06	0 00E+00	4 02E-01	8 04E-01
Co-60	7 4047E-07	24,345 03	48,690 06	0 00E+00	1 80E-02	3 61E-02
Cs-134	2 0455E-05	24,345 03	48,690 06	0 00E+00	4 98E-01	9 96E-01
Cs-135	3 4477E-06	24,345 03	48,690 06	0 00E+00	8 39E-02	1 68E-01
Cs-137	1 4365E+00	24,345 03	48,690 06	0 00E+00	3 50E+04	6 99E+04
Eu-154	7.3230E-03	24,345 03	48,690 06	0 00E+00	1.78E+02	3.57E+02
Eu-155	5 9259E-04	24,345 03	48,690 06	0 00E+00	1 44E+01	2.89E+01
Fe-55	2 2791E-06	24,345 03	48,690 06	0.00E+00	5 55E-02	1 11E-01
H-3	1 9698E-03	24,345 03	48,690 06	0 00E+00	4 80E+01	9 59E+01
I-129	7.5300E-07	24,345 03	48,690 06	0 00E+00	1 83E-02	3 67E-02
Kr-85	4 1176E-02	24,345 03	48,690 06	0 00E+00	1 00E+03	2 00E+03
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
Tl-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 Radionuclides					3 33E+04	6 66E+04

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg MeV	
0 0150	3.586E+15
0 0250	7.446E+14
0 0375	6 473E+14
0 0575	6 967E+14
0 0850	4 198E+14
0 1250	2 773E+14
0 2250	3 624E+14
0 3750	1.577E+14
0 5750	2 606E+15
0.8500	3 183E+13
1.2500	1 539E+13
1 7500	8 664E+11
2 2500	7.244E+07
2 7500	6 914E+07
3 5000	4 040E+04
5.0000	1 651E+04
7 0000	1 808E+03
11 0000	2.016E+02

Thermal Power

Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
4 07E+02	8 15E+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 %	45 011	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		24,345 03
Bounding		48 690 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	0.22	
Bounding	0 44	

Estimated EOL HM/Given EOL HM: 1 00

[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

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

Estimated Canister usage: 18"x10" 4 22

II. Estimates

	m	x_n	x_b	b	y_n	y_b
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	6,794 30	13,588 59	0 00E+00	1 36E-05	2 73E-05
Am-241	2 5251E-03	6,794 30	13,588 59	0 00E+00	1 72E+01	3 43E+01
Am-242m	3 9624E-07	6,794 30	13,588 59	0 00E+00	2 69E-03	5.38E-03
Am-243	1 4880E-06	6,794 30	13,588 59	0 00E+00	1 01E-02	2.02E-02
C-14	5 7053E-09	6,794 30	13,588 59	0 00E+00	3 88E-05	7 75E-05
Cl-36	1 3124E-32	6,794 30	13,588 59	0 00E+00	8 92E-29	1 78E-28
Cm-243	1 1419E-07	6,794.30	13,588 59	0 00E+00	7 76E-04	1 55E-03
Cm-244	1 6522E-05	6,794.30	13,588 59	0 00E+00	1 12E-01	2 25E-01
Co-60	7 4047E-07	6,794 30	13,588.59	0 00E+00	5 03E-03	1 01E-02
Cs-134	2 0455E-05	6,794 30	13,588.59	0 00E+00	1 39E-01	2 78E-01
Cs-135	3 4477E-06	6,794 30	13,588 59	0 00E+00	2 34E-02	4 68E-02
Cs-137	1 4365E+00	6,794 30	13,588 59	0 00E+00	9 76E+03	1 95E+04
Eu-154	7.3230E-03	6,794 30	13,588 59	0 00E+00	4 98E+01	9 95E+01
Eu-155	5 9259E-04	6,794 30	13,588 59	0 00E+00	4 03E+00	8.05E+00
Fe-55	2 2791E-06	6,794 30	13,588 59	0 00E+00	1 55E-02	3.10E-02
H-3	1 9698E-03	6,794 30	13,588 59	0 00E+00	1 34E+01	2 68E+01
I-129	7 5300E-07	6,794 30	13,588 59	0 00E+00	5 12E-03	1 02E-02
Kr-85	4 1176E-02	6,794 30	13,588 59	0 00E+00	2 80E+02	5 60E+02
Np-237	9 5752E-06	6,794.30	13,588 59	0 00E+00	6 51E-02	1 30E-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
Tl-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

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg MeV	
0 0150	1 001E+15
0 0250	2.078E+14
0 0375	1 806E+14
0 0575	1 944E+14
0 0850	1 172E+14
0 1250	7 738E+13
0.2250	1 011E+14
0 3750	4 400E+13
0 5750	7 272E+14
0.8500	8 882E+12
1.2500	4.296E+12
1 7500	2.418E+11
2.2500	2 022E+07
2.7500	1 930E+07
3.5000	1 118E+04
5 0000	4.570E+03
7 0000	5 001E+02
11 0000	5 576E+01

Thermal Power

Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
1.14E+02	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

[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: 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

[1]Fuel decay start date: 1989
Estimates as of: 2030
Template: HFBR (Heavy Water Alum 40 to 100% U)
[2]Template 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

Radionuclide	m Ci/MWd From Template	x_n Nominal Fuel Burnup (MWd)[2]	x_b Bounding Fuel Burnup (MWd)[2]	b Initial Activity (Ci)	y_n Nominal Fuel Inventories(Ci)	y_b Bounding Fuel Inventories(Ci)
Ac-227	9.5869E-10	7,122.71	14,245.41	0.00E+00	6.83E-06	1.37E-05
Am-241	1.0109E-02	7,122.71	14,245.41	0.00E+00	7.20E+01	1.44E+02
Am-242m	1.2789E-06	7,122.71	14,245.41	0.00E+00	9.11E-03	1.82E-02
Am-243	3.7047E-05	7,122.71	14,245.41	0.00E+00	2.64E-01	5.28E-01
C-14	2.6416E-08	7,122.71	14,245.41	0.00E+00	1.88E-04	3.76E-04
Cl-36	4.4441E-31	7,122.71	14,245.41	0.00E+00	3.17E-27	6.33E-27
Cm-243	3.9605E-06	7,122.71	14,245.41	0.00E+00	2.82E-02	5.64E-02
Cm-244	2.6227E-03	7,122.71	14,245.41	0.00E+00	1.87E+01	3.74E+01
Co-60	6.7740E-06	7,122.71	14,245.41	0.00E+00	4.82E-02	9.65E-02
Cs-134	6.8894E-05	7,122.71	14,245.41	0.00E+00	4.91E-01	9.81E-01
Cs-135	4.2564E-06	7,122.71	14,245.41	0.00E+00	3.03E-02	6.06E-02
Cs-137	1.4399E+00	7,122.71	14,245.41	0.00E+00	1.03E+04	2.05E+04
Eu-154	1.5522E-02	7,122.71	14,245.41	0.00E+00	1.11E+02	2.21E+02
Eu-155	1.7588E-03	7,122.71	14,245.41	0.00E+00	1.25E+01	2.51E+01
Fe-55	2.4933E-05	7,122.71	14,245.41	0.00E+00	1.78E-01	3.55E-01
H-3	1.9945E-03	7,122.71	14,245.41	0.00E+00	1.42E+01	2.84E+01
I-129	6.6403E-07	7,122.71	14,245.41	0.00E+00	4.73E-03	9.46E-03
Kr-85	4.1002E-02	7,122.71	14,245.41	0.00E+00	2.92E+02	5.84E+02
Np-237	3.1610E-05	7,122.71	14,245.41	0.00E+00	2.25E-01	4.50E-01
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
Tl-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

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg MeV	
0.0150	1.052E+15
0.0250	2.162E+14
0.0375	1.895E+14
0.0575	2.039E+14
0.0850	1.220E+14
0.1250	8.227E+13
0.2250	1.054E+14
0.3750	4.575E+13
0.5750	7.642E+14
0.8500	1.132E+13
1.2500	6.763E+12
1.7500	3.199E+11
2.2500	2.215E+07
2.7500	2.226E+07
3.5000	5.919E+05
5.0000	2.516E+05
7.0000	2.880E+04
11.0000	3.296E+03

Thermal Power

Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
1.50E+02	3.00E+02
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 %	44.93930164	40 to 100

Basis for Parameter Differences:

Burnup Summary (MWd)[2]

	From SFD	Estimated	Basis for burnup used in estimate:
Nominal		7,122.71	Nominal burnup calculated from the heavy metal mass destroyed
Bounding		14,245.41	Bounding burnup assumed to be twice nominal burnup

Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup
Nominal	0.23	
Bounding	0.46	

Estimated EOL HM/Given EOL HM: 1.00

[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: 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

[1]Fuel decay start date: 1989
Estimates as of: 2030
Template: HFBR (Heavy Water, Alum , 40 to 100%, U)
[2]Template 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_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	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 4441E-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		
Tl-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		

Thermal Power	
Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
3.34E+01	6 68E+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 %	93 01903552	40 to 100

Basis for Parameter Differences:

Burnup Summary (MWd)[2]

	From SFD	Estimated
Nominal		1,584 67
Bounding		3,169 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	0.52	
Bounding	1.05	

Estimated EOL HM/Given EOL HM: 1.01

[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: 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

[1]Fuel decay start date: 1989
Estimates as of: 2030
Template: HFBR (Heavy Water Alum , 10 to 20% U)
[2]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

Radionuclide	m: Ci/MWd From Template	x_n: Nominal Fuel Burnup (MWd)[2]	x_b: Bounding Fuel Burnup (MWd)[2]	b: Initial Activity (Ci)	y_n: Nominal Fuel Inventories(Ci)	y_b: Bounding Fuel Inventories(Ci)
Ac-227	2 6507E-09	8,229 12	16,458.25	0 00E+00	2 18E-05	4.36E-05
Am-241	2 8587E-02	8,229 12	16,458.25	0 00E+00	2 35E+02	4 70E+02
Am-242m	8 3267E-06	8,229 12	16,458 25	0 00E+00	6 85E-02	1 37E-01
Am-243	6.3920E-06	8,229 12	16,458 25	0 00E+00	5 26E-02	1 05E-01
C-14	2 9567E-08	8,229 12	16,458 25	0 00E+00	2 43E-04	4 87E-04
Cl-36	5 9507E-35	8,229 12	16,458 25	0 00E+00	4 90E-31	9 79E-31
Cm-243	1 5333E-06	8,229 12	16,458.25	0 00E+00	1.26E-02	2 52E-02
Cm-244	6 1980E-05	8,229 12	16,458.25	0 00E+00	5 10E-01	1 02E+00
Co-60	2.2720E-06	8,229 12	16,458.25	0 00E+00	1 87E-02	3 74E-02
Cs-134	1.3787E-05	8,229 12	16,458 25	0 00E+00	1 13E-01	2 27E-01
Cs-135	4 8607E-06	8,229 12	16,458 25	0 00E+00	4 00E-02	8 00E-02
Cs-137	1 4300E+00	8,229 12	16,458 25	0 00E+00	1 18E+04	2 35E+04
Eu-154	6 2340E-03	8,229 12	16,458 25	0 00E+00	5 13E+01	1.03E+02
Eu-155	5 0213E-04	8,229 12	16,458.25	0 00E+00	4 13E+00	8.26E+00
Fe-55	2 5980E-05	8,229 12	16,458.25	0 00E+00	2 14E-01	4 28E-01
H-3	2.0100E-03	8,229 12	16 458.25	0 00E+00	1 65E+01	3 31E+01
I-129	7.1600E-07	8,229 12	16,458 25	0 00E+00	5 89E-03	1.18E-02
Kr-85	3 8813E-02	8,229 12	16,458 25	0 00E+00	3 19E+02	6 39E+02
Np-237	3 9360E-06	8,229 12	16,458 25	0 00E+00	3.24E-02	6 48E-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
Tl-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
U-233	8 5800E-10	8,229 12	16,458.25	0 00E+00	7 06E-06	1 41E-05
U-234	8 0733E-07	8,229 12	16,458.25	0 00E+00	6 64E-03	1.33E-02
U-235	-2 5335E-06	8,229 12	0 00	7.10E-02	5 02E-02	7.10E-02
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
Other Radionuclides					1 12E+04	2.24E+04

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg MeV	
0 0150	1 165E+15
0 0250	2.415E+14
0 0375	2 115E+14
0 0575	2.314E+14
0 0850	1.358E+14
0 1250	8 948E+13
0 2250	1 171E+14
0 3750	5 092E+13
0 5750	8 759E+14
0.8500	1 005E+13
1.2500	4 727E+12
1 7500	2 724E+11
2.2500	2.352E+07
2.7500	3 927E+06
3.5000	7 104E+04
5 0000	2.980E+04
7.0000	3.353E+03
11 0000	3.804E+02

Thermal Power

Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
1.42E+02	2.84E+02
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 %	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

[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: JRR-4 (U3Si2 LEU)
SNF ID #: 1071
Fuel Units & Descr: 47 - ASSEMBLY
Heavy Metal Mass: BOL=47kg, EOL=44 655kg
ROD Storage Site: SRS

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

Estimated Canister usage 18"x10'
1 96

II. Estimates

	m	x_n	x_b	b	y_n	y_b
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	2,221 04	4,442 09	0 00E+00	4 46E-06	8 91E-06
Am-241	2 5251E-03	2,221 04	4,442.09	0 00E+00	5 61E+00	1.12E+01
Am-242m	3 9624E-07	2,221 04	4,442 09	0 00E+00	8 80E-04	1 76E-03
Am-243	1 4880E-06	2,221 04	4,442 09	0 00E+00	3.30E-03	6 61E-03
C-14	5 7053E-09	2,221 04	4,442 09	0 00E+00	1.27E-05	2.53E-05
Cl-36	1.3124E-32	2,221 04	4,442 09	0 00E+00	2 91E-29	5 83E-29
Cm-243	1.1419E-07	2,221 04	4,442 09	0 00E+00	2.54E-04	5 07E-04
Cm-244	1 6522E-05	2,221 04	4,442 09	0 00E+00	3 67E-02	7.34E-02
Co-60	7 4047E-07	2,221 04	4,442 09	0 00E+00	1 64E-03	3 29E-03
Cs-134	2 0455E-05	2,221 04	4,442 09	0 00E+00	4 54E-02	9 09E-02
Cs-135	3 4477E-06	2,221 04	4,442 09	0 00E+00	7 66E-03	1 53E-02
Cs-137	1 4365E+00	2,221 04	4,442 09	0 00E+00	3 19E+03	6 38E+03
Eu-154	7 3230E-03	2,221 04	4,442 09	0 00E+00	1 63E+01	3 25E+01
Eu-155	5 9259E-04	2,221 04	4,442 09	0 00E+00	1 32E+00	2 63E+00
Fe-55	2 2791E-06	2 221.04	4,442 09	0 00E+00	5 06E-03	1 01E-02
H-3	1 9698E-03	2,221 04	4,442.09	0 00E+00	4 37E+00	8 75E+00
I-129	7 5300E-07	2,221 04	4,442.09	0 00E+00	1 67E-03	3 34E-03
Kr-85	4 1176E-02	2,221 04	4,442 09	0 00E+00	9 15E+01	1 83E+02
Np-237	9 5752E-06	2,221 04	4,442 09	0 00E+00	2.13E-02	4.25E-02
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
Tl-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

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg MeV	
0 0150	3.272E+14
0 0250	6 794E+13
0 0375	5 905E+13
0 0575	6.356E+13
0 0850	3.830E+13
0 1250	2.530E+13
0.2250	3 306E+13
0 3750	1 438E+13
0 5750	2 377E+14
0 8500	2 904E+12
1.2500	1 404E+12
1 7500	7 904E+10
2.2500	6 609E+06
2.7500	6.308E+06
3.5000	3 721E+03
5 0000	1 522E+03
7 0000	1 667E+02
11 0000	1 860E+01

Thermal Power

Nominal Heat Output (Watts)	Bounding Heat Output (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 Drfferences:

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

[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: 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

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

Estimated Canister usage

18"x10'
1 19

II. Estimates

Radionuclide	m: Ci/MWd From Template	x_n: Nominal Fuel Burnup (MWd)[2]	x_b: Bounding Fuel Burnup (MWd)[2]	b: Initial Activity (Ci)	y_n: Nominal Fuel Inventories(Ci)	y_b: Bounding Fuel Inventories(Ci)
Ac-227	2 0068E-09	1,266 45	2,532 90	0 00E+00	2 54E-06	5 08E-06
Am-241	2 5251E-03	1,266 45	2,532 90	0 00E+00	3.20E+00	6 40E+00
Am-242m	3 9624E-07	1,266 45	2,532 90	0 00E+00	5 02E-04	1 00E-03
Am-243	1 4880E-06	1,266 45	2,532 90	0 00E+00	1 88E-03	3 77E-03
C-14	5 7053E-09	1,266 45	2,532 90	0 00E+00	7.23E-06	1 45E-05
Cl-36	1.3124E-32	1,266 45	2,532 90	0 00E+00	1 66E-29	3 32E-29
Cm-243	1 1419E-07	1,266 45	2,532 90	0 00E+00	1.45E-04	2.89E-04
Cm-244	1 6522E-05	1,266 45	2,532 90	0 00E+00	2.09E-02	4 18E-02
Co-60	7 4047E-07	1,266 45	2,532.90	0 00E+00	9 38E-04	1 88E-03
Cs-134	2 0455E-05	1,266 45	2,532.90	0 00E+00	2 59E-02	5 18E-02
Cs-135	3 4477E-06	1,266 45	2,532 90	0 00E+00	4 37E-03	8 73E-03
Cs-137	1 4365E+00	1,266 45	2,532 90	0 00E+00	1 82E+03	3 64E+03
Eu-154	7 3230E-03	1,266 45	2,532 90	0 00E+00	9 27E+00	1 85E+01
Eu-155	5 9259E-04	1,266 45	2,532 90	0 00E+00	7 50E-01	1 50E+00
Fe-55	2.2791E-06	1,266 45	2,532 90	0 00E+00	2 89E-03	5 77E-03
H-3	1 9698E-03	1,266 45	2,532 90	0 00E+00	2 49E+00	4.99E+00
I-129	7.5300E-07	1,266 45	2,532 90	0 00E+00	9 54E-04	1 91E-03
Kr-85	4 1176E-02	1,266 45	2,532 90	0 00E+00	5.21E+01	1 04E+02
Np-237	9 5752E-06	1,266 45	2,532.90	0 00E+00	1.21E-02	2 43E-02
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
Tl-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
U-233	3 6275E-09	1,266 45	2,532 90	0 00E+00	4 59E-06	9 19E-06
U-234	1.8562E-04	1,266 45	2,532 90	0 00E+00	2.35E-01	4 70E-01
U-235	-2 7235E-06	1,266 45	0 00	1 54E-02	1.20E-02	1 54E-02
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

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg MeV	
0 0150	1.866E+14
0 0250	3.874E+13
0 0375	3 367E+13
0 0575	3 624E+13
0 0850	2 184E+13
0 1250	1 442E+13
0.2250	1 885E+13
0 3750	8.201E+12
0 5750	1.355E+14
0 8500	1.656E+12
1.2500	8 008E+11
1 7500	4 507E+10
2.2500	3 768E+06
2 7500	3 597E+06
3.5000	2 084E+03
5 0000	8 518E+02
7 0000	9 321E+01
11 0000	1 039E+01

Thermal Power

Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
2.12E+01	4.24E+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 03204799	60 to 100

Basis for Parameter Differences:

Burnup Summary (MWd)[2]

	From SFD	Estimated
Nominal		1,266 45
Bounding		2,532.90

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	0.52	
Bounding	1 05	

Estimated EOL HM/Given EOL HM: 1 01

[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: 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

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

Estimated Canister usage 18"x10": 0 31

II. Estimates

	m	x_n	x_b	b	y_n	y_b
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	323 98	647 95	0 00E+00	6 50E-07	1 30E-06
Am-241	2 5251E-03	323 98	647 95	0 00E+00	8 18E-01	1 64E+00
Am-242m	3 9624E-07	323 98	647 95	0 00E+00	1.28E-04	2 57E-04
Am-243	1 4880E-06	323.98	647 95	0 00E+00	4 82E-04	9 64E-04
C-14	5 7053E-09	323 98	647 95	0 00E+00	1 85E-06	3 70E-06
Cl-36	1 3124E-32	323 98	647 95	0 00E+00	4 25E-30	8 50E-30
Cm-243	1 1419E-07	323 98	647 95	0 00E+00	3 70E-05	7 40E-05
Cm-244	1 6522E-05	323 98	647 95	0 00E+00	5 35E-03	1 07E-02
Co-60	7 4047E-07	323 98	647 95	0 00E+00	2 40E-04	4 80E-04
Cs-134	2 0455E-05	323 98	647 95	0 00E+00	6 63E-03	1 33E-02
Cs-135	3 4477E-06	323 98	647 95	0 00E+00	1.12E-03	2.23E-03
Cs-137	1 4365E+00	323 98	647.95	0 00E+00	4 65E+02	9 31E+02
Eu-154	7 3230E-03	323 98	647.95	0 00E+00	2.37E+00	4 74E+00
Eu-155	5 9259E-04	323 98	647.95	0 00E+00	1 92E-01	3 84E-01
Fe-55	2.2791E-06	323 98	647 95	0 00E+00	7.38E-04	1 48E-03
H-3	1.9698E-03	323 98	647 95	0 00E+00	6.38E-01	1 28E+00
I-129	7.5300E-07	323 98	647 95	0 00E+00	2 44E-04	4 88E-04
Kr-85	4 1176E-02	323.98	647 95	0 00E+00	1 33E+01	2 67E+01
Np-237	9 5752E-06	323 98	647 95	0 00E+00	3 10E-03	6 20E-03
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
Tl-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

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg MeV	
0 0150	4 772E+13
0 0250	9 910E+12
0 0375	8 613E+12
0 0575	9.271E+12
0 0850	5.586E+12
0 1250	3.690E+12
0.2250	4 823E+12
0 3750	2.098E+12
0.5750	3 467E+13
0.8500	4 235E+11
1.2500	2 049E+11
1 7500	1 153E+10
2.2500	9 640E+05
2.7500	9 201E+05
3 5000	5 332E+02
5 0000	2 179E+02
7 0000	2.384E+01
11 0000	2 659E+00

Thermal Power

Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
5 42E+00	1 08E+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 03204799	60 to 100

Basis for Parameter Differences:

Burnup Summary (MWd)[2]

	From SFD	Estimated	Basis for burnup used in estimate:
Nominal		323 98	Nominal burnup calculated from the heavy metal mass destroyed.
Bounding		647 95	Bounding burnup assumed to be twice nominal burnup

Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup
Nominal	0.52	
Bounding	1 05	

Estimated EOL HM/Given EOL HM: 1 01

[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 KURR (UALX-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

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

Estimated Canister usage

18"x10'
6 67

II. Estimates

Radionuclide	m Ci/MWd From Template	x_n Nominal Fuel Burnup (MWd)[2]	x_b Bounding Fuel Burnup (MWd)[2]	b Initial Activity (Ci)	y_n Nominal Fuel Inventories(Ci)	y_b Bounding Fuel Inventories(Ci)
Ac-227	6 6313E-10	6,954 91	13,909 82	0 00E+00	4 61E-06	9.22E-06
Am-241	2 0060E-03	6,954 91	13,909 82	0 00E+00	1 40E+01	2.79E+01
Am-242m	4.2429E-07	6,954 91	13,909 82	0 00E+00	2 95E-03	5 90E-03
Am-243	1 4899E-06	6,954 91	13,909 82	0 00E+00	1 04E-02	2 07E-02
C-14	5 7135E-09	6,954 91	13,909 82	0 00E+00	3 97E-05	7 95E-05
Cl-36	1 3124E-32	6,954 91	13,909 82	0 00E+00	9.13E-29	1 83E-28
Cm-243	1 6443E-07	6,954 91	13,909 82	0 00E+00	1.14E-03	2.29E-03
Cm-244	2 9330E-05	6,954 91	13,909 82	0 00E+00	2 04E-01	4 08E-01
Co-60	5 3186E-06	6,954 91	13,909 82	0 00E+00	3 70E-02	7.40E-02
Cs-134	3 1563E-03	6,954 91	13,909 82	0 00E+00	2 20E+01	4.39E+01
Cs-135	3 4477E-06	6,954 91	13,909 82	0 00E+00	2 40E-02	4 80E-02
Cs-137	2 0313E+00	6,954.91	13,909 82	0 00E+00	1 41E+04	2 83E+04
Eu-154	2 4513E-02	6,954 91	13,909 82	0 00E+00	1 70E+02	3 41E+02
Eu-155	4 8175E-03	6,954 91	13,909 82	0 00E+00	3 35E+01	6 70E+01
Fe-55	1.2397E-04	6,954 91	13,909 82	0 00E+00	8 62E-01	1 72E+00
H-3	4 5697E-03	6,954 91	13,909 82	0 00E+00	3 18E+01	6 36E+01
I-129	7 5300E-07	6,954 91	13,909 82	0 00E+00	5 24E-03	1 05E-02
Kr-85	1 0850E-01	6,954 91	13,909 82	0 00E+00	7 55E+02	1 51E+03
Np-237	9 5561E-06	6,954 91	13,909 82	0 00E+00	6 65E-02	1 33E-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
Tl-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
U-233	2 5825E-09	6,954 91	13,909 82	0 00E+00	1 80E-05	3.59E-05
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
U-236	1 5493E-05	6,954 91	13,909 82	0 00E+00	1 08E-01	2 16E-01
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

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg MeV	
0 0150	1 468E+15
0 0250	3.053E+14
0 0375	2 663E+14
0 0575	2.852E+14
0 0850	1 724E+14
0 1250	1 166E+14
0 2250	1.487E+14
0 3750	6 474E+13
0 5750	1 056E+15
0.8500	1 785E+13
1.2500	1.019E+13
1 7500	4 679E+11
2 2500	4 105E+07
2 7500	2.321E+07
3.5000	1 066E+05
5 0000	6 028E+03
7.0000	6 655E+02
11 0000	7 459E+01

Thermal Power

Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
1.66E+02	3.32E+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 %	93 175	60 to 100

Basis for Parameter Differences:

Burnup Summary (MWd)[2]

	From SFD	Estimated	Basis for burnup used in estimate
Nominal		6,954 91	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
Nominal	0 54	
Bounding	1 08	

Estimated EOL HM/Given EOL HM: 1 01

[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: LWR SAMPLES
SNF ID #: 134
Fuel Units & Descr: 5 - ROD
Heavy Metal Mass. BOL= , EOL=12 74kg
ROD Storage Site: INEEL

[1]Fuel decay start date: 1966
Estimates as of: 2030
Template: (Worst Case)
[2]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

Radionuclide	m Ci/MWd From Template	x_n Nominal Fuel Burnup (MWd)[2]	x_b Bounding Fuel Burnup (MWd)[2]	b Initial Activity (Ci)	y_n Nominal Fuel Inventories(Ci)	y_b Bounding Fuel Inventories(Ci)
Ac-227	2 5200E-06	12,107 49	12,107 49	0 00E+00	3 05E-02	3 05E-02
Am-241	8 6432E+00	12,107 49	12,107 49	0 00E+00	1 05E+05	1 05E+05
Am-242m	1.5728E-02	12,107 49	12,107 49	0 00E+00	1 90E+02	1 90E+02
Am-243	1 6288E-02	12,107 49	12,107 49	0 00E+00	1 97E+02	1 97E+02
C-14	1.2068E-01	12,107 49	12,107 49	0 00E+00	1 46E+03	1 46E+03
Cl-36	2 2849E-03	12,107 49	12,107 49	0 00E+00	2 77E+01	2.77E+01
Cm-243	6 0144E-04	12,107 49	12,107.49	0 00E+00	7 28E+00	7.28E+00
Cm-244	9 4880E-02	12,107 49	12,107 49	0 00E+00	1 15E+03	1 15E+03
Co-60	3 9052E+00	12,107 49	12,107 49	0 00E+00	4 73E+04	4 73E+04
Cs-134	2 2139E-06	12,107.49	12,107 49	0 00E+00	2 68E-02	2 68E-02
Cs-135	4 3976E-04	12,107.49	12,107 49	0 00E+00	5 32E+00	5.32E+00
Cs-137	1 4887E+01	12,107 49	12,107 49	0 00E+00	1 80E+05	1.80E+05
Eu-154	3 7342E-01	12,107 49	12,107 49	0 00E+00	4 52E+03	4.52E+03
Eu-155	8 4893E-03	12,107 49	12,107 49	0 00E+00	1 03E+02	1 03E+02
Fe-55	5 3750E-03	12,107 49	12,107 49	0 00E+00	6 51E+01	6.51E+01
H-3	1 0472E-01	12,107 49	12,107 49	0 00E+00	1.27E+03	1.27E+03
I-129	1 0618E-05	12,107 49	12,107 49	0 00E+00	1 29E-01	1.29E-01
Kr-85	2 2717E-01	12,107 49	12,107 49	0 00E+00	2.75E+03	2 75E+03
Np-237	1 6400E-04	12,107 49	12,107 49	0 00E+00	1.99E+00	1 99E+00
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
Tl-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

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg MeV	
0.0150	1 026E+16
0 0250	2 027E+15
0 0375	1 713E+15
0 0575	3 237E+15
0 0850	1 085E+15
0 1250	7 676E+14
0.2250	9 390E+14
0 3750	4 064E+14
0 5750	6 725E+15
0 8500	1 473E+14
1 2500	3 611E+15
1 7500	4 339E+12
2 2500	1 876E+10
2 7500	3.230E+10
3 5000	1 759E+07
5 0000	7 432E+06
7 0000	8 464E+05
11 0000	9 654E+04

Thermal Power

Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
6.50E+03	6 64E+03
Total	Total

III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary

	From SFD	Used
Reactor Moderator	LIGHT WATER	(Worst Case)
Fuel Cladding	ZIRC OR SST	SST/Inconel
BOL HM Constituents	Pu and U	U Th, & Pu
BOL Enrichment %		0 to 100

Basis for Parameter Differences:

This fuel didn't closely match any existing templates, therefore the worst case template was used

Burnup Summary (MWd)[2]

	From SFD	Estimated
Nominal		12,107 49
Bounding		12,107 49

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	14 21	
Bounding	14 21	

Estimated EOL HM/Given EOL HM: 591 64

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

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

Estimated Canister usage: 18"x10' — 17 50

II. Estimates

	m	x_n	x_b	b	y_n	y_b
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	1 4545E-10	95,816 70	191,633.40	0 00E+00	1.39E-05	2.79E-05
Am-241	1 1190E-03	95,816 70	191,633 40	0 00E+00	1 07E+02	2.14E+02
Am-242m	4.5425E-07	95,816 70	191,633 40	0 00E+00	4.35E-02	8 70E-02
Am-243	1.4921E-06	95,816 70	191,633 40	0 00E+00	1 43E-01	2 86E-01
C-14	5 7244E-09	95,816 70	191,633 40	0 00E+00	5 48E-04	1 10E-03
Cl-36	1.3124E-32	95,816 70	191,633 40	0 00E+00	1 26E-27	2 51E-27
Cm-243	2 3676E-07	95,816 70	191,633 40	0 00E+00	2 27E-02	4 54E-02
Cm-244	5.2042E-05	95,816 70	191,633 40	0 00E+00	4 99E+00	9 97E+00
Co-60	3 8208E-05	95,816 70	191,633 40	0 00E+00	3 66E+00	7.32E+00
Cs-134	4 8693E-01	95,816 70	191,633 40	0 00E+00	4 67E+04	9 33E+04
Cs-135	3 4477E-06	95,816 70	191,633 40	0 00E+00	3 30E-01	6 61E-01
Cs-137	2 8731E+00	95,816.70	191,633 40	0 00E+00	2 75E+05	5.51E+05
Eu-154	8.2053E-02	95,816.70	191,633 40	0 00E+00	7 86E+03	1.57E+04
Eu-155	3 9134E-02	95,816 70	191,633 40	0 00E+00	3 75E+03	7.50E+03
Fe-55	6 7429E-03	95,816 70	191,633 40	0 00E+00	6 46E+02	1.29E+03
H-3	1 0599E-02	95,816 70	191,633 40	0 00E+00	1.02E+03	2 03E+03
I-129	7 5300E-07	95,816 70	191,633 40	0 00E+00	7.21E-02	1 44E-01
Kr-85	2 8595E-01	95,816 70	191,633 40	0 00E+00	2 74E+04	5 48E+04
Np-237	9 5479E-06	95,816 70	191,633 40	0 00E+00	9 15E-01	1 83E+00
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
Tl-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
U-233	1 9564E-09	95,816 70	191,633 40	0 00E+00	1 87E-04	3 75E-04
U-234	1 8371E-04	95,816 70	191,633 40	0 00E+00	1 76E+01	3 52E+01
U-235	-2 7235E-06	95,816 70	0 00	5 76E-01	3 15E-01	5 76E-01
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

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg MeV	
0 0150	3 697E+16
0 0250	7 965E+15
0 0375	7 350E+15
0 0575	7.227E+15
0 0850	4 607E+15
0 1250	3.990E+15
0.2250	3.905E+15
0.3750	1.890E+15
0 5750	2.596E+16
0.8500	3 636E+15
1.2500	6 765E+14
1 7500	2 837E+13
2.2500	5 950E+13
2.7500	3 423E+11
3.5000	3 797E+10
5.0000	1 135E+05
7.0000	1.265E+04
11 0000	1.426E+03

Thermal Power

Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
4.86E+03	9 72E+03
Total	Total

III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary

	From SFD	Used
Reactor Moderator	LIGHT WATER	LIGHT WATER
Fuel Cladding	ALUM	ALUM
BOL HM Constituents	U	U
BOL Enrichment %	93 1245618	60 to 100

Basis for Parameter Drfferences:

Burnup Summary (MWd)[2]

	From SFD	Estimated
Nominal	95,816 70	50 514 01
Bounding		191,633 40

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	1.06	0 53
Bounding	2 13	

Estimated EOL HM/Given EOL HM: 0 82

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

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

Estimated Canister usage: 18"x10' = 4 00

II. Estimates

Radionuclide	m: Ci/MWd From Template	x_n: Nominal Fuel Burnup (MWd)[2]	x_b: Bounding Fuel Burnup (MWd)[2]	b: Initial Activity (Ci)	y_n: Nominal Fuel Inventories(Ci)	y_b: Bounding Fuel Inventories(Ci)
Ac-227	2 0068E-09	21,239.75	42,479 50	0 00E+00	4.26E-05	8.52E-05
Am-241	2.5251E-03	21,239.75	42,479 50	0 00E+00	5 36E+01	1 07E+02
Am-242m	3 9624E-07	21,239.75	42,479.50	0 00E+00	8 42E-03	1 68E-02
Am-243	1 4880E-06	21,239.75	42,479 50	0 00E+00	3.16E-02	6.32E-02
C-14	5.7053E-09	21,239 75	42,479 50	0 00E+00	1 21E-04	2 42E-04
Cl-36	1.3124E-32	21,239 75	42,479 50	0 00E+00	2 79E-28	5 57E-28
Cm-243	1 1419E-07	21,239 75	42,479 50	0 00E+00	2 43E-03	4 85E-03
Cm-244	1 6522E-05	21,239 75	42,479 50	0 00E+00	3 51E-01	7 02E-01
Co-60	7 4047E-07	21,239 75	42,479 50	0 00E+00	1 57E-02	3 15E-02
Cs-134	2 0455E-05	21,239 75	42,479 50	0 00E+00	4 34E-01	8 69E-01
Cs-135	3 4477E-06	21,239 75	42,479 50	0 00E+00	7 32E-02	1 46E-01
Cs-137	1 4365E+00	21,239 75	42,479 50	0 00E+00	3 05E+04	6 10E+04
Eu-154	7 3230E-03	21,239 75	42,479 50	0 00E+00	1 56E+02	3 11E+02
Eu-155	5 9259E-04	21,239 75	42,479 50	0 00E+00	1 26E+01	2 52E+01
Fe-55	2 2791E-06	21,239 75	42,479 50	0 00E+00	4 84E-02	9 68E-02
H-3	1 9698E-03	21,239 75	42,479 50	0 00E+00	4 18E+01	8 37E+01
I-129	7 5300E-07	21,239 75	42,479 50	0 00E+00	1 60E-02	3 20E-02
Kr-85	4 1176E-02	21,239 75	42,479 50	0 00E+00	8 75E+02	1 75E+03
Np-237	9 5752E-06	21,239 75	42,479 50	0 00E+00	2 03E-01	4 07E-01
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
Tl-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

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg MeV	
0 0150	3 129E+15
0 0250	6 497E+14
0 0375	5 647E+14
0 0575	6 078E+14
0 0850	3 662E+14
0 1250	2 419E+14
0 2250	3 162E+14
0 3750	1 375E+14
0 5750	2.273E+15
0 8500	2 777E+13
1.2500	1 343E+13
1 7500	7 559E+11
2.2500	6 320E+07
2 7500	6 032E+07
3.5000	3 495E+04
5 0000	1 428E+04
7 0000	1.563E+03
11 0000	1 742E+02

Thermal Power

Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
3.55E+02	7 11E+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 145832	60 to 100

Basis for Parameter Differences:

Burnup Summary (MWd)[1]

	From SFD	Estimated	Basis for burnup used in estimate:
Nominal		21,239 75	Nominal burnup calculated from the heavy metal mass destroyed
Bounding		42 479.50	Bounding burnup assumed to be twice nominal burnup.

Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup
Nominal	1.03	
Bounding	2.06	

Estimated EOL HM/Given EOL HM: 1 03

[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: 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

[1]Fuel decay start date: 1965
Estimates as of: 2030
Template: Pathfinder (Light Water SST, 60 to 100%, U)
[2]Template 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

Radionuclide	m Ci/MWd From Template	x_n Nominal Fuel Burnup (MWd)[2]	x_b Bounding Fuel Burnup (MWd)[2]	b Initial Activity (Ci)	y_n Nominal Fuel Inventories(Ci)	y_b Bounding Fuel Inventories(Ci)
Ac-227	4 5940E-08	316.46	632 91	0 00E+00	1 45E-05	2 91E-05
Am-241	1 1471E-04	316 46	632 91	0 00E+00	3 63E-02	7.26E-02
Am-242m	7 4210E-09	316 46	632.91	0 00E+00	2 35E-06	4 70E-06
Am-243	9 8236E-10	316 46	632 91	0 00E+00	3 11E-07	6 22E-07
C-14	2 2928E-04	316 46	632 91	0 00E+00	7.26E-02	1 45E-01
Cl-36	1.2260E-06	316 46	632 91	0 00E+00	3 88E-04	7 76E-04
Cm-243	1.2000E-10	316 46	632 91	0 00E+00	3 80E-08	7.59E-08
Cm-244	7.3577E-10	316 46	632 91	0 00E+00	2 33E-07	4 66E-07
Co-60	1.3732E-03	316 46	632 91	0 00E+00	4 35E-01	8 69E-01
Cs-134	1 2709E-10	316 46	632.91	0 00E+00	4 02E-08	8 04E-08
Cs-135	3 0316E-05	316 46	632 91	0 00E+00	9 59E-03	1 92E-02
Cs-137	7.2579E-01	316 46	632 91	0 00E+00	2.30E+02	4 59E+02
Eu-154	5.9750E-05	316 46	632 91	0 00E+00	1 89E-02	3 78E-02
Eu-155	1 0577E-05	316 46	632 91	0 00E+00	3 35E-03	6 69E-03
Fe-55	4 1631E-07	316 46	632.91	0 00E+00	1.32E-04	2 63E-04
H-3	4 6722E-04	316 46	632.91	0 00E+00	1.48E-01	2 96E-01
I-129	7 3195E-07	316 46	632 91	0 00E+00	2.32E-04	4 63E-04
Kr-85	5 9418E-03	316 46	632 91	0 00E+00	1 88E+00	3 76E+00
Np-237	1.1499E-06	316 46	632 91	0 00E+00	3 64E-04	7.28E-04
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
Tl-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
U-233	3 3344E-09	316 46	632.91	0 00E+00	1 06E-06	2 11E-06
U-234	4 0749E-07	316 46	632 91	0 00E+00	1.29E-04	2 58E-04
U-235	-2.7761E-06	316 46	0 00	1 18E-01	1 17E-01	1.18E-01
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

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg MeV	
0 0150	2.310E+13
0 0250	4.800E+12
0 0375	4 171E+12
0 0575	4 476E+12
0 0850	2 704E+12
0 1250	1 754E+12
0.2250	2.332E+12
0 3750	1.016E+12
0 5750	1 710E+13
0 8500	1 660E+11
1.2500	1 202E+11
1 7500	4.271E+09
2.2500	8 077E+05
2 7500	3 618E+05
3 5000	4 749E+01
5 0000	1 969E+01
7 0000	2 187E+00
11 0000	2 462E-01

Thermal Power

Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
2.58E+00	5 16E+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	HASTELLOY	SST
BOL HM Constituents	U	U
BOL Enrichment %	93 143	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		316 46
Bounding		632.91

Basis for burnup used in estimate:
Nominal burnup calculated from the heavy metal mass destroyed
Bounding burnup assumed to be twice nominal burnup

Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup
Nominal	0 12	
Bounding	0.23	

Estimated EOL HM/Given EOL HM: 1 00

[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: 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

[1]Fuel decay start date: 2006
Estimates as of 2030
Template: ATR (Light Water, Alum., 60 to 100%, U)
[2]Template Burnup(MWd) 367.2
Template BOL Heavy Metal Mass (MT): 0 00116689
Template Decay Time: 20 years

Estimated Canister usage: 18"x10' = 2 31

II. Estimates

	m	x_n	x_b	b	y_n	y_b
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	4,118 78	8,237.55	0 00E+00	2.73E-06	5 46E-06
Am-241	2 0060E-03	4,118 78	8,237 55	0 00E+00	8 26E+00	1 65E+01
Am-242m	4 2429E-07	4,118.78	8,237 55	0 00E+00	1 75E-03	3 50E-03
Am-243	1 4899E-06	4,118.78	8,237 55	0 00E+00	6 14E-03	1 23E-02
C-14	5 7135E-09	4,118 78	8,237 55	0 00E+00	2 35E-05	4 71E-05
Cl-36	1 3124E-32	4,118 78	8,237 55	0 00E+00	5 41E-29	1 08E-28
Cm-243	1 6443E-07	4,118 78	8,237 55	0 00E+00	6 77E-04	1 35E-03
Cm-244	2.9330E-05	4,118 78	8,237 55	0 00E+00	1.21E-01	2 42E-01
Co-60	5 3186E-06	4,118 78	8,237.55	0 00E+00	2.19E-02	4 38E-02
Cs-134	3.1563E-03	4,118 78	8,237.55	0 00E+00	1 30E+01	2 60E+01
Cs-135	3 4477E-06	4,118 78	8,237 55	0 00E+00	1 42E-02	2 84E-02
Cs-137	2 0313E+00	4,118.78	8,237 55	0 00E+00	8 37E+03	1 67E+04
Eu-154	2 4513E-02	4,118.78	8,237 55	0 00E+00	1 01E+02	2 02E+02
Eu-155	4 8175E-03	4,118 78	8,237 55	0 00E+00	1 98E+01	3 97E+01
Fe-55	1 2397E-04	4,118 78	8,237 55	0 00E+00	5 11E-01	1 02E+00
H-3	4 5697E-03	4,118 78	8,237 55	0 00E+00	1 88E+01	3.76E+01
I-129	7.5300E-07	4,118 78	8,237.55	0 00E+00	3.10E-03	6.20E-03
Kr-85	1.0850E-01	4,118 78	8,237.55	0 00E+00	4 47E+02	8 94E+02
Np-237	9 5561E-06	4,118 78	8,237 55	0 00E+00	3 94E-02	7 87E-02
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
Tl-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

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg MeV	
0 0150	8 695E+14
0 0250	1 808E+14
0 0375	1.577E+14
0 0575	1 689E+14
0 0850	1.021E+14
0 1250	6.907E+13
0.2250	8.808E+13
0.3750	3 834E+13
0 5750	6.254E+14
0 8500	1 057E+13
1 2500	6 037E+12
1 7500	2 771E+11
2.2500	2.431E+07
2 7500	1 374E+07
3 5000	6.313E+04
5 0000	3.569E+03
7.0000	3.940E+02
11 0000	4 416E+01

Thermal Power

Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
9.82E+01	1 96E+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 11672336	60 to 100

Basis for Parameter Differences:

Burnup Summary (MWd)[2]

	From SFD	Estimated
Nominal		4,118 78
Bounding		8 237 55

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

[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: 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

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

Estimated Canister usage: 18"x10": 0.31

II. Estimates

Radionuclide	m: Ci/MWd From Template	x_n: Nominal Fuel Burnup (MWd)[2]	x_b: Bounding Fuel Burnup (MWd)[2]	b: Initial Activity (Ci)	y_n: Nominal Fuel Inventories(Ci)	y_b: Bounding Fuel Inventories(Ci)
Ac-227	6.6313E-10	545.86	1,091.72	0.00E+00	3.62E-07	7.24E-07
Am-241	2.0060E-03	545.86	1,091.72	0.00E+00	1.09E+00	2.19E+00
Am-242m	4.2429E-07	545.86	1,091.72	0.00E+00	2.32E-04	4.63E-04
Am-243	1.4899E-06	545.86	1,091.72	0.00E+00	8.13E-04	1.63E-03
C-14	5.7135E-09	545.86	1,091.72	0.00E+00	3.12E-06	6.24E-06
Cl-36	1.3124E-32	545.86	1,091.72	0.00E+00	7.16E-30	1.43E-29
Cm-243	1.6443E-07	545.86	1,091.72	0.00E+00	8.98E-05	1.80E-04
Cm-244	2.9330E-05	545.86	1,091.72	0.00E+00	1.60E-02	3.20E-02
Co-60	5.3186E-06	545.86	1,091.72	0.00E+00	2.90E-03	5.81E-03
Cs-134	3.1563E-03	545.86	1,091.72	0.00E+00	1.72E+00	3.45E+00
Cs-135	3.4477E-06	545.86	1,091.72	0.00E+00	1.88E-03	3.76E-03
Cs-137	2.0313E+00	545.86	1,091.72	0.00E+00	1.11E+03	2.22E+03
Eu-154	2.4513E-02	545.86	1,091.72	0.00E+00	1.34E+01	2.68E+01
Eu-155	4.8175E-03	545.86	1,091.72	0.00E+00	2.63E+00	5.26E+00
Fe-55	1.2397E-04	545.86	1,091.72	0.00E+00	6.77E-02	1.35E-01
H-3	4.5697E-03	545.86	1,091.72	0.00E+00	2.49E+00	4.99E+00
I-129	7.5300E-07	545.86	1,091.72	0.00E+00	4.11E-04	8.22E-04
Kr-85	1.0850E-01	545.86	1,091.72	0.00E+00	5.92E+01	1.18E+02
Np-237	9.5561E-06	545.86	1,091.72	0.00E+00	5.22E-03	1.04E-02
Pa-231	2.0359E-09	545.86	1,091.72	0.00E+00	1.11E-06	2.22E-06
Pb-210	4.9728E-11	545.86	1,091.72	0.00E+00	2.71E-08	5.43E-08
Pm-147	4.8502E-02	545.86	1,091.72	0.00E+00	2.65E+01	5.30E+01
Pu-238	1.8254E-02	545.86	1,091.72	0.00E+00	9.96E+00	1.99E+01
Pu-239	4.2810E-04	545.86	1,091.72	0.00E+00	2.34E-01	4.67E-01
Pu-240	2.4368E-04	545.86	1,091.72	0.00E+00	1.33E-01	2.66E-01
Pu-241	3.3415E-02	545.86	1,091.72	0.00E+00	1.82E+01	3.65E+01
Pu-242	3.6329E-07	545.86	1,091.72	0.00E+00	1.98E-04	3.97E-04
Ra-226	2.2854E-10	545.86	1,091.72	0.00E+00	1.25E-07	2.50E-07
Ra-228	1.2426E-14	545.86	1,091.72	0.00E+00	6.78E-12	1.36E-11
Ru-106	6.3589E-06	545.86	1,091.72	0.00E+00	3.47E-03	6.94E-03
Se-79	1.2933E-05	545.86	1,091.72	0.00E+00	7.06E-03	1.41E-02
Sn-126	1.1574E-05	545.86	1,091.72	0.00E+00	6.32E-03	1.26E-02
Sr-90	1.9248E+00	545.86	1,091.72	0.00E+00	1.05E+03	2.10E+03
Tc-99	4.2239E-04	545.86	1,091.72	0.00E+00	2.31E-01	4.61E-01
Th-229	5.0953E-12	545.86	1,091.72	0.00E+00	2.78E-09	5.56E-09
Th-230	4.1885E-08	545.86	1,091.72	0.00E+00	2.29E-05	4.57E-05
Th-232	1.9270E-14	545.86	1,091.72	0.00E+00	1.05E-11	2.10E-11
Tl-208	4.6024E-08	545.86	1,091.72	0.00E+00	2.51E-05	5.02E-05
U-232	1.2582E-07	545.86	1,091.72	0.00E+00	6.87E-05	1.37E-04
U-233	2.5825E-09	545.86	1,091.72	0.00E+00	1.41E-06	2.82E-06
U-234	1.8450E-04	545.86	1,091.72	0.00E+00	1.01E-01	2.01E-01
U-235	-2.7235E-06	545.86	0.00	3.94E-03	2.46E-03	3.94E-03
U-236	1.5493E-05	545.86	1,091.72	0.00E+00	8.46E-03	1.69E-02
U-238	-4.2851E-09	545.86	0.00	4.53E-05	4.30E-05	4.53E-05
Y-90	1.9254E+00	545.86	1,091.72	0.00E+00	1.05E+03	2.10E+03
Other Radionuclides					1.06E+03	2.11E+03

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg. MeV	
0.0150	1.152E+14
0.0250	2.396E+13
0.0375	2.090E+13
0.0575	2.239E+13
0.0850	1.353E+13
0.1250	9.154E+12
0.2250	1.167E+13
0.3750	5.081E+12
0.5750	8.289E+13
0.8500	1.401E+12
1.2500	8.001E+11
1.7500	3.673E+10
2.2500	3.222E+06
2.7500	1.821E+06
3.5000	8.367E+03
5.0000	4.730E+02
7.0000	5.222E+01
11.0000	5.853E+00

Thermal Power

Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
1.30E+01	2.60E+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 %	93.11672336	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

[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: 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

[1]Fuel decay start date: 2035
Estimates as of: 2030
Template: ATR (Light Water, Alum , 60 to 100%, U)
[2]Template Burnup(MWd): 367 2
Template BOL Heavy Metal Mass (MT): 0 00116689
Template Decay Time: 5 years

Estimated Canister usage: 18"x10' 40 50

II. Estimates

Radionuclide	m Ci/MWd From Template	x_n Nominal Fuel Burnup (MWd)[2]	x_b Bounding Fuel Burnup (MWd)[2]	b Initial Activity (Ci)	y_n Nominal Fuel Inventories(Ci)	y_b Bounding Fuel Inventories(Ci)
Ac-227	1 4545E-10	97,941 50	195,883 01	0 00E+00	1 42E-05	2 85E-05
Am-241	1 1190E-03	97,941 50	195,883 01	0 00E+00	1 10E+02	2 19E+02
Am-242m	4 5425E-07	97,941 50	195,883 01	0 00E+00	4 45E-02	8 90E-02
Am-243	1 4921E-06	97,941 50	195,883 01	0 00E+00	1 46E-01	2 92E-01
C-14	5.7244E-09	97,941 50	195,883 01	0 00E+00	5 61E-04	1 12E-03
Cl-36	1 3124E-32	97,941.50	195,883 01	0 00E+00	1 29E-27	2 57E-27
Cm-243	2 3676E-07	97,941 50	195 883.01	0 00E+00	2 32E-02	4 64E-02
Cm-244	5 2042E-05	97,941 50	195,883 01	0 00E+00	5.10E+00	1 02E+01
Co-60	3 8208E-05	97,941 50	195,883 01	0 00E+00	3.74E+00	7 48E+00
Cs-134	4 8693E-01	97,941 50	195,883 01	0 00E+00	4.77E+04	9 54E+04
Cs-135	3 4477E-06	97,941 50	195,883 01	0 00E+00	3.38E-01	6.75E-01
Cs-137	2 8731E+00	97,941 50	195,883 01	0 00E+00	2 81E+05	5 63E+05
Eu-154	8 2053E-02	97,941 50	195,883 01	0 00E+00	8 04E+03	1 61E+04
Eu-155	3 9134E-02	97,941 50	195,883 01	0.00E+00	3 83E+03	7 67E+03
Fe-55	6 7429E-03	97,941 50	195,883 01	0 00E+00	6 60E+02	1 32E+03
H-3	1 0599E-02	97,941 50	195,883 01	0 00E+00	1 04E+03	2 08E+03
I-129	7.5300E-07	97,941.50	195,883 01	0 00E+00	7 37E-02	1 47E-01
Kr-85	2 8595E-01	97,941.50	195,883 01	0 00E+00	2 80E+04	5 60E+04
Np-237	9 5479E-06	97,941 50	195,883 01	0 00E+00	9 35E-01	1 87E+00
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
Sr-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
Tl-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

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg. MeV	
0 0150	3 779E+16
0 0250	8 142E+15
0 0375	7.513E+15
0 0575	7.387E+15
0 0850	4 710E+15
0 1250	4.078E+15
0.2250	3 992E+15
0.3750	1 932E+15
0.5750	2 654E+16
0 8500	3 717E+15
1.2500	6 915E+14
1 7500	2 900E+13
2 2500	6 082E+13
2 7500	3 499E+11
3 5000	3 881E+10
5 0000	1 161E+05
7 0000	1.294E+04
11 0000	1 458E+03

Thermal Power

Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
4 97E+03	9 93E+03
Total	Total

III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary

	From SFD	Used
Reactor Moderator	LIGHT WATER	LIGHT WATER
Fuel Cladding	ALUM	ALUM
BOL HM Constituents	U	U
BOL Enrichment %	93.26113117	60 to 100

Basis for Parameter Differences:

Burnup Summary (MWd)[2]

	From SFD	Estimated	Basis for burnup used in estimate:
Nominal		97,941 50	Nominal burnup calculated from the heavy metal mass destroyed.
Bounding		195 883 01	Bounding burnup assumed to be twice nominal burnup.

Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup
Nominal	0 39	
Bounding	0 77	

Estimated EOL HM/Given EOL HM: 1 01

[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: 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

[1]Fuel decay start date: 1990
Estimates as of: 2030
Template: ATR (Light Water, Alum , 60 to 100%, U)
[2]Template Burnup(MWd): 367.2
Template BOL Heavy Metal Mass (MT): 0 00116689
Template Decay Time: 35 years

Estimated Canister usage
18"x10'
13 00

II. Estimates

Radionuclide	m: Ci/MWd From Template	x_n: Nominal Fuel Burnup (MWd)[2]	x_b: Bounding Fuel Burnup (MWd)[2]	b: Initial Activity (Ci)	y_n: Nominal Fuel Inventories(Ci)	y_b: Bounding Fuel Inventories(Ci)
Ac-227	2 0068E-09	43,522 74	87,045 48	0 00E+00	8 73E-05	1 75E-04
Am-241	2 5251E-03	43,522 74	87,045 48	0 00E+00	1 10E+02	2.20E+02
Am-242m	3 9624E-07	43,522 74	87,045 48	0 00E+00	1 72E-02	3 45E-02
Am-243	1 4880E-06	43,522 74	87,045 48	0 00E+00	6 48E-02	1 30E-01
C-14	5 7053E-09	43,522 74	87,045.48	0 00E+00	2 48E-04	4 97E-04
Cl-36	1.3124E-32	43,522.74	87,045 48	0 00E+00	5 71E-28	1.14E-27
Cm-243	1.1419E-07	43,522.74	87,045 48	0 00E+00	4 97E-03	9 94E-03
Cm-244	1.6522E-05	43,522 74	87,045 48	0 00E+00	7 19E-01	1 44E+00
Co-60	7.4047E-07	43,522 74	87,045 48	0 00E+00	3 22E-02	6 45E-02
Cs-134	2 0455E-05	43,522 74	87,045 48	0 00E+00	8 90E-01	1 78E+00
Cs-135	3 4477E-06	43,522 74	87,045 48	0 00E+00	1.50E-01	3 00E-01
Cs-137	1 4365E+00	43,522 74	87,045 48	0 00E+00	6.25E+04	1 25E+05
Eu-154	7 3230E-03	43,522 74	87,045.48	0 00E+00	3 19E+02	6 37E+02
Eu-155	5 9259E-04	43,522.74	87,045.48	0 00E+00	2 58E+01	5 16E+01
Fe-55	2 2791E-06	43,522 74	87,045 48	0 00E+00	9 92E-02	1.98E-01
H-3	1.9698E-03	43,522 74	87,045 48	0 00E+00	8 57E+01	1.71E+02
I-129	7.5300E-07	43,522 74	87,045 48	0 00E+00	3 28E-02	6 55E-02
Kr-85	4 1176E-02	43,522 74	87,045 48	0 00E+00	1 79E+03	3 58E+03
Np-237	9 5752E-06	43,522 74	87,045 48	0 00E+00	4 17E-01	8 33E-01
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 6329E-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
Tl-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
Other Radionuclides					5.96E+04	1.19E+05

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg MeV	
0 0150	6 411E+15
0 0250	1.331E+15
0 0375	1 157E+15
0 0575	1.245E+15
0 0850	7.504E+14
0 1250	4 957E+14
0.2250	6 479E+14
0 3750	2 819E+14
0 5750	4 658E+15
0 8500	5 690E+13
1 2500	2.752E+13
1 7500	1.549E+12
2.2500	1.295E+08
2 7500	1.236E+08
3.5000	7 163E+04
5 0000	2 927E+04
7 0000	3 203E+03
11 0000	3 571E+02

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

	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

Basis for Parameter Differences:

Burnup Summary (MWd)[2]

	From SFD	Estimated
Nominal		43,522 74
Bounding		87,045 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 53	
Bounding	1.07	

Estimated EOL HM/Given EOL HM: 1.01

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

[1]Fuel decay start date: 1963
Estimates as of: 2030
Template: PWR (Light Water Zirc, 0 to 5%, U)
[2]Template 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

Radionuclide	m Ci/MWd From Template	x_n Nominal Fuel Burnup (MWd)[2]	x_b Bounding Fuel Burnup (MWd)[2]	b Initial Activity (Ci)	y_n Nominal Fuel Inventories(Ci)	y_b Bounding Fuel Inventories(Ci)
Ac-227	1.2581E-09	31 68	31 68	0 00E+00	3 99E-08	3 99E-08
Am-241	1 4761E-01	31 68	31 68	0 00E+00	4 68E+00	4 68E+00
Am-242m	2 5032E-04	31 68	31 68	0 00E+00	7 93E-03	7 93E-03
Am-243	6 2387E-04	31 68	31 68	0 00E+00	1 98E-02	1.98E-02
C-14	4 7739E-05	31 68	31 68	0 00E+00	1 51E-03	1.51E-03
Cl-36	8 0297E-07	31 68	31 68	0 00E+00	2 54E-05	2.54E-05
Cm-243	1 2099E-04	31 68	31 68	0 00E+00	3 83E-03	3 83E-03
Cm-244	1 5560E-02	31 68	31.68	0 00E+00	4 93E-01	4 93E-01
Co-60	4 9580E-05	31 68	31 68	0 00E+00	1 57E-03	1 57E-03
Cs-134	1.7022E-09	31 68	31 68	0 00E+00	5 39E-08	5 39E-08
Cs-135	1 4433E-05	31 68	31 68	0 00E+00	4 57E-04	4 57E-04
Cs-137	6 9929E-01	31 68	31 68	0 00E+00	2.22E+01	2.22E+01
Eu-154	1 8023E-03	31 68	31 68	0 00E+00	5.71E-02	5 71E-02
Eu-155	2 6793E-05	31 68	31 68	0.00E+00	8.49E-04	8 49E-04
Fe-55	1 4580E-08	31 68	31 68	0 00E+00	4 62E-07	4 62E-07
H-3	3 8566E-03	31 68	31 68	0 00E+00	1 22E-01	1 22E-01
I-129	9 8288E-07	31 68	31 68	0 00E+00	3 11E-05	3 11E-05
Kr-85	4 0617E-03	31 68	31 68	0 00E+00	1 29E-01	1.29E-01
Np-237	1.2645E-05	31 68	31 68	0 00E+00	4 01E-04	4 01E-04
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
Tl-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

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg MeV	
0 0150	8.578E+11
0 0250	1 704E+11
0 0375	1 593E+11
0 0575	2.186E+11
0 0850	9 324E+10
0 1250	6 083E+10
0.2250	7 932E+10
0 3750	3 432E+10
0 5750	8 169E+11
0.8500	6.549E+09
1.2500	3 062E+09
1 7500	1 761E+08
2.2500	3 109E+04
2.7500	1 543E+05
3 5000	7 694E+03
5 0000	3.286E+03
7 0000	3 783E+02
11 0000	4 342E+01

Thermal Power

Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
4 65E-01	4 65E-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	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		31 68
Bounding		31 68

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

Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup
Nominal	0 04	
Bounding	0 04	

Estimated EOL HM/Given EOL HM: 1 00

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

[1]Fuel decay start date: 1982
Estimates as of: 2030
Template: ATR (Light Water, Alum , 60 to 100°•, U)
[2]Template Burnup(MWd): 367.2
Template BOL Heavy Metal Mass (MT): 0 00116689
Template Decay Time: 35 years

Estimated Canister usage: 18"x10' = 1 92

II. Estimates

Radionuclide	m: Ci/MWd From Template	x_n: Nominal Fuel Burnup (MWd)[2]	x_b: Bounding Fuel Burnup (MWd)[2]	b: Initial Activity (Ci)	y_n: Nominal Fuel Inventories(Ci)	y_b: Bounding Fuel Inventories(Ci)
Ac-227	2 0068E-09	21.27	42 53	0 00E+00	4 27E-08	8 54E-08
Am-241	2 5251E-03	21.27	42 53	0 00E+00	5 37E-02	1 07E-01
Am-242m	3 9624E-07	21.27	42 53	0 00E+00	8 43E-06	1 69E-05
Am-243	1 4880E-06	21.27	42 53	0 00E+00	3 16E-05	6 33E-05
C-14	5 7053E-09	21.27	42 53	0 00E+00	1.21E-07	2 43E-07
Cl-36	1.3124E-32	21.27	42.53	0 00E+00	2 79E-31	5 58E-31
Cm-243	1 1419E-07	21 27	42.53	0 00E+00	2 43E-06	4 86E-06
Cm-244	1.6522E-05	21.27	42.53	0 00E+00	3 51E-04	7 03E-04
Co-60	7.4047E-07	21 27	42 53	0 00E+00	1.57E-05	3 15E-05
Cs-134	2 0455E-05	21 27	42 53	0 00E+00	4.35E-04	8 70E-04
Cs-135	3 4477E-06	21.27	42 53	0 00E+00	7.33E-05	1.47E-04
Cs-137	1 4365E+00	21.27	42 53	0 00E+00	3 05E+01	6.11E+01
Eu-154	7.3230E-03	21.27	42 53	0 00E+00	1 56E-01	3 11E-01
Eu-155	5 9259E-04	21.27	42 53	0 00E+00	1 26E-02	2 52E-02
Fe-55	2 2791E-06	21.27	42 53	0 00E+00	4 85E-05	9 69E-05
H-3	1 9698E-03	21.27	42 53	0.00E+00	4 19E-02	8 38E-02
I-129	7.5300E-07	21.27	42 53	0 00E+00	1 60E-05	3 20E-05
Kr-85	4 1176E-02	21.27	42.53	0 00E+00	8 76E-01	1 75E+00
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
Tl-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

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg MeV	
0 0150	3 134E+12
0 0250	6.505E+11
0 0375	5 654E+11
0 0575	6 086E+11
0 0850	3 669E+11
0 1250	2.426E+11
0.2250	3 180E+11
0.3750	1 377E+11
0 5750	2.276E+12
0 8500	2 780E+10
1.2500	1.345E+10
1 7500	7.568E+08
2.2500	6.329E+04
2 7500	6 040E+04
3 5000	4 116E+01
5 0000	1 689E+01
7 0000	1 856E+00
11 0000	2 075E-01

Thermal Power

Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
3.58E-01	7.14E-01
Total	Total

III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary

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

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

Burnup Summary (MWd)[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

[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: NIST
SNF ID #: 154
Fuel Units & Descr: 980 - 17 CURVED PLATES
Heavy Metal Mass: BOL=367 5kg EOL=159 74kg
ROD Storage Site: SRS

[1]Fuel decay start date: 1997
Estimates as of: 2030
Template: HFBR (Heavy Water, Alum , 40 to 100%, U)
[2]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

Radionuclide	m Ci/MWd From Template	x_n Nominal Fuel Burnup (MWd)[2]	x_b Bounding Fuel Burnup (MWd)[2]	b Initial Activity (Ci)	y_n Nominal Fuel Inventories(Ci)	y_b Bounding Fuel Inventories(Ci)
Ac-227	5 4520E-10	191,368 36	338,505.35	0 00E+00	1 04E-04	1 85E-04
Am-241	9 2284E-03	191,368.36	338,505.35	0 00E+00	1 77E+03	3 12E+03
Am-242m	1 3390E-06	191,368.36	338,505.35	0 00E+00	2 56E-01	4 53E-01
Am-243	3 7084E-05	191,368.36	338,505 35	0 00E+00	7 10E+00	1.26E+01
C-14	2 6452E-08	191,368.36	338,505 35	0 00E+00	5 06E-03	8 95E-03
Cl-36	4 4441E-31	191,368 36	338,505 35	0 00E+00	8 50E-26	1 50E-25
Cm-243	5 0498E-06	191,368 36	338,505 35	0 00E+00	9 66E-01	1 71E+00
Cm-244	3 8451E-03	191,368 36	338,505 35	0 00E+00	7.36E+02	1 30E+03
Co-60	2 5225E-05	191,368 36	338,505 35	0 00E+00	4 83E+00	8 54E+00
Cs-134	1 9830E-03	191,368 36	338,505 35	0 00E+00	3 79E+02	6 71E+02
Cs-135	4.2564E-06	191,368 36	338,505 35	0 00E+00	8.15E-01	1 44E+00
Cs-137	1 8141E+00	191,368 36	338,505 35	0 00E+00	3 47E+05	6 14E+05
Eu-154	3.4733E-02	191,368 36	338,505 35	0 00E+00	6 65E+03	1 18E+04
Eu-155	7.1081E-03	191,368 36	338,505.35	0 00E+00	1 36E+03	2 41E+03
Fe-55	3.5790E-04	191,368 36	338,505.35	0 00E+00	6 85E+01	1 21E+02
H-3	3 4945E-03	191,368 36	338,505.35	0 00E+00	6 69E+02	1 18E+03
I-129	6 6403E-07	191,368.36	338,505.35	0 00E+00	1 27E-01	2 25E-01
Kr-85	7 8250E-02	191,368.36	338,505 35	0 00E+00	1 50E+04	2 65E+04
Np-237	3 1567E-05	191,368.36	338,505 35	0 00E+00	6 04E+00	1 07E+01
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
Tl-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

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg MeV	
0 0150	3 173E+16
0 0250	6.532E+15
0 0375	5 767E+15
0 0575	6 151E+15
0 0850	3 702E+15
0 1250	2.569E+15
0 2250	3 196E+15
0 3750	1 383E+15
0 5750	2 294E+16
0 8500	4 518E+14
1 2500	3 049E+14
1 7500	1.262E+13
2.2500	6 803E+08
2 7500	5 848E+08
3.5000	2 008E+07
5 0000	8.511E+06
7.0000	9 762E+05
11 0000	1 118E+05

Thermal Power

Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
4 96E+03	8 78E+03
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 %	93.33333333	40 to 100

Basis for Parameter Differences:

Burnup Summary (MWd)[1]

	From SFD	Estimated	Basis for burnup used in estimate:
Nominal:		191,368 36	Nominal burnup calculated from the heavy metal mass destroyed.
Bounding:	190.365 00	338,505.35	Bounding burnup calculated assuming all BOL heavy metal burned.

Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup
Nominal	1 19	
Bounding	2.11	1 78

Estimated EOL HM/Given EOL HM: 1 03

[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: 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

[1]Fuel decay start date: 1997
Estimates as of: 2030
Template: HFBR (Heavy Water, Alum , 40 to 100%, U)
[2]Template 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

Radionuclide	m: Ci/MWd From Template	x_n: Nominal Fuel Burnup (MWd)[2]	x_b: Bounding Fuel Burnup (MWd)[2]	b: Initial Activity (Ci)	y_n: Nominal Fuel Inventories(Ci)	y_b: Bounding Fuel Inventories(Ci)
Ac-227	5 4520E-10	35,243 24	66,463 11	0 00E+00	1 92E-05	3 62E-05
Am-241	9.2284E-03	35,243 24	66,463 11	0 00E+00	3.25E+02	6 13E+02
Am-242m	1.3390E-06	35,243 24	66,463 11	0 00E+00	4 72E-02	8 90E-02
Am-243	3 7084E-05	35,243 24	66,463 11	0 00E+00	1 31E+00	2 46E+00
C-14	2 6452E-08	35,243.24	66,463 11	0 00E+00	9 32E-04	1.76E-03
Cl-36	4 4441E-31	35,243.24	66,463 11	0 00E+00	1.57E-26	2 95E-26
Cm-243	5 0498E-06	35,243.24	66,463 11	0 00E+00	1.78E-01	3 36E-01
Cm-244	3 8451E-03	35,243.24	66,463.11	0 00E+00	1.36E+02	2.56E+02
Co-60	2 5225E-05	35,243.24	66,463 11	0 00E+00	8 89E-01	1 68E+00
Cs-134	1 9830E-03	35,243 24	66,463 11	0 00E+00	6 99E+01	1.32E+02
Cs-135	4.2564E-06	35,243 24	66,463 11	0 00E+00	1 50E-01	2 83E-01
Cs-137	1.8141E+00	35,243 24	66,463 11	0 00E+00	6 39E+04	1 21E+05
Eu-154	3 4733E-02	35,243 24	66,463 11	0 00E+00	1 22E+03	2.31E+03
Eu-155	7 1081E-03	35,243 24	66,463 11	0.00E+00	2 51E+02	4 72E+02
Fe-55	3 5790E-04	35,243.24	66,463 11	0 00E+00	1 26E+01	2.38E+01
H-3	3 4945E-03	35,243.24	66,463 11	0 00E+00	1.23E+02	2.32E+02
I-129	6 6403E-07	35,243.24	66,463 11	0 00E+00	2.34E-02	4 41E-02
Kr-85	7 8250E-02	35,243.24	66,463 11	0 00E+00	2.76E+03	5 20E+03
Np-237	3 1567E-05	35,243.24	66,463.11	0 00E+00	1 11E+00	2 10E+00
Pa-231	1.3372E-09	35,243.24	66,463 11	0 00E+00	4 71E-05	8 89E-05
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
Tl-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

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg MeV	
0 0150	6.231E+15
0 0250	1.282E+15
0 0375	1 132E+15
0 0575	1.208E+15
0 0850	7.269E+14
0 1250	5.044E+14
0.2250	6.274E+14
0 3750	2 716E+14
0 5750	4.504E+15
0 8500	8 871E+13
1.2500	5 987E+13
1 7500	2 478E+12
2.2500	1 336E+08
2 7500	1 148E+08
3 5000	3 942E+06
5 0000	1.671E+06
7 0000	1.917E+05
11 0000	2 195E+04

Thermal Power

Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
9 14E+02	1 72E+03
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 %	93 17430199	40 to 100

Basis for Parameter Differences:

Burnup Summary (MWd)[2]

	From SFD	Estimated
Nominal	43.29	35,243.24
Bounding		66 463 11

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 12	814 05
Bounding	2.11	

Estimated EOL HM/Given EOL HM: 1 02

[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: 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

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

Estimated Canister usage: 18"x10': 0 67

II. Estimates

Radionuclide	m Ci/MWd From Template	x_n Nominal Fuel Burnup (MWd)[2]	x_b Bounding Fuel Burnup (MWd)[2]	b Initial Activity (Ci)	y_n Nominal Fuel Inventories(Ci)	y_b Bounding Fuel Inventories(Ci)
Ac-227	2 0068E-09	64 59	129.19	0 00E+00	1 30E-07	2 59E-07
Am-241	2 5251E-03	64 59	129 19	0 00E+00	1 63E-01	3 26E-01
Am-242m	3 9624E-07	64 59	129 19	0 00E+00	2 56E-05	5 12E-05
Am-243	1.4880E-06	64 59	129 19	0 00E+00	9 61E-05	1 92E-04
C-14	5 7053E-09	64 59	129 19	0 00E+00	3 69E-07	7 37E-07
Cl-36	1.3124E-32	64 59	129 19	0 00E+00	8 48E-31	1 70E-30
Cm-243	1.1419E-07	64 59	129 19	0 00E+00	7 38E-06	1 48E-05
Cm-244	1 6522E-05	64 59	129 19	0 00E+00	1 07E-03	2 13E-03
Co-60	7 4047E-07	64 59	129 19	0 00E+00	4 78E-05	9 57E-05
Cs-134	2 0455E-05	64 59	129 19	0 00E+00	1 32E-03	2 64E-03
Cs-135	3 4477E-06	64 59	129 19	0 00E+00	2 23E-04	4 45E-04
Cs-137	1 4365E+00	64 59	129 19	0 00E+00	9 28E+01	1 86E+02
Eu-154	7 3230E-03	64 59	129 19	0 00E+00	4 73E-01	9 46E-01
Eu-155	5 9259E-04	64 59	129 19	0 00E+00	3 83E-02	7 66E-02
Fe-55	2 2791E-06	64 59	129 19	0 00E+00	1 47E-04	2 94E-04
H-3	1 9698E-03	64 59	129 19	0 00E+00	1.27E-01	2.54E-01
I-129	7 5300E-07	64 59	129 19	0 00E+00	4 86E-05	9.73E-05
Kr-85	4 1176E-02	64 59	129.19	0 00E+00	2 66E+00	5 32E+00
Np-237	9 5752E-06	64 59	129.19	0 00E+00	6.19E-04	1 24E-03
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
Tl-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

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg. MeV	
0 0150	9.515E+12
0 0250	1.976E+12
0 0375	1 717E+12
0 0575	1.848E+12
0 0850	1 114E+12
0 1250	7 357E+11
0.2250	9 616E+11
0.3750	4 183E+11
0 5750	6 913E+12
0 8500	8.445E+10
1.2500	4 084E+10
1.7500	2.299E+09
2.2500	1 922E+05
2.7500	1 834E+05
3.5000	1 069E+02
5 0000	4 368E+01
7 0000	4 781E+00
11 0000	5.331E-01

Thermal Power

Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
1 08E+00	2.16E+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 %:	93.25425219	60 to 100

Basis for Parameter Differences:

Burnup Summary (MWd)[2]

	From SFD	Estimated	Basis for burnup used in estimate:
Nominal		64 59	Nominal burnup assumed to be 2% of BOL heavy metal mass.
Bounding		129 19	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

[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: 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

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

Estimated Canister usage

18"x10'
1.25

II. Estimates

Radionuclide	m Ci/MWd From Template	x_n Nominal Fuel Burnup (MWd)[2]	x_b Bounding Fuel Burnup (MWd)[2]	b Initial Activity (Ci)	y_n Nominal Fuel Inventories(Ci)	y_b Bounding Fuel Inventories(Ci)
Ac-227	1 4545E-10	495.31	990 62	0 00E+00	7 20E-08	1 44E-07
Am-241	1 1190E-03	495 31	990 62	0 00E+00	5 54E-01	1 11E+00
Am-242m	4 5425E-07	495 31	990 62	0 00E+00	2 25E-04	4 50E-04
Am-243	1 4921E-06	495 31	990 62	0 00E+00	7.39E-04	1 48E-03
C-14	5 7244E-09	495 31	990 62	0 00E+00	2 84E-06	5 67E-06
Cl-36	1 3124E-32	495 31	990 62	0 00E+00	6 50E-30	1.30E-29
Cm-243	2 3676E-07	495 31	990 62	0 00E+00	1 17E-04	2.35E-04
Cm-244	5.2042E-05	495.31	990 62	0 00E+00	2.58E-02	5 16E-02
Co-60	3 8208E-05	495.31	990 62	0 00E+00	1 89E-02	3 78E-02
Cs-134	4 8693E-01	495.31	990 62	0 00E+00	2 41E+02	4 82E+02
Cs-135	3 4477E-06	495.31	990 62	0 00E+00	1 71E-03	3 42E-03
Cs-137	2 8731E+00	495 31	990 62	0 00E+00	1 42E+03	2 85E+03
Eu-154	8 2053E-02	495 31	990 62	0 00E+00	4 06E+01	8 13E+01
Eu-155	3 9134E-02	495 31	990 62	0 00E+00	1 94E+01	3 88E+01
Fe-55	6 7429E-03	495 31	990 62	0 00E+00	3 34E+00	6 68E+00
H-3	1 0599E-02	495 31	990 62	0 00E+00	5.25E+00	1.05E+01
I-129	7.5300E-07	495 31	990 62	0 00E+00	3 73E-04	7 46E-04
Kr-85	2 8595E-01	495.31	990 62	0 00E+00	1.42E+02	2 83E+02
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 9055E-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
Tl-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

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg MeV	
0 0150	1 911E+14
0 0250	4 117E+13
0 0375	3 799E+13
0 0575	3 736E+13
0 0850	2.382E+13
0 1250	2 063E+13
0.2250	2 019E+13
0 3750	9 771E+12
0 5750	1 342E+14
0 8500	1 880E+13
1.2500	3.497E+12
1 7500	1 466E+11
2.2500	3 076E+11
2 7500	1 770E+09
3 5000	1.963E+08
5 0000	6 030E+02
7 0000	6 728E+01
11.0000	7 588E+00

Thermal Power

Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
2 51E+01	5 02E+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 %	19 76578383	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		495.31
Bounding		990 62

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

[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: 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

[1]Fuel decay start date: 1992
Estimates as of: 2030
Template: ATR (Light Water, Alum , 60 to 100%, U)
[2]Template Burnup(MWd): 367.2
Template BOL Heavy Metal Mass (MT): 0 00116689
Template Decay Time: 35 years

Estimated Canister usage: 18"x10' 0 67

II. Estimates

	m	x_n	x_b	b	y_n	y_b
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	848 64	1,021 63	0 00E+00	1.70E-06	2 05E-06
Am-241	2 5251E-03	848 64	1,021 63	0 00E+00	2.14E+00	2 58E+00
Am-242m	3 9624E-07	848 64	1,021 63	0 00E+00	3.36E-04	4 05E-04
Am-243	1 4880E-06	848.64	1,021 63	0 00E+00	1.26E-03	1 52E-03
C-14	5 7053E-09	848 64	1,021 63	0 00E+00	4 84E-06	5 83E-06
Cl-36	1 3124E-32	848 64	1,021 63	0 00E+00	1 11E-29	1 34E-29
Cm-243	1 1419E-07	848 64	1,021 63	0 00E+00	9 69E-05	1 17E-04
Cm-244	1 6522E-05	848 64	1,021 63	0 00E+00	1 40E-02	1 69E-02
Co-60	7 4047E-07	848 64	1,021 63	0 00E+00	6 28E-04	7 56E-04
Cs-134	2 0455E-05	848 64	1,021 63	0 00E+00	1 74E-02	2 09E-02
Cs-135	3 4477E-06	848 64	1,021 63	0 00E+00	2 93E-03	3 52E-03
Cs-137	1 4365E+00	848 64	1,021 63	0 00E+00	1.22E+03	1 47E+03
Eu-154	7 3230E-03	848 64	1,021 63	0 00E+00	6.21E+00	7 48E+00
Eu-155	5 9259E-04	848 64	1,021 63	0 00E+00	5 03E-01	6 05E-01
Fe-55	2 2791E-06	848 64	1,021 63	0 00E+00	1.93E-03	2 33E-03
H-3	1 9698E-03	848.64	1,021 63	0 00E+00	1 67E+00	2 01E+00
I-129	7 5300E-07	848 64	1,021 63	0 00E+00	6 39E-04	7 69E-04
Kr-85	4 1176E-02	848 64	1,021 63	0 00E+00	3 49E+01	4 21E+01
Np-237	9 5752E-06	848 64	1,021 63	0 00E+00	8 13E-03	9 78E-03
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
Tl-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

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg MeV	
0 0150	7 524E+13
0 0250	1 562E+13
0.0375	1.358E+13
0.0575	1 462E+13
0 0850	8.808E+12
0 1250	5.818E+12
0.2250	7.604E+12
0 3750	3.308E+12
0 5750	5 467E+13
0 8500	6 678E+11
1 2500	3.230E+11
1 7500	1 818E+10
2.2500	1 520E+06
2 7500	1 451E+06
3 5000	8 408E+02
5 0000	3 436E+02
7 0000	3 760E+01
11 0000	4 192E+00

Thermal Power

Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
1 42E+01	1 71E+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 %	93.1372549	60 to 100

Basis for Parameter Differences:

Burnup Summary (MWd)[2]

	From SFD	Estimated	Basis for burnup used in estimate:
Nominal	848 64	700.04	Nominal burnup taken directly from SFD (converted to MWd)
Bounding	1 021 63	1 400.07	Bounding burnup taken directly from SFD (converted to MWd).

Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup
Nominal	0.83	0 82
Bounding	0 99	1 37

Estimated EOL HM/Given EOL HM: 0 96

[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: 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

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

Estimated Canister usage 18"x10": 1.83

II. Estimates

Radionuclide	m Ci/MWd From Template	x_n Nominal Fuel Burnup (MWd)[2]	x_b Bounding Fuel Burnup (MWd)[2]	b Initial Activity (Ci)	y_n Nominal Fuel Inventories(Ci)	y_b Bounding Fuel Inventories(Ci)
Ac-227	2.0068E-09	3,665.55	4,475.50	0.00E+00	7.36E-06	8.98E-06
Am-241	2.5251E-03	3,665.55	4,475.50	0.00E+00	9.26E+00	1.13E+01
Am-242m	3.9624E-07	3,665.55	4,475.50	0.00E+00	1.45E-03	1.77E-03
Am-243	1.4880E-06	3,665.55	4,475.50	0.00E+00	5.45E-03	6.66E-03
C-14	5.7053E-09	3,665.55	4,475.50	0.00E+00	2.09E-05	2.55E-05
Cl-36	1.3124E-32	3,665.55	4,475.50	0.00E+00	4.81E-29	5.87E-29
Cm-243	1.1419E-07	3,665.55	4,475.50	0.00E+00	4.19E-04	5.11E-04
Cm-244	1.6522E-05	3,665.55	4,475.50	0.00E+00	6.06E-02	7.39E-02
Co-60	7.4047E-07	3,665.55	4,475.50	0.00E+00	2.71E-03	3.31E-03
Cs-134	2.0455E-05	3,665.55	4,475.50	0.00E+00	7.50E-02	9.15E-02
Cs-135	3.4477E-06	3,665.55	4,475.50	0.00E+00	1.26E-02	1.54E-02
Cs-137	1.4365E+00	3,665.55	4,475.50	0.00E+00	5.27E+03	6.43E+03
Eu-154	7.3230E-03	3,665.55	4,475.50	0.00E+00	2.68E+01	3.28E+01
Eu-155	5.9259E-04	3,665.55	4,475.50	0.00E+00	2.17E+00	2.65E+00
Fe-55	2.2791E-06	3,665.55	4,475.50	0.00E+00	8.35E-03	1.02E-02
H-3	1.9698E-03	3,665.55	4,475.50	0.00E+00	7.22E+00	8.82E+00
I-129	7.5300E-07	3,665.55	4,475.50	0.00E+00	2.76E-03	3.37E-03
Kr-85	4.1176E-02	3,665.55	4,475.50	0.00E+00	1.51E+02	1.84E+02
Np-237	9.5752E-06	3,665.55	4,475.50	0.00E+00	3.51E-02	4.29E-02
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
Tl-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

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg MeV	
0.0150	3.296E+14
0.0250	6.845E+13
0.0375	5.949E+13
0.0575	6.404E+13
0.0850	3.858E+13
0.1250	2.549E+13
0.2250	3.331E+13
0.3750	1.449E+13
0.5750	2.395E+14
0.8500	2.925E+12
1.2500	1.415E+12
1.7500	7.964E+10
2.2500	6.658E+06
2.7500	6.355E+06
3.5000	3.682E+03
5.0000	1.505E+03
7.0000	1.647E+02
11.0000	1.836E+01

Thermal Power

Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
5.13E+01	7.49E+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 %	93.22033898	60 to 100

Basis for Parameter Differences:

Burnup Summary (MWd)[2]

	From SFD	Estimated	Basis for burnup used in estimate:
Nominal	3,665.55	2,954.32	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
Nominal	1.12	0.81
Bounding	1.37	1.32

Estimated EOL HM/Given EOL HM: 0.93

[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: 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

[1]Fuel decay start date: 1992
Estimates as of: 2030
Template: ATR (Light Water, Alum , 60 to 100%, U)
[2]Template Burnup(MWd): 367.2
Template BOL Heavy Metal Mass (MT): 0 00116689
Template Decay Time: 35 years

Estimated Canister usage: 18"x10' = 1 13

II. Estimates

	m	x_n	x_b	b	y_n	y_b
Radionuclide	Ci/MWd From Template	Nominal Fuel Burnup (MWd)[2]	Bounding Fuel Burnup (MWd)[2]	Initial Activity (Ci)	Nominal Fuel Inventones(Ci)	Bounding Fuel Inventories(Ci)
Ac-227	2 0068E-09	1,559 25	2,949 75	0 00E+00	3.13E-06	5 92E-06
Am-241	2 5251E-03	1,559 25	2,949 75	0 00E+00	3 94E+00	7 45E+00
Am-242m	3 9624E-07	1,559.25	2,949 75	0 00E+00	6 18E-04	1 17E-03
Am-243	1 4880E-06	1,559.25	2,949 75	0 00E+00	2 32E-03	4.39E-03
C-14	5 7053E-09	1,559.25	2,949 75	0 00E+00	8 90E-06	1 68E-05
Cl-36	1.3124E-32	1,559.25	2,949 75	0 00E+00	2 05E-29	3 87E-29
Cm-243	1 1419E-07	1,559.25	2,949 75	0 00E+00	1 78E-04	3 37E-04
Cm-244	1 6522E-05	1,559.25	2,949 75	0 00E+00	2 58E-02	4 87E-02
Co-60	7 4047E-07	1,559 25	2,949 75	0 00E+00	1 15E-03	2 18E-03
Cs-134	2 0455E-05	1,559.25	2,949 75	0 00E+00	3 19E-02	6 03E-02
Cs-135	3 4477E-06	1,559 25	2,949 75	0 00E+00	5 38E-03	1 02E-02
Cs-137	1 4365E+00	1,559 25	2,949 75	0 00E+00	2.24E+03	4 24E+03
Eu-154	7 3230E-03	1,559 25	2,949 75	0 00E+00	1.14E+01	2.16E+01
Eu-155	5 9259E-04	1,559 25	2,949 75	0 00E+00	9 24E-01	1.75E+00
Fe-55	2 2791E-06	1,559 25	2,949 75	0 00E+00	3 55E-03	6 72E-03
H-3	1 9698E-03	1,559 25	2,949.75	0 00E+00	3 07E+00	5 81E+00
I-129	7 5300E-07	1,559.25	2,949 75	0 00E+00	1.17E-03	2.22E-03
Kr-85	4 1176E-02	1,559.25	2,949 75	0 00E+00	6 42E+01	1.21E+02
Np-237	9 5752E-06	1,559.25	2,949 75	0 00E+00	1 49E-02	2 82E-02
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
Tl-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

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg MeV	
0 0150	2.173E+14
0.0250	4 511E+13
0 0375	3 921E+13
0 0575	4.221E+13
0 0850	2 543E+13
0 1250	1 680E+13
0 2250	2.195E+13
0 3750	9 551E+12
0 5750	1 579E+14
0 8500	1 928E+12
1.2500	9 326E+11
1 7500	5.249E+10
2.2500	4 388E+06
2 7500	4 189E+06
3 5000	2 427E+03
5 0000	9 918E+02
7 0000	1 085E+02
11.0000	1.210E+01

Thermal Power

Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
2.61E+01	4 94E+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 %	93 048	60 to 100

Basis for Parameter Differences:

Burnup Summary (MWd)[2]

	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

[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: 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

[1]Fuel decay start date: 1966
Estimates as of: 2030
Template: ATR (Light Water, Alum , 60 to 100% U)
[2]Template Burnup(MWd): 367.2
Template BOL Heavy Metal Mass (MT): 0 00116689
Template Decay Time: 50 years

Estimated Canister usage: 18"x10' = 2 69

II. Estimates

Radionuclide	m Ci/MWd From Template	x_n Nominal Fuel Burnup (MWd)[2]	x_b Bounding Fuel Burnup (MWd)[2]	b Initial Activity (Ci)	y_n Nominal Fuel Inventories(Ci)	y_b Bounding Fuel Inventories(Ci)
Ac-227	2 9739E-09	8,396 08	16,792.17	0 00E+00	2.50E-05	4 99E-05
Am-241	2 5986E-03	8,396 08	16,792.17	0 00E+00	2 18E+01	4.36E+01
Am-242m	3 7010E-07	8,396 08	16,792 17	0 00E+00	3 11E-03	6 21E-03
Am-243	1 4858E-06	8,396 08	16,792 17	0 00E+00	1.25E-02	2 50E-02
C-14	5 6944E-09	8,396 08	16,792 17	0 00E+00	4 78E-05	9 56E-05
Cl-36	1.3124E-32	8,396 08	16,792 17	0 00E+00	1 10E-28	2.20E-28
Cm-243	7 9303E-08	8,396 08	16,792 17	0 00E+00	6 66E-04	1.33E-03
Cm-244	9 3083E-06	8,396 08	16,792 17	0 00E+00	7 82E-02	1.56E-01
Co-60	1 0310E-07	8 396 08	16,792.17	0 00E+00	8 66E-04	1 73E-03
Cs-134	1 3254E-07	8,396 08	16,792.17	0 00E+00	1 11E-03	2 23E-03
Cs-135	3 4477E-06	8,396 08	16,792 17	0 00E+00	2 89E-02	5 79E-02
Cs-137	1 0161E+00	8,396 08	16,792 17	0 00E+00	8 53E+03	1 71E+04
Eu-154	2 1879E-03	8,396 08	16,792 17	0 00E+00	1 84E+01	3 67E+01
Eu-155	7.2930E-05	8,396 08	16,792 17	0 00E+00	6 12E-01	1.22E+00
Fe-55	4 1912E-08	8,396.08	16,792 17	0 00E+00	3 52E-04	7 04E-04
H-3	8 4913E-04	8,396 08	16,792 17	0.00E+00	7.13E+00	1 43E+01
I-129	7.5300E-07	8,396 08	16,792.17	0 00E+00	6.32E-03	1 26E-02
Kr-85	1 5615E-02	8,396 08	16,792 17	0 00E+00	1.31E+02	2 62E+02
Np-237	9 5861E-06	8,396 08	16,792 17	0 00E+00	8 05E-02	1 61E-01
Pa-231	5 0790E-09	8,396 08	16,792 17	0 00E+00	4 26E-05	8.53E-05
Pb-210	6 6176E-10	8,396 08	16,792 17	0 00E+00	5 56E-06	1 11E-05
Pm-147	1.7606E-05	8,396 08	16,792 17	0 00E+00	1 48E-01	2 96E-01
Pu-238	1 4406E-02	8,396.08	16,792 17	0 00E+00	1.21E+02	2 42E+02
Pu-239	4 2783E-04	8,396 08	16,792.17	0 00E+00	3.59E+00	7 18E+00
Pu-240	2 4297E-04	8,396 08	16,792 17	0 00E+00	2 04E+00	4 08E+00
Pu-241	7 8949E-03	8,396 08	16,792 17	0 00E+00	6 63E+01	1.33E+02
Pu-242	3 6329E-07	8,396 08	16,792 17	0 00E+00	3 05E-03	6 10E-03
Ra-226	1.5169E-09	8,396 08	16,792 17	0 00E+00	1.27E-05	2 55E-05
Ra-228	4.2429E-14	8,396 08	16,792.17	0 00E+00	3 56E-10	7 12E-10
Ru-106	7 0833E-15	8,396 08	16,792 17	0 00E+00	5.95E-11	1 19E-10
Se-79	1.2928E-05	8,396 08	16,792.17	0 00E+00	1 09E-01	2 17E-01
Sn-126	1 1571E-05	8,396 08	16,792 17	0 00E+00	9 72E-02	1.94E-01
Sr-90	9 4308E-01	8,396 08	16,792 17	0 00E+00	7 92E+03	1.58E+04
Tc-99	4.2239E-04	8,396 08	16,792 17	0 00E+00	3 55E+00	7.09E+00
Th-229	1.7968E-11	8,396 08	16,792 17	0 00E+00	1.51E-07	3 02E-07
Th-230	1.0855E-07	8,396 08	16,792 17	0 00E+00	9 11E-04	1 82E-03
Th-232	4 9809E-14	8,396 08	16,792 17	0 00E+00	4 18E-10	8 36E-10
Tl-208	3 4995E-08	8,396 08	16,792.17	0 00E+00	2 94E-04	5 88E-04
U-232	9 4798E-08	8,396 08	16,792.17	0 00E+00	7 96E-04	1.59E-03
U-233	4.2538E-09	8,396 08	16,792 17	0 00E+00	3 57E-05	7 14E-05
U-234	1 8617E-04	8,396 08	16,792 17	0 00E+00	1 56E+00	3 13E+00
U-235	-2 7235E-06	8,396 08	0 00	5 97E-02	3 68E-02	5 97E-02
U-236	1.5493E-05	8,396 08	16,792 17	0 00E+00	1.30E-01	2 60E-01
U-238	-4 2851E-09	8,396 08	0 00	6 82E-04	6 46E-04	6 82E-04
Y-90	9 4308E-01	8,396.08	16,792 17	0 00E+00	7.92E+03	1.58E+04
Other Radionuclides					8 14E+03	1.63E+04

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg MeV	
0.0150	8 652E+14
0 0250	1 796E+14
0 0375	1.561E+14
0 0575	1 681E+14
0 0850	1 012E+14
0 1250	6 611E+13
0.2250	8 728E+13
0.3750	3 802E+13
0 5750	6.352E+14
0 8500	6.805E+12
1.2500	2 752E+12
1 7500	1 803E+11
2.2500	1 749E+07
2 7500	2.065E+07
3 5000	1 133E+04
5 0000	4 605E+03
7 0000	5 007E+02
11 0000	5.562E+01

Thermal Power

Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
9 95E+01	1.99E+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 15626243	60 to 100

Basis for Parameter Differences:

Burnup Summary (MWd)[2]

	From SFD	Estimated
Nominal		8 396 08
Bounding		16 792.17

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

Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup
Nominal	0 90	
Bounding	1.80	

Estimated EOL HM/Given EOL HM: 1 02

[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: 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

[1]Fuel decay start date: 1966
Estimates as of: 2030
Template: ATR (Light Water, Alum , 60 to 100%, U)
[2]Template Burnup(MWd): 367.2
Template BOL Heavy Metal Mass (MT): 0 00116689
Template Decay Time: 50 years

Estimated Canister usage: 18"x10" = 0 11

II. Estimates

Radionuclide	m: Ci/MWd From Template	x_n: Nominal Fuel Burnup (MWd)[2]	x_b: Bounding Fuel Burnup (MWd)[2]	b: Initial Activity (Ci)	y_n: Nominal Fuel Inventories(Ci)	y_b: Bounding Fuel Inventories(Ci)
Ac-227	2 9739E-09	386 76	678 07	0 00E+00	1 15E-06	2 02E-06
Am-241	2 5986E-03	386 76	678 07	0 00E+00	1 01E+00	1 76E+00
Am-242m	3 7010E-07	386 76	678 07	0 00E+00	1 43E-04	2 51E-04
Am-243	1 4858E-06	386 76	678 07	0 00E+00	5 75E-04	1 01E-03
C-14	5 6944E-09	386 76	678 07	0 00E+00	2.20E-06	3 86E-06
Cl-36	1 3124E-32	386.76	678 07	0 00E+00	5 08E-30	8 90E-30
Cm-243	7 9303E-08	386.76	678 07	0 00E+00	3 07E-05	5 38E-05
Cm-244	9 3083E-06	386.76	678 07	0 00E+00	3 60E-03	6 31E-03
Co-60	1 0310E-07	386 76	678 07	0 00E+00	3 99E-05	6 99E-05
Cs-134	1 3254E-07	386 76	678 07	0 00E+00	5 13E-05	8 99E-05
Cs-135	3 4477E-06	386 76	678 07	0 00E+00	1 33E-03	2.34E-03
Cs-137	1 0161E+00	386 76	678 07	0 00E+00	3 93E+02	6 89E+02
Eu-154	2 1879E-03	386 76	678 07	0 00E+00	8 46E-01	1 48E+00
Eu-155	7 2930E-05	386 76	678.07	0 00E+00	2 82E-02	4.95E-02
Fe-55	4 1912E-08	386 76	678 07	0 00E+00	1 62E-05	2 84E-05
H-3	8 4913E-04	386 76	678 07	0 00E+00	3 28E-01	5 76E-01
I-129	7 5300E-07	386 76	678 07	0 00E+00	2 91E-04	5 11E-04
Kr-85	1 5615E-02	386 76	678 07	0 00E+00	6 04E+00	1 06E+01
Np-237	9 5861E-06	386 76	678 07	0 00E+00	3 71E-03	6 50E-03
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
Tl-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

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg MeV	
0.0150	3 494E+13
0 0250	7.252E+12
0 0375	6.302E+12
0 0575	6.789E+12
0 0850	4 086E+12
0 1250	2 670E+12
0 2250	3 524E+12
0 3750	1 535E+12
0 5750	2 565E+13
0 8500	2 748E+11
1.2500	1 111E+11
1 7500	7.280E+09
2.2500	7 061E+05
2.7500	8.337E+05
3.5000	4.572E+02
5.0000	1 859E+02
7 0000	2 021E+01
11 0000	2.245E+00

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

[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: ORR (U3SI2 LEU)
SNF ID #: 165
Fuel Units & Descr: 52 - 19 CURVED PLATES
Heavy Metal Mass: BOL=87.953kg, EOL=83.294kg
ROD Storage Site: SRS

[1]Fuel decay start date: 1987
Estimates as of: 2030
Template: ATR (Light Water, Alum , 60 to 100%, U)
[2]Template Burnup(MWd): 367.2
Template BOL Heavy Metal Mass (MT): 0 00116689
Template Decay Time: 35 years

Estimated Canister usage

18"x10'
1 44

II. Estimates

	m	x_n	x_b	b	y_n	y_b
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	4 412.35	8,824 71	0 00E+00	8.85E-06	1.77E-05
Am-241	2 5251E-03	4,412.35	8,824 71	0 00E+00	1.11E+01	2.23E+01
Am-242m	3 9624E-07	4,412.35	8,824 71	0 00E+00	1 75E-03	3.50E-03
Am-243	1 4880E-06	4,412.35	8,824 71	0 00E+00	6 57E-03	1.31E-02
C-14	5 7053E-09	4,412 35	8,824 71	0 00E+00	2 52E-05	5 03E-05
Cl-36	1 3124E-32	4,412 35	8,824 71	0 00E+00	5 79E-29	1 16E-28
Cm-243	1 1419E-07	4,412 35	8,824.71	0 00E+00	5 04E-04	1 01E-03
Cm-244	1 6522E-05	4,412 35	8,824 71	0 00E+00	7 29E-02	1 46E-01
Co-60	7 4047E-07	4,412 35	8,824 71	0 00E+00	3 27E-03	6 53E-03
Cs-134	2 0455E-05	4,412 35	8,824 71	0 00E+00	9 03E-02	1 81E-01
Cs-135	3 4477E-06	4,412 35	8,824 71	0 00E+00	1.52E-02	3 04E-02
Cs-137	1 4365E+00	4,412 35	8,824 71	0 00E+00	6 34E+03	1.27E+04
Eu-154	7.3230E-03	4,412.35	8,824 71	0 00E+00	3.23E+01	6 46E+01
Eu-155	5 9259E-04	4,412.35	8,824 71	0 00E+00	2 61E+00	5.23E+00
Fe-55	2 2791E-06	4,412 35	8,824 71	0 00E+00	1 01E-02	2 01E-02
H-3	1 9698E-03	4,412 35	8,824 71	0 00E+00	8 69E+00	1 74E+01
I-129	7 5300E-07	4,412 35	8,824 71	0 00E+00	3 32E-03	6 64E-03
Kr-85	4 1176E-02	4,412 35	8,824 71	0 00E+00	1 82E+02	3 63E+02
Np-237	9 5752E-06	4,412 35	8,824 71	0 00E+00	4.22E-02	8 45E-02
Pa-231	3.9379E-09	4,412 35	8,824 71	0 00E+00	1.74E-05	3 48E-05
Pb-210	3.3115E-10	4,412 35	8,824 71	0 00E+00	1.46E-06	2.92E-06
Pm-147	9.2402E-04	4,412.35	8,824 71	0 00E+00	4 08E+00	8.15E+00
Pu-238	1 6217E-02	4 412.35	8,824 71	0 00E+00	7.16E+01	1 43E+02
Pu-239	4.2810E-04	4,412.35	8,824 71	0 00E+00	1 89E+00	3 78E+00
Pu-240	2 4333E-04	4,412 35	8,824 71	0 00E+00	1 07E+00	2 15E+00
Pu-241	1 6242E-02	4,412.35	8,824 71	0 00E+00	7 17E+01	1 43E+02
Pu-242	3 6329E-07	4,412 35	8,824.71	0 00E+00	1 60E-03	3.21E-03
Ra-226	9 0114E-10	4,412 35	8,824.71	0 00E+00	3 98E-06	7.95E-06
Ra-228	3 1019E-14	4,412 35	8,824 71	0 00E+00	1.37E-10	2.74E-10
Ru-106	2.1225E-10	4,412 35	8,824 71	0 00E+00	9.37E-07	1.87E-06
Se-79	1.2930E-05	4,412.35	8,824 71	0 00E+00	5 71E-02	1 14E-01
Sn-126	1 1571E-05	4,412.35	8,824 71	0 00E+00	5 11E-02	1 02E-01
Sr-90	1.3472E+00	4,412.35	8,824 71	0 00E+00	5 94E+03	1 19E+04
Tc-99	4.2239E-04	4,412.35	8,824 71	0 00E+00	1 86E+00	3 73E+00
Th-229	1.2407E-11	4,412 35	8,824 71	0 00E+00	5 47E-08	1 09E-07
Th-230	8 3497E-08	4,412 35	8,824 71	0 00E+00	3 68E-04	7.37E-04
Th-232	3 8371E-14	4,412 35	8,824.71	0 00E+00	1 69E-10	3 39E-10
Tl-208	4 0414E-08	4,412 35	8,824.71	0.00E+00	1.78E-04	3.57E-04
U-232	1.0948E-07	4,412 35	8,824 71	0 00E+00	4.83E-04	9 66E-04
U-233	3 6275E-09	4,412.35	8,824 71	0 00E+00	1 60E-05	3 20E-05
U-234	1 8562E-04	4 412.35	8,824 71	0 00E+00	8 19E-01	1 64E+00
U-235	-2 7235E-06	4,412.35	0 00	3 81E-02	2 61E-02	3 81E-02
U-236	1 5493E-05	4,412.35	8,824 71	0 00E+00	6 84E-02	1.37E-01
U-238	-4.2851E-09	4,412.35	0 00	2 36E-02	2 36E-02	2 36E-02
Y-90	1 3475E+00	4,412 35	8,824 71	0 00E+00	5 95E+03	1 19E+04
Other Radionuclides					6 04E+03	1.21E+04

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg MeV	
0 0150	6 499E+14
0 0250	1.350E+14
0 0375	1 173E+14
0 0575	1.263E+14
0 0850	7.608E+13
0 1250	5 025E+13
0.2250	6 568E+13
0 3750	2.857E+13
0 5750	4 722E+14
0 8500	5 768E+12
1.2500	2 790E+12
1 7500	1.570E+11
2.2500	1.313E+07
2 7500	1.253E+07
3 5000	7.384E+03
5 0000	3 020E+03
7 0000	3 308E+02
11 0000	3 690E+01

Thermal Power

Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
7.38E+01	1.48E+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 %	20 03831236	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		4,412.35
Bounding		8 824 71

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	0.32	

Estimated EOL HM/Given EOL HM: 1.00

[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: ORR (U3Si2 LEU)
SNF ID #: 850
Fuel Units & Descr: 11 - ASSEMBLY
Heavy Metal Mass: BOL=11 076kg, EOL=9 908kg
ROD Storage Site: SRS

[1]Fuel decay start date: 1966
Estimates as of: 2030
Template: ATR (Light Water, Alum , 60 to 100%, U)
[2]Template Burnup(MWd): 367 2
Template BOL Heavy Metal Mass (MT): 0 00116689
Template Decay Time: 50 years

Estimated Canister usage

18"x10'
0 31

II. Estimates

	m	x_n	x_b	b	y_n	y_b
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 9739E-09	1,106 31	2,212 62	0 00E+00	3 29E-06	6 58E-06
Am-241	2 5986E-03	1,106 31	2,212 62	0 00E+00	2 87E+00	5 75E+00
Am-242m	3 7010E-07	1,106 31	2,212 62	0 00E+00	4 09E-04	8.19E-04
Am-243	1 4858E-06	1,106 31	2,212 62	0 00E+00	1 64E-03	3.29E-03
C-14	5 6944E-09	1,106 31	2,212 62	0 00E+00	6 30E-06	1.26E-05
Cl-36	1 3124E-32	1,106 31	2,212 62	0 00E+00	1 45E-29	2 90E-29
Cm-243	7 9303E-08	1,106 31	2,212 62	0 00E+00	8 77E-05	1.75E-04
Cm-244	9 3083E-06	1,106 31	2,212 62	0 00E+00	1 03E-02	2.06E-02
Co-60	1 0310E-07	1,106 31	2,212 62	0 00E+00	1.14E-04	2.28E-04
Cs-134	1 3254E-07	1,106 31	2,212 62	0 00E+00	1 47E-04	2 93E-04
Cs-135	3 4477E-06	1,106 31	2,212 62	0 00E+00	3 81E-03	7 63E-03
Cs-137	1 0161E+00	1,106 31	2,212 62	0 00E+00	1 12E+03	2 25E+03
Eu-154	2 1879E-03	1,106 31	2,212 62	0 00E+00	2 42E+00	4 84E+00
Eu-155	7 2930E-05	1,106 31	2,212 62	0 00E+00	8 07E-02	1 61E-01
Fe-55	4 1912E-08	1,106 31	2,212 62	0 00E+00	4 64E-05	9.27E-05
H-3	8 4913E-04	1,106 31	2,212 62	0 00E+00	9 39E-01	1 88E+00
I-129	7 5300E-07	1,106 31	2,212 62	0 00E+00	8 33E-04	1 67E-03
Kr-85	1 5615E-02	1,106 31	2,212 62	0 00E+00	1 73E+01	3 46E+01
Np-237	9 5861E-06	1,106 31	2,212 62	0 00E+00	1 06E-02	2 12E-02
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
Tl-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
U-233	4 2538E-09	1,106 31	2,212 62	0 00E+00	4 71E-06	9 41E-06
U-234	1 8617E-04	1,106 31	2,212 62	0 00E+00	2 06E-01	4.12E-01
U-235	-2.7235E-06	1,106 31	0 00	4 74E-03	1 73E-03	4.74E-03
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

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg MeV	-
0 0150	1 140E+14
0 0250	2.366E+13
0 0375	2 056E+13
0 0575	2.215E+13
0 0850	1 333E+13
0 1250	8 711E+12
0 2250	1 150E+13
0 3750	5 010E+12
0 5750	8.370E+13
0 8500	8 967E+11
1 2500	3 626E+11
1 7500	2.375E+10
2.2500	2.304E+06
2 7500	2.721E+06
3 5000	1 508E+03
5 0000	6 134E+02
7 0000	6 674E+01
11 0000	7 416E+00

Thermal Power

Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
1.31E+01	2.62E+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 %	19 81328831	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		1,106 31
Bounding		2,212 62

Basis for burnup used in estimate:

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

Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup
Nominal	0 32	
Bounding	0 63	

Estimated EOL HM/Given EOL HM: 1 01

[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. 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

[1]Fuel decay start date 1987
Estimates as of 2030
Template ATR (Light Water, Alum , 60 to 100%, U)
[2]Template Burnup(MWd). 367.2
Template BOL Heavy Metal Mass (MT) 0 00116689
Template Decay Time 35 years

Estimated Canister usage 18"x10' 1 38

II. Estimates

Radionuclide	m Ci/MWd From Template	x_n Nominal Fuel Burnup (MWd)[2]	x_b Bounding Fuel Burnup (MWd)[2]	b Initial Activity (Ci)	y_n Nominal Fuel Inventories(Ci)	y_b Bounding Fuel Inventories(Ci)
Ac-227	2 0068E-09	2,731.39	5,462 79	0 00E+00	5 48E-06	1 10E-05
Am-241	2.5251E-03	2,731 39	5,462 79	0 00E+00	6 90E+00	1.38E+01
Am-242m	3 9624E-07	2,731 39	5,462.79	0 00E+00	1 08E-03	2 16E-03
Am-243	1.4880E-06	2,731 39	5,462.79	0.00E+00	4 06E-03	8 13E-03
C-14	5 7053E-09	2,731 39	5,462.79	0 00E+00	1.56E-05	3 12E-05
Cl-36	1.3124E-32	2,731 39	5,462.79	0 00E+00	3 58E-29	7 17E-29
Cm-243	1 1419E-07	2,731 39	5,462 79	0 00E+00	3 12E-04	6.24E-04
Cm-244	1 6522E-05	2,731.39	5,462 79	0 00E+00	4 51E-02	9.03E-02
Co-60	7 4047E-07	2,731.39	5,462 79	0 00E+00	2 02E-03	4 05E-03
Cs-134	2 0455E-05	2,731.39	5,462 79	0 00E+00	5 59E-02	1 12E-01
Cs-135	3 4477E-06	2,731.39	5,462 79	0 00E+00	9 42E-03	1 88E-02
Cs-137	1 4365E+00	2,731.39	5,462 79	0 00E+00	3 92E+03	7 85E+03
Eu-154	7.3230E-03	2,731.39	5,462 79	0 00E+00	2 00E+01	4 00E+01
Eu-155	5 9259E-04	2,731 39	5,462 79	0 00E+00	1.62E+00	3 24E+00
Fe-55	2.2791E-06	2,731 39	5,462.79	0 00E+00	6.23E-03	1.25E-02
H-3	1 9698E-03	2,731 39	5,462.79	0 00E+00	5.38E+00	1 08E+01
I-129	7.5300E-07	2,731 39	5,462 79	0 00E+00	2 06E-03	4.11E-03
Kr-85	4 1176E-02	2,731 39	5,462 79	0 00E+00	1 12E+02	2.25E+02
Np-237	9 5752E-06	2,731 39	5,462 79	0 00E+00	2 62E-02	5.23E-02
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
Tl-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

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg MeV	
0 0150	4 023E+14
0 0250	8 355E+13
0 0375	7.262E+13
0 0575	7 816E+13
0 0850	4 710E+13
0 1250	3 111E+13
0.2250	4 066E+13
0.3750	1 769E+13
0.5750	2.923E+14
0 8500	3.571E+12
1.2500	1 727E+12
1 7500	9 720E+10
2.2500	8 127E+06
2.7500	7 757E+06
3.5000	4.574E+03
5.0000	1.871E+03
7.0000	2 049E+02
11.0000	2.286E+01

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

	From SFD	Used
Reactor Moderator	LIGHT WATER	LIGHT WATER
Fuel Cladding	ALUM	ALUM
BOL HM Constituents	U	U
BOL Enrichment %	19 818	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		2,731.39
Bounding		5 462 79

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 31	

Estimated EOL HM/Given EOL HM: 1 00

[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: 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

[1]Fuel decay start date: 1966
Estimates as of: 2030
Template: ATR (Light Water, Alum , 60 to 100%, U)
[2]Template Burnup(MWd): 367.2
Template BOL Heavy Metal Mass (MT): 0 00116689
Template Decay Time: 50 years

Estimated Canister usage 18"x10': 0 31

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 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		
Tl-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

	From SFD	Used
Reactor Moderator	LIGHT WATER	LIGHT WATER
Fuel Cladding	ALUM	ALUM
BOL HM Constituents	U	U
BOL Enrichment %	23 64708607	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		3,376.22
Bounding		6,752.44

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 49	
Bounding	0 97	

Estimated EOL HM/Given EOL HM: 1 01

[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: 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

[1]Fuel decay start date 1966
Estimates as of: 2030
Template (Worst Case)
[2]Template 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

Radionuclide	m Ci/MWd From Template	x_n Nominal Fuel Burnup (MWd)[2]	x_b Bounding Fuel Burnup (MWd)[2]	b Initial Activity (Ci)	y_n Nominal Fuel Inventones(Ci)	y_b Bounding Fuel Inventones(Ci)
Ac-227	2 5200E-06	66 52	66 52	0 00E+00	1 68E-04	1 68E-04
Am-241	8 6432E+00	66 52	66 52	0 00E+00	5 75E+02	5 75E+02
Am-242m	1.5728E-02	66 52	66 52	0 00E+00	1.05E+00	1 05E+00
Am-243	1 6288E-02	66 52	66.52	0 00E+00	1.08E+00	1 08E+00
C-14	1.2068E-01	66 52	66 52	0 00E+00	8 03E+00	8 03E+00
Cl-36	2 2849E-03	66 52	66 52	0 00E+00	1 52E-01	1.52E-01
Cm-243	6 0144E-04	66 52	66 52	0 00E+00	4 00E-02	4 00E-02
Cm-244	9 4880E-02	66 52	66 52	0 00E+00	6 31E+00	6.31E+00
Co-60	3 9052E+00	66 52	66 52	0 00E+00	2 60E+02	2 60E+02
Cs-134	2.2139E-06	66 52	66 52	0 00E+00	1.47E-04	1 47E-04
Cs-135	4.3976E-04	66 52	66 52	0 00E+00	2 93E-02	2 93E-02
Cs-137	1 4887E+01	66 52	66 52	0 00E+00	9 90E+02	9 90E+02
Eu-154	3 7342E-01	66 52	66 52	0 00E+00	2 48E+01	2 48E+01
Eu-155	8 4893E-03	66.52	66 52	0 00E+00	5 65E-01	5 65E-01
Fe-55	5 3750E-03	66 52	66 52	0 00E+00	3 58E-01	3 58E-01
H-3	1 0472E-01	66 52	66 52	0 00E+00	6 97E+00	6 97E+00
I-129	1 0618E-05	66 52	66 52	0 00E+00	7.06E-04	7 06E-04
Kr-85	2.2717E-01	66 52	66.52	0 00E+00	1.51E+01	1 51E+01
Np-237	1 6400E-04	66 52	66 52	0 00E+00	1 09E-02	1.09E-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
Tl-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
U-233	3 6128E-04	66 52	66.52	0 00E+00	2 40E-02	2 40E-02
U-234	1.2788E-02	66 52	66.52	0 00E+00	8 51E-01	8 51E-01
U-235	5 7486E-04	66 52	66 52	6 02E-05	3 83E-02	3 83E-02
U-236	2 3485E-04	66.52	66 52	0 00E+00	1.56E-02	1.56E-02
U-238	1 1581E-04	66.52	66 52	7.49E-06	7.71E-03	7.71E-03
Y-90	1.3861E+01	66 52	66 52	0 00E+00	9.22E+02	9.22E+02
Other Radionuclides					3.42E+03	3 42E+03

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg MeV	
0 0150	5.639E+13
0 0250	1 114E+13
0 0375	9 415E+12
0 0575	1 778E+13
0 0850	5 961E+12
0 1250	4 218E+12
0.2250	5 159E+12
0.3750	2.233E+12
0 5750	3.695E+13
0 8500	8 094E+11
1 2500	1 984E+13
1 7500	2.384E+10
2.2500	1 031E+08
2 7500	1 775E+08
3 5000	9 662E+04
5 0000	4 083E+04
7 0000	4 651E+03
11 0000	5.305E+02

Thermal Power

Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
3 57E+01	3 65E+01
Total	Total

III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary

	From SFD	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

Basis for Parameter Differences:
This fuel didn't closely match any existing templates, therefore the worst case template was used

Burnup Summary (MWd)[2]

	From SFD	Estimated
Nominal		66.52
Bounding		66.52

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	14.21	
Bounding	14.21	

Estimated EOL HM/Given EOL HM: 591 64

[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: PRR-1 (UALX-HEU) PHILIPPIINES
SNF ID #: 638
Fuel Units & Descr: 21 - 18 FLAT PLATES
Heavy Metal Mass: BOL=3.286kg, EOL=3.286kg
ROD Storage Site: SRS

[1]Fuel decay start date: 1998
Estimates as of: 2030
Template: TRIGA-Al (LW/U-Zrx, Alum , 10 to 20%, U)
[2]Template 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

Radionuclide	m Ci/MWd From Template	x_n Nominal Fuel Burnup (MWd)[2]	x_b Bounding Fuel Burnup (MWd)[2]	b Initial Activity (Ci)	y_n Nominal Fuel Inventories(Ci)	y_b Bounding Fuel Inventories(Ci)
Ac-227	3 8271E-09	62 74	125 48	0 00E+00	2 40E-07	4 80E-07
Am-241	4 4195E-03	62 74	125 48	0 00E+00	2 77E-01	5 55E-01
Am-242m	1 8195E-06	62 74	125 48	0 00E+00	1 14E-04	2.28E-04
Am-243	2 3278E-07	62 74	125 48	0 00E+00	1 46E-05	2 92E-05
C-14	4.3203E-05	62 74	125 48	0 00E+00	2 71E-03	5 42E-03
Cl-36	4.3023E-08	62 74	125 48	0 00E+00	2 70E-06	5 40E-06
Cm-243	1 6872E-07	62 74	125 48	0 00E+00	1 06E-05	2 12E-05
Cm-244	1.4660E-06	62 74	125 48	0 00E+00	9 20E-05	1 84E-04
Co-60	2.2376E-03	62.74	125 48	0 00E+00	1 40E-01	2 81E-01
Cs-134	1.2525E-04	62.74	125 48	0 00E+00	7 86E-03	1 57E-02
Cs-135	3.1549E-05	62.74	125 48	0 00E+00	1.98E-03	3 96E-03
Cs-137	1 7368E+00	62.74	125 48	0 00E+00	1 09E+02	2.18E+02
Eu-154	2 6947E-01	62.74	125 48	0 00E+00	1 69E+01	3 38E+01
Eu-155	2 6857E-02	62 74	125 48	0 00E+00	1 69E+00	3.37E+00
Fe-55	4 2105E-05	62 74	125 48	0 00E+00	2 64E-03	5 28E-03
H-3	3 5173E-03	62 74	125 48	0 00E+00	2 21E-01	4 41E-01
I-129	7 3805E-07	62 74	125 48	0 00E+00	4 63E-05	9.26E-05
Kr-85	6 9263E-02	62 74	125 48	0 00E+00	4 35E+00	8 69E+00
Np-237	1 4752E-06	62 74	125 48	0 00E+00	9 26E-05	1 85E-04
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
Tl-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 Radionuclides					1 18E+02	2.36E+02

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg MeV	
0 0150	1 134E+13
0 0250	2 343E+12
0 0375	2 346E+12
0 0575	2.250E+12
0 0850	1 353E+12
0 1250	1.376E+12
0.2250	1.225E+12
0 3750	5 093E+11
0 5750	8.237E+12
0 8500	6 798E+11
1.2500	7 134E+11
1 7500	2.184E+10
2.2500	3.350E+05
2.7500	7 716E+04
3.5000	1 809E+02
5 0000	7 058E+01
7 0000	7 960E+00
11 0000	9 048E-01

Thermal Power

Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
1 40E+00	2.79E+00
Total	Total

III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary

	From SFD	Used
Reactor Moderator	LW AND U ZIRC HYDRIDE	LW AND U ZIRC HYDRIDE
Fuel Cladding	ALUM	ALUM
BOL HM Constituents	U	U
BOL Enrichment %	93.14680552	10 to 20 1

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		62 74
Bounding		125 48

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 52	
Bounding	1 03	

Estimated EOL HM/Given EOL HM: 0 98

[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 PRR-1 (UALX-LEU) PHILLIPPINES
SNF ID #. 558
Fuel Units & Descr: 30 - 17 FLAT PLATES
Heavy Metal Mass BOL=20 328kg, EOL=19 713kg
ROD Storage Site SRS

[1]Fuel decay start date 1998
Estimates as of. 2030
Template: TRIGA-Al (LW/U-Zrx Alum , 10 to 20% U)
[2]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

Radionuclide	m Ci/MWd From Template	x_n Nominal Fuel Burnup (MWd)[2]	x_b Bounding Fuel Burnup (MWd)[2]	b Initial Activity (Ci)	y_n Nominal Fuel Inventories(Ci)	y_b Bounding Fuel Inventories(Ci)
Ac-227	3 8271E-09	587 03	1,174 06	0 00E+00	2 25E-06	4 49E-06
Am-241	4 4195E-03	587 03	1,174 06	0 00E+00	2 59E+00	5 19E+00
Am-242m	1 8195E-06	587 03	1,174 06	0 00E+00	1 07E-03	2 14E-03
Am-243	2 3278E-07	587 03	1,174 06	0 00E+00	1.37E-04	2 73E-04
C-14	4 3203E-05	587 03	1,174 06	0 00E+00	2.54E-02	5 07E-02
Cl-36	4 3023E-08	587.03	1,174 06	0 00E+00	2.53E-05	5 05E-05
Cm-243	1 6872E-07	587 03	1,174 06	0 00E+00	9 90E-05	1 98E-04
Cm-244	1 4660E-06	587 03	1,174 06	0 00E+00	8 61E-04	1.72E-03
Co-60	2.2376E-03	587 03	1,174 06	0 00E+00	1.31E+00	2 63E+00
Cs-134	1.2525E-04	587 03	1,174 06	0 00E+00	7 35E-02	1 47E-01
Cs-135	3 1549E-05	587 03	1,174 06	0 00E+00	1 85E-02	3 70E-02
Cs-137	1 7368E+00	587 03	1,174 06	0 00E+00	1 02E+03	2 04E+03
Eu-154	2 6947E-01	587 03	1,174 06	0 00E+00	1 58E+02	3 16E+02
Eu-155	2 6857E-02	587.03	1,174 06	0 00E+00	1 58E+01	3 15E+01
Fe-55	4 2105E-05	587.03	1,174 06	0 00E+00	2.47E-02	4 94E-02
H-3	3 5173E-03	587.03	1,174 06	0 00E+00	2.06E+00	4 13E+00
I-129	7.3805E-07	587.03	1,174 06	0 00E+00	4 33E-04	8 67E-04
Kr-85	6 9263E-02	587.03	1,174 06	0 00E+00	4 07E+01	8 13E+01
Np-237	1.4752E-06	587 03	1,174 06	0 00E+00	8 66E-04	1 73E-03
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
Ra-226	5.1293E-13	587.03	1,174 06	0 00E+00	3 01E-10	6 02E-10
Ra-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
Tl-208	1.7368E-08	587.03	1,174 06	0 00E+00	1 02E-05	2 04E-05
U-232	4 6797E-08	587.03	1,174 06	0 00E+00	2 75E-05	5 49E-05
U-233	1.3146E-07	587.03	1,174 06	0 00E+00	7 72E-05	1.54E-04
U-234	2 5729E-07	587.03	1,174.06	0 00E+00	1.51E-04	3 02E-04
U-235	-2 6159E-06	587 03	0 00	8 73E-03	7.20E-03	8 73E-03
U-236	1.2719E-05	587 03	1,174 06	0 00E+00	7 47E-03	1 49E-02
U-238	-3 8857E-08	587 03	0 00	5 47E-03	5 45E-03	5 47E-03
Y-90	1 6165E+00	587 03	1,174 06	0 00E+00	9 49E+02	1 90E+03
Other Radionuclides					1 10E+03	2 21E+03

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg MeV	
0 0150	1 061E+14
0.0250	2 192E+13
0 0375	2 195E+13
0 0575	2 105E+13
0 0850	1 266E+13
0 1250	1.287E+13
0 2250	1.146E+13
0 3750	4 765E+12
0 5750	7 707E+13
0 8500	6.361E+12
1.2500	6 674E+12
1 7500	2 043E+11
2.2500	3 135E+06
2 7500	7 219E+05
3 5000	1 716E+03
5 0000	6 706E+02
7 0000	7.566E+01
11 0000	8 602E+00

Thermal Power

Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
1.31E+01	2.61E+01
Total	Total

III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary

	From SFD	Used
Reactor Moderator:	LW AND U ZIRC HYDRIDE	LW AND U ZIRC HYDRIDE
Fuel Cladding	ALUM	ALUM
BOL HM Constituents	U	U
BOL Enrichment %	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

[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: 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

[1]Fuel decay start date: 2035
Estimates as of: 2030
Template: ATR (Light Water, Alum., 60 to 100%, U)
[2]Template Burnup(MWd): 367.2
Template BOL Heavy Metal Mass (MT): 0.00116689
Template Decay Time: 5 years

Estimated Canister usage

18"x10'
3.44

II. Estimates

	m	x_n	x_b	b	y_n	y_b
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	1.4545E-10	42.04	84.08	0.00E+00	6.11E-09	1.22E-08
Am-241	1.1190E-03	42.04	84.08	0.00E+00	4.70E-02	9.41E-02
Am-242m	4.5425E-07	42.04	84.08	0.00E+00	1.91E-05	3.82E-05
Am-243	1.4921E-06	42.04	84.08	0.00E+00	6.27E-05	1.25E-04
C-14	5.7244E-09	42.04	84.08	0.00E+00	2.41E-07	4.81E-07
Cl-36	1.3124E-32	42.04	84.08	0.00E+00	5.52E-31	1.10E-30
Cm-243	2.3676E-07	42.04	84.08	0.00E+00	9.95E-06	1.99E-05
Cm-244	5.2042E-05	42.04	84.08	0.00E+00	2.19E-03	4.38E-03
Co-60	3.8208E-05	42.04	84.08	0.00E+00	1.61E-03	3.21E-03
Cs-134	4.8693E-01	42.04	84.08	0.00E+00	2.05E+01	4.09E+01
Cs-135	3.4477E-06	42.04	84.08	0.00E+00	1.45E-04	2.90E-04
Cs-137	2.8731E+00	42.04	84.08	0.00E+00	1.21E+02	2.42E+02
Eu-154	8.2053E-02	42.04	84.08	0.00E+00	3.45E+00	6.90E+00
Eu-155	3.9134E-02	42.04	84.08	0.00E+00	1.65E+00	3.29E+00
Fe-55	6.7429E-03	42.04	84.08	0.00E+00	2.83E-01	5.67E-01
H-3	1.0599E-02	42.04	84.08	0.00E+00	4.46E-01	8.91E-01
I-129	7.5300E-07	42.04	84.08	0.00E+00	3.17E-05	6.33E-05
Kr-85	2.8595E-01	42.04	84.08	0.00E+00	1.20E+01	2.40E+01
Np-237	9.5479E-06	42.04	84.08	0.00E+00	4.01E-04	8.03E-04
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
Tl-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

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg. MeV	
0.0150	1.622E+13
0.0250	3.495E+12
0.0375	3.225E+12
0.0575	3.171E+12
0.0850	2.022E+12
0.1250	1.751E+12
0.2250	1.713E+12
0.3750	8.293E+11
0.5750	1.139E+13
0.8500	1.595E+12
1.2500	2.968E+11
1.7500	1.245E+10
2.2500	2.611E+10
2.7500	1.502E+08
3.5000	1.666E+07
5.0000	4.999E+01
7.0000	5.573E+00
11.0000	6.282E-01

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 Drfferences:

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

[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: 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

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

Estimated Canister usage 18"x10": 0 44

II. Estimates

Radionuclide	m: Ci/MWd From Template	x_n: Nominal Fuel Burnup (MWd)[2]	x_b: Bounding Fuel Burnup (MWd)[2]	b: Initial Activity (Ci)	y_n: Nominal Fuel Inventories(Ci)	y_b: Bounding Fuel Inventories(Ci)
Ac-227	1 4545E-10	344 38	688 76	0 00E+00	5 01E-08	1 00E-07
Am-241	1 1190E-03	344.38	688 76	0 00E+00	3 85E-01	7 71E-01
Am-242m	4 5425E-07	344 38	688 76	0 00E+00	1 56E-04	3 13E-04
Am-243	1.4921E-06	344 38	688 76	0 00E+00	5 14E-04	1 03E-03
C-14	5 7244E-09	344 38	688 76	0 00E+00	1.97E-06	3 94E-06
Cl-36	1.3124E-32	344 38	688 76	0 00E+00	4.52E-30	9 04E-30
Cm-243	2 3676E-07	344 38	688 76	0 00E+00	8 15E-05	1 63E-04
Cm-244	5 2042E-05	344 38	688.76	0 00E+00	1 79E-02	3 58E-02
Co-60	3 8208E-05	344 38	688 76	0 00E+00	1 32E-02	2 63E-02
Cs-134	4 8693E-01	344 38	688 76	0 00E+00	1 68E+02	3 35E+02
Cs-135	3 4477E-06	344 38	688 76	0 00E+00	1 19E-03	2.37E-03
Cs-137	2 8731E+00	344.38	688 76	0 00E+00	9 89E+02	1.98E+03
Eu-154	8.2053E-02	344.38	688 76	0 00E+00	2 83E+01	5 65E+01
Eu-155	3 9134E-02	344 38	688 76	0 00E+00	1 35E+01	2 70E+01
Fe-55	6 7429E-03	344 38	688 76	0 00E+00	2 32E+00	4 64E+00
H-3	1 0599E-02	344 38	688 76	0 00E+00	3 65E+00	7 30E+00
I-129	7 5300E-07	344 38	688 76	0 00E+00	2.59E-04	5 19E-04
Kr-85	2 8595E-01	344 38	688 76	0 00E+00	9 85E+01	1 97E+02
Np-237	9 5479E-06	344 38	688.76	0 00E+00	3 29E-03	6.58E-03
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
Se-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
Tl-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

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg MeV	
0 0150	1.329E+14
0 0250	2.863E+13
0 0375	2 642E+13
0 0575	2 598E+13
0 0850	1 656E+13
0 1250	1 434E+13
0.2250	1 404E+13
0 3750	6 794E+12
0.5750	9.332E+13
0 8500	1.307E+13
1.2500	2.431E+12
1 7500	1 020E+11
2.2500	2 139E+11
2 7500	1.230E+09
3 5000	1 365E+08
5 0000	4 193E+02
7.0000	4 679E+01
11 0000	5.277E+00

Thermal Power

Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
1 75E+01	3 49E+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 %	19 0001402	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		344 38
Bounding		688 76

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

[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: 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

[1]Fuel decay start date: 1996
Estimates as of: 2030
Template: ATR (Light Water, Alum , 60 to 100%, U)
[2]Template Burnup(MWd): 367.2
Template BOL Heavy Metal Mass (MT): 0 00116689
Template Decay Time: 25 years

Estimated Canister usage: 18"x10" 5 08

II. Estimates

	m	x_n	x_b	b	y_n	y_b
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	1 1465E-09	40,241 32	80,482 63	0 00E+00	4 61E-05	9.23E-05
Am-241	2 3056E-03	40,241 32	80,482 63	0 00E+00	9.28E+01	1 86E+02
Am-242m	4 1476E-07	40,241 32	80,482 63	0 00E+00	1 67E-02	3 34E-02
Am-243	1 4894E-06	40,241 32	80,482 63	0 00E+00	5 99E-02	1 20E-01
C-14	5 7108E-09	40,241 32	80,482 63	0 00E+00	2 30E-04	4 60E-04
Cl-36	1 3124E-32	40,241 32	80,482 63	0 00E+00	5.28E-28	1 06E-27
Cm-243	1 4562E-07	40,241 32	80,482 63	0 00E+00	5 86E-03	1 17E-02
Cm-244	2 4221E-05	40,241 32	80,482 63	0 00E+00	9 75E-01	1 95E+00
Co-60	2 7560E-06	40,241 32	80,482 63	0 00E+00	1 11E-01	2 22E-01
Cs-134	5 8851E-04	40,241 32	80,482 63	0 00E+00	2 37E+01	4 74E+01
Cs-135	3 4477E-06	40,241 32	80,482 63	0 00E+00	1 39E-01	2 77E-01
Cs-137	1 8099E+00	40,241 32	80,482 63	0 00E+00	7 28E+04	1 46E+05
Eu-154	1 6386E-02	40,241.32	80,482 63	0.00E+00	6 59E+02	1 32E+03
Eu-155	2 3957E-03	40,241.32	80,482 63	0 00E+00	9 64E+01	1.93E+02
Fe-55	3 2707E-05	40,241.32	80,482 63	0 00E+00	1.32E+00	2 63E+00
H-3	3 4504E-03	40,241.32	80,482 63	0 00E+00	1.39E+02	2.78E+02
I-129	7 5300E-07	40,241 32	80,482 63	0 00E+00	3 03E-02	6 06E-02
Kr-85	7 8540E-02	40,241 32	80,482 63	0 00E+00	3.16E+03	6.32E+03
Np-237	9 5615E-06	40,241 32	80,482 63	0 00E+00	3 85E-01	7.70E-01
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
Tl-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

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg MeV	
0 0150	7 531E+15
0 0250	1.565E+15
0 0375	1 363E+15
0 0575	1 463E+15
0 0850	8 828E+14
0 1250	5 913E+14
0 2250	7 622E+14
0 3750	3 314E+14
0 5750	5 432E+15
0 8500	7 828E+13
1.2500	4 353E+13
1 7500	2 151E+12
2.2500	1 533E+08
2 7500	1.255E+08
3 5000	9 520E+04
5 0000	3.207E+04
7 0000	3 529E+03
11 0000	3 949E+02

Thermal Power

Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
8.51E+02	1 70E+03
Total	Total

III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary

	From SFD	Used
Reactor Moderator:	LIGHT WATER	LIGHT WATER
Fuel Cladding:	ALUM	ALUM
BOL HM Constituents:	U	U
BOL Enrichment %:	19 84262055	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		40,241.32
Bounding		80 482 63

Basis for burnup used in estimate:

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

Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup
Nominal	0.36	
Bounding	0 73	

Estimated EOL HM/Given EOL HM: 1 01

[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: R-2 SVTR (UALX HEU) SWEDEN
SNF ID #: 801
Fuel Units & Descr: 450 - MTR TYPE
Heavy Metal Mass: BOL=111 015kg EOL=59 85kg
ROD Storage Site: SRS

[1]Fuel decay start date: 1996
Estimates as of: 2030
Template: ATR (Light Water, Alum , 60 to 100%, U)
[2]Template Burnup(MWd): 367 2
Template BOL Heavy Metal Mass (MT): 0 00116689
Template Decay Time: 25 years

Estimated Canister usage: 18"x10" = 12 50

II. Estimates

Radionuclide	m: Ci/MWd From Template	x_n: Nominal Fuel Burnup (MWd)[2]	x_b: Bounding Fuel Burnup (MWd)[2]	b: Initial Activity (Ci)	y_n: Nominal Fuel Inventories(Ci)	y_b: Bounding Fuel Inventories(Ci)
Ac-227	1 1465E-09	48,454.25	96,908.50	0 00E+00	5 56E-05	1 11E-04
Am-241	2.3056E-03	48,454 25	96,908 50	0 00E+00	1 12E+02	2.23E+02
Am-242m	4 1476E-07	48,454 25	96,908 50	0 00E+00	2.01E-02	4 02E-02
Am-243	1.4894E-06	48,454 25	96,908 50	0 00E+00	7.22E-02	1 44E-01
C-14	5 7108E-09	48,454 25	96,908 50	0 00E+00	2 77E-04	5 53E-04
Cl-36	1.3124E-32	48,454 25	96,908 50	0 00E+00	6 36E-28	1.27E-27
Cm-243	1 4562E-07	48,454.25	96,908 50	0 00E+00	7 06E-03	1 41E-02
Cm-244	2 4221E-05	48,454.25	96,908 50	0 00E+00	1 17E+00	2.35E+00
Co-60	2 7560E-06	48,454.25	96,908 50	0 00E+00	1 34E-01	2 67E-01
Cs-134	5 8851E-04	48,454.25	96,908 50	0 00E+00	2 85E+01	5 70E+01
Cs-135	3 4477E-06	48,454.25	96,908 50	0 00E+00	1 67E-01	3 34E-01
Cs-137	1 8099E+00	48,454.25	96,908.50	0 00E+00	8 77E+04	1 75E+05
Eu-154	1 6386E-02	48,454.25	96,908.50	0 00E+00	7 94E+02	1 59E+03
Eu-155	2.3957E-03	48,454 25	96,908 50	0 00E+00	1.16E+02	2 32E+02
Fe-55	3 2707E-05	48,454 25	96,908 50	0 00E+00	1.58E+00	3 17E+00
H-3	3 4504E-03	48,454 25	96,908 50	0 00E+00	1 67E+02	3 34E+02
I-129	7.5300E-07	48,454 25	96,908 50	0 00E+00	3 65E-02	7.30E-02
Kr-85	7 8540E-02	48,454.25	96,908 50	0 00E+00	3 81E+03	7 61E+03
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
Tl-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

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg MeV	
0 0150	9 068E+15
0 0250	1 884E+15
0 0375	1 641E+15
0 0575	1 762E+15
0 0850	1 063E+15
0 1250	7.120E+14
0 2250	9 177E+14
0 3750	3 990E+14
0 5750	6.541E+15
0 8500	9 425E+13
1.2500	5 242E+13
1 7500	2 590E+12
2.2500	1 846E+08
2 7500	1.511E+08
3.5000	1 140E+05
5 0000	3.836E+04
7 0000	4.220E+03
11 0000	4 721E+02

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
Reactor Moderator	LIGHT WATER	LIGHT WATER
Fuel Cladding	ALUM	ALUM
BOL HM Constituents	U	U
BOL Enrichment %	92 5168132	60 to 100

Basis for Parameter Differences:

Burnup Summary (MWd)[2]

	From SFD	Estimated	Basis for burnup used in estimate*
Nominal		48 454.25	Nominal burnup calculated from the heavy metal mass destroyed.
Bounding		96 908 50	Bounding burnup assumed to be twice nominal burnup

Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup
Nominal	1 39	
Bounding	2 77	

Estimated EOL HM/Given EOL HM: 1 05

[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: 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

[1]Fuel decay start date: 1987
Estimates as of 2030
Template: ATR (Light Water, Alum , 60 to 100°₀, U)
[2]Template 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

Radionuclide	m Ci/MWd From Template	x_n Nominal Fuel Burnup (MWd)[2]	x_b Bounding Fuel Burnup (MWd)[2]	b Initial Activity (Ci)	y_n Nominal Fuel Inventories(Ci)	y_b Bounding Fuel Inventories(Ci)
Ac-227	2 0068E-09	1,066 72	2,133 45	0 00E+00	2 14E-06	4 28E-06
Am-241	2 5251E-03	1,066 72	2,133 45	0 00E+00	2 69E+00	5.39E+00
Am-242m	3 9624E-07	1,066 72	2,133 45	0 00E+00	4 23E-04	8 45E-04
Am-243	1 4880E-06	1,066 72	2,133.45	0 00E+00	1 59E-03	3 17E-03
C-14	5 7053E-09	1,066 72	2,133 45	0 00E+00	6 09E-06	1.22E-05
Cl-36	1 3124E-32	1,066 72	2,133 45	0 00E+00	1 40E-29	2 80E-29
Cm-243	1 1419E-07	1,066 72	2,133 45	0 00E+00	1 22E-04	2 44E-04
Cm-244	1 6522E-05	1,066.72	2,133 45	0 00E+00	1 76E-02	3 52E-02
Co-60	7 4047E-07	1,066.72	2,133 45	0 00E+00	7 90E-04	1 58E-03
Cs-134	2 0455E-05	1,066.72	2,133 45	0 00E+00	2.18E-02	4 36E-02
Cs-135	3 4477E-06	1,066 72	2,133 45	0 00E+00	3 68E-03	7 36E-03
Cs-137	1 4365E+00	1,066 72	2,133 45	0 00E+00	1 53E+03	3 06E+03
Eu-154	7 3230E-03	1,066 72	2,133 45	0 00E+00	7 81E+00	1 56E+01
Eu-155	5 9259E-04	1,066 72	2,133 45	0 00E+00	6.32E-01	1.26E+00
Fe-55	2 2791E-06	1,066 72	2,133 45	0 00E+00	2 43E-03	4 86E-03
H-3	1 9698E-03	1,066 72	2,133 45	0 00E+00	2 10E+00	4.20E+00
I-129	7 5300E-07	1,066 72	2,133 45	0 00E+00	8 03E-04	1 61E-03
Kr-85	4 1176E-02	1,066 72	2,133 45	0 00E+00	4 39E+01	8.78E+01
Np-237	9 5752E-06	1,066 72	2,133 45	0 00E+00	1 02E-02	2.04E-02
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
Tl-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

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg MeV	
0 0150	1.571E+14
0 0250	3.263E+13
0 0375	2.836E+13
0 0575	3 053E+13
0 0850	1 839E+13
0 1250	1 215E+13
0.2250	1 588E+13
0 3750	6 908E+12
0 5750	1 142E+14
0.8500	1 395E+12
1.2500	6 745E+11
1.7500	3 796E+10
2.2500	3 174E+06
2.7500	3 030E+06
3 5000	1 756E+03
5 0000	7 175E+02
7 0000	7 852E+01
11 0000	8 754E+00

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

	From SFD	Used
Reactor Moderator	LIGHT WATER	LIGHT WATER
Fuel Cladding	ALUM	ALUM
BOL HM Constituents	U	U
BOL Enrichment %	89.96321383	60 to 100

Basis for Parameter Differences:

Burnup Summary (MWd)[2]

	From SFD	Estimated	Basis for burnup used in estimate:
Nominal		1 066 72	Nominal burnup calculated from the heavy metal mass destroyed.
Bounding		2,133 45	Bounding burnup assumed to be twice nominal burnup.

Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup
Nominal	0.59	
Bounding	1 18	

Estimated EOL HM/Given EOL HM: 1 01

[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: 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

[1]Fuel decay start date: 1987
Estimates as of: 2030
Template: ATR (Light Water, Alum , 60 to 100%, U)
[2]Template Burnup(MWd): 367.2
Template BOL Heavy Metal Mass (MT): 0 00116689
Template Decay Time: 35 years

Estimated Canister usage

18"x10"
8 63

II. Estimates

Radionuclide	m Ci/MWd From Template	x_n Nominal Fuel Burnup (MWd)[2]	x_b Bounding Fuel Burnup (MWd)[2]	b Initial Activity (Ci)	y_n Nominal Fuel Inventories(Ci)	y_b Bounding Fuel Inventories(Ci)
Ac-227	2 0068E-09	7,292 43	14,584 86	0 00E+00	1 46E-05	2 93E-05
Am-241	2 5251E-03	7,292 43	14,584 86	0 00E+00	1 84E+01	3 68E+01
Am-242m	3 9624E-07	7,292 43	14,584 86	0 00E+00	2 89E-03	5 78E-03
Am-243	1 4880E-06	7,292 43	14,584 86	0 00E+00	1 09E-02	2 17E-02
C-14	5 7053E-09	7,292 43	14,584 86	0 00E+00	4 16E-05	8 32E-05
Cl-36	1.3124E-32	7,292 43	14,584 86	0 00E+00	9 57E-29	1 91E-28
Cm-243	1 1419E-07	7,292 43	14,584 86	0 00E+00	8 33E-04	1 67E-03
Cm-244	1 6522E-05	7,292 43	14,584 86	0 00E+00	1.20E-01	2 41E-01
Co-60	7 4047E-07	7,292 43	14,584 86	0 00E+00	5 40E-03	1 08E-02
Cs-134	2 0455E-05	7,292 43	14,584 86	0 00E+00	1.49E-01	2.98E-01
Cs-135	3 4477E-06	7,292 43	14,584 86	0.00E+00	2 51E-02	5.03E-02
Cs-137	1 4365E+00	7,292 43	14,584 86	0 00E+00	1 05E+04	2.10E+04
Eu-154	7 3230E-03	7,292 43	14,584 86	0 00E+00	5 34E+01	1.07E+02
Eu-155	5 9259E-04	7,292 43	14,584 86	0 00E+00	4 32E+00	8 64E+00
Fe-55	2.2791E-06	7,292 43	14,584 86	0 00E+00	1 66E-02	3 32E-02
H-3	1 9698E-03	7,292 43	14,584 86	0 00E+00	1 44E+01	2 87E+01
I-129	7.5300E-07	7,292 43	14,584 86	0 00E+00	5 49E-03	1 10E-02
Kr-85	4 1176E-02	7,292 43	14,584 86	0 00E+00	3 00E+02	6 01E+02
Np-237	9 5752E-06	7,292 43	14,584 86	0 00E+00	6 98E-02	1.40E-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
Tl-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

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg MeV	
0 0150	1 074E+15
0 0250	2.231E+14
0 0375	1.939E+14
0 0575	2.087E+14
0 0850	1.257E+14
0 1250	8.305E+13
0.2250	1 086E+14
0.3750	4 723E+13
0 5750	7 805E+14
0.8500	9 534E+12
1.2500	4 611E+12
1 7500	2 595E+11
2.2500	2 170E+07
2 7500	2.071E+07
3.5000	1.200E+04
5 0000	4 905E+03
7 0000	5 367E+02
11.0000	5 985E+01

Thermal Power

Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
1.22E+02	2.44E+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 %	89 97773401	60 to 100

Basis for Parameter Differences:

Burnup Summary (MWd)[2]

	From SFD	Estimated	Basis for burnup used in estimate
Nominal		7 292.43	Nominal burnup calculated from the heavy metal mass destroyed
Bounding		14 584.86	Bounding burnup assumed to be twice nominal burnup

Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup
Nominal	0 61	
Bounding	1.22	

Estimated EOL HM/Given EOL HM: 1 01

[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: 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

[1]Fuel decay start date: 1999
Estimates as of 2030
Template: ATR (Light Water Alum 60 to 100%, U)
[2]Template Burnup(MWd): 367.2
Template BOL Heavy Metal Mass (MT): 0 00116689
Template Decay Time: 25 years

Estimated Canister usage 18"x10": 2 42

II. Estimates

Radionuclide	m Ci/MWd From Template	x_n Nominal Fuel Burnup (MWd)[2]	x_b Bounding Fuel Burnup (MWd)[2]	b Initial Activity (Ci)	y_n Nominal Fuel Inventories(Ci)	y_b Bounding Fuel Inventories(Ci)
Ac-227	1 1465E-09	3,669 13	7,338.26	0 00E+00	4 21E-06	8 41E-06
Am-241	2 3056E-03	3,669 13	7,338 26	0 00E+00	8 46E+00	1 69E+01
Am-242m	4 1476E-07	3,669 13	7,338.26	0 00E+00	1 52E-03	3 04E-03
Am-243	1 4894E-06	3,669 13	7,338.26	0 00E+00	5 46E-03	1 09E-02
C-14	5 7108E-09	3,669 13	7,338 26	0 00E+00	2.10E-05	4 19E-05
Cl-36	1 3124E-32	3,669.13	7,338 26	0 00E+00	4 82E-29	9 63E-29
Cm-243	1 4562E-07	3,669 13	7,338 26	0 00E+00	5 34E-04	1 07E-03
Cm-244	2 4221E-05	3,669 13	7,338 26	0 00E+00	8 89E-02	1 78E-01
Co-60	2 7560E-06	3,669 13	7,338 26	0 00E+00	1 01E-02	2 02E-02
Cs-134	5 8851E-04	3,669 13	7,338.26	0 00E+00	2 16E+00	4.32E+00
Cs-135	3 4477E-06	3,669 13	7,338.26	0 00E+00	1 27E-02	2 53E-02
Cs-137	1 8099E+00	3,669 13	7,338.26	0 00E+00	6 64E+03	1.33E+04
Eu-154	1 6386E-02	3,669 13	7,338.26	0 00E+00	6 01E+01	1.20E+02
Eu-155	2 3957E-03	3,669 13	7,338.26	0 00E+00	8 79E+00	1 76E+01
Fe-55	3 2707E-05	3,669 13	7,338.26	0 00E+00	1 20E-01	2 40E-01
H-3	3 4504E-03	3,669 13	7,338.26	0 00E+00	1.27E+01	2 53E+01
I-129	7 5300E-07	3,669 13	7,338 26	0 00E+00	2.76E-03	5 53E-03
Kr-85	7 8540E-02	3,669 13	7,338.26	0 00E+00	2.88E+02	5 76E+02
Np-237	9 5615E-06	3,669 13	7,338 26	0 00E+00	3 51E-02	7 02E-02
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
Tl-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

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg MeV	
0 0150	6 867E+14
0 0250	1 427E+14
0 0375	1.242E+14
0 0575	1.334E+14
0 0850	8.049E+13
0 1250	5.392E+13
0.2250	6 949E+13
0 3750	3 021E+13
0.5750	4 953E+14
0 8500	7 137E+12
1.2500	3 969E+12
1 7500	1 961E+11
2.2500	1 398E+07
2 7500	1 144E+07
3.5000	8 639E+03
5 0000	2 906E+03
7 0000	3 197E+02
11 0000	3 577E+01

Thermal Power

Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
7 76E+01	1.55E+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 %	79 9939132	60 to 100

Basis for Parameter Differences:

Burnup Summary (MWd)[2]

	From SFD	Estimated
Nominal:		3 669 13
Bounding		7 338.26

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 03

[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: 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

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

Estimated Canister usage: 18"x10' = 0 67

II. Estimates

Radionuclide	m Ci/MWd From Template	x_n Nominal Fuel Burnup (MWd)[2]	x_b Bounding Fuel Burnup (MWd)[2]	b Initial Activity (Ci)	y_n Nominal Fuel Inventories(Ci)	y_b Bounding Fuel Inventories(Ci)
Ac-227	2 0068E-09	10,786 55	21,573 10	0 00E+00	2 16E-05	4 33E-05
Am-241	2 5251E-03	10,786 55	21,573 10	0 00E+00	2 72E+01	5 45E+01
Am-242m	3 9624E-07	10,786 55	21,573 10	0 00E+00	4.27E-03	8 55E-03
Am-243	1.4880E-06	10,786 55	21,573 10	0 00E+00	1 61E-02	3 21E-02
C-14	5 7053E-09	10,786.55	21,573.10	0 00E+00	6.15E-05	1.23E-04
Cl-36	1 3124E-32	10,786.55	21,573 10	0 00E+00	1.42E-28	2 83E-28
Cm-243	1 1419E-07	10,786 55	21,573 10	0 00E+00	1.23E-03	2.46E-03
Cm-244	1 6522E-05	10,786 55	21,573 10	0 00E+00	1 78E-01	3 56E-01
Co-60	7 4047E-07	10,786 55	21,573 10	0 00E+00	7 99E-03	1 60E-02
Cs-134	2 0455E-05	10,786 55	21,573 10	0 00E+00	2 21E-01	4 41E-01
Cs-135	3 4477E-06	10,786 55	21,573 10	0 00E+00	3 72E-02	7 44E-02
Cs-137	1 4365E+00	10,786 55	21,573 10	0 00E+00	1 55E+04	3 10E+04
Eu-154	7.3230E-03	10,786 55	21,573 10	0 00E+00	7 90E+01	1 58E+02
Eu-155	5 9259E-04	10,786 55	21,573 10	0 00E+00	6 39E+00	1 28E+01
Fe-55	2 2791E-06	10,786.55	21,573 10	0 00E+00	2.46E-02	4.92E-02
H-3	1 9698E-03	10,786 55	21,573 10	0 00E+00	2.12E+01	4.25E+01
I-129	7 5300E-07	10,786 55	21,573 10	0 00E+00	8 12E-03	1 62E-02
Kr-85	4 1176E-02	10,786 55	21,573 10	0 00E+00	4 44E+02	8 88E+02
Np-237	9 5752E-06	10,786 55	21,573 10	0 00E+00	1 03E-01	2 07E-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
Tl-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
U-233	3.6275E-09	10,786 55	21,573 10	0 00E+00	3.91E-05	7.83E-05
U-234	1 8562E-04	10,786 55	21,573 10	0 00E+00	2 00E+00	4 00E+00
U-235	-2 7235E-06	10,786.55	0 00	7 41E-02	4 48E-02	7 41E-02
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					1 48E+04	2 95E+04

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg MeV	
0 0150	1.589E+15
0 0250	3.299E+14
0 0375	2.868E+14
0 0575	3.087E+14
0 0850	1.860E+14
0 1250	1.228E+14
0.2250	1 606E+14
0.3750	6 985E+13
0.5750	1 154E+15
0 8500	1 410E+13
1.2500	6 820E+12
1 7500	3.839E+11
2.2500	3.210E+07
2.7500	3 063E+07
3 5000	1 775E+04
5.0000	7.252E+03
7.0000	7 936E+02
11 0000	8 848E+01

Thermal Power

Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
1.81E+02	3 61E+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 %	92.97	60 to 100

Basis for Parameter Differences*:

Burnup Summary (MWd)[2]

	From SFD	Estimated	Basis for burnup used in estimate*
Nominal		10 786 55	Nominal burnup calculated from the heavy metal mass destroyed
Bounding		21,573 10	Bounding burnup assumed to be twice nominal burnup

Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup
Nominal	0 93	
Bounding	1.86	

Estimated EOL HM/Given EOL HM: 1.03

[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: RINSC
SNF ID #: 181
Fuel Units & Descr: 44 - 18 FLAT PLATES
Heavy Metal Mass: BOL=61 12kg; EOL=60 465kg
ROD Storage Site: SRS

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

Estimated Canister usage

18"x10'
1 83

II. Estimates

	m	x_n	x_b	b	y_n	y_b
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	1 4545E-10	620 87	1,241 73	0 00E+00	9 03E-08	1 81E-07
Am-241	1 1190E-03	620 87	1,241 73	0 00E+00	6 95E-01	1 39E+00
Am-242m	4 5425E-07	620 87	1,241.73	0 00E+00	2 82E-04	5 64E-04
Am-243	1 4921E-06	620 87	1,241.73	0 00E+00	9 26E-04	1 85E-03
C-14	5 7244E-09	620 87	1,241.73	0 00E+00	3 55E-06	7 11E-06
Cl-36	1 3124E-32	620 87	1,241 73	0 00E+00	8 15E-30	1 63E-29
Cm-243	2 3676E-07	620 87	1,241 73	0 00E+00	1 47E-04	2 94E-04
Cm-244	5 2042E-05	620 87	1,241 73	0 00E+00	3.23E-02	6 46E-02
Co-60	3 8208E-05	620 87	1,241 73	0 00E+00	2.37E-02	4 74E-02
Cs-134	4 8693E-01	620 87	1,241 73	0 00E+00	3 02E+02	6 05E+02
Cs-135	3 4477E-06	620 87	1,241 73	0 00E+00	2.14E-03	4.28E-03
Cs-137	2.8731E+00	620 87	1,241 73	0 00E+00	1 78E+03	3 57E+03
Eu-154	8.2053E-02	620 87	1,241 73	0 00E+00	5 09E+01	1 02E+02
Eu-155	3 9134E-02	620 87	1,241 73	0 00E+00	2 43E+01	4 86E+01
Fe-55	6 7429E-03	620 87	1,241.73	0 00E+00	4 19E+00	8 37E+00
H-3	1 0599E-02	620.87	1,241.73	0 00E+00	6 58E+00	1 32E+01
I-129	7 5300E-07	620 87	1,241.73	0 00E+00	4 68E-04	9 35E-04
Kr-85	2 8595E-01	620 87	1,241 73	0 00E+00	1.78E+02	3 55E+02
Np-237	9 5479E-06	620 87	1,241 73	0 00E+00	5 93E-03	1.19E-02
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
Tl-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

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg. MeV	
0 0150	2.396E+14
0.0250	5 161E+13
0.0375	4 763E+13
0 0575	4 683E+13
0 0850	2 985E+13
0 1250	2.585E+13
0 2250	2 530E+13
0 3750	1.225E+13
0 5750	1 682E+14
0 8500	2.356E+13
1.2500	4 383E+12
1 7500	1 838E+11
2.2500	3 855E+11
2 7500	2.218E+09
3.5000	2 460E+08
5.0000	7 735E+02
7 0000	8 636E+01
11 0000	9 745E+00

Thermal Power

Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
3 15E+01	6 30E+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 %	19 7728395	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		620 87
Bounding		1 241 73

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 03	
Bounding	0 06	

Estimated EOL HM/Given EOL HM: 1 00

[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: RINSC
SNF ID #: 180
Fuel Units & Descr: 70 - 18 FLAT PLATES
Heavy Metal Mass: BOL=9 366kg EOL=8 498kg
ROD Storage Site: SRS

[1]Fuel decay start date: 1992
Estimates as of: 2030
Template: ATR (Light Water, Alum , 60 to 100%, U)
[2]Template Burnup(MWd): 367.2
Template BOL Heavy Metal Mass (MT): 0 00116689
Template Decay Time: 35 years

Estimated Canister usage

18"x10'
1.94

II. Estimates

Radionuclide	m Ci/MWd From Template	x_n Nominal Fuel Burnup (MWd)[2]	x_b Bounding Fuel Burnup (MWd)[2]	b Initial Activity (Ci)	y_n Nominal Fuel Inventories(Ci)	y_b Bounding Fuel Inventories(Ci)
Ac-227	2 0068E-09	822.01	1,644 03	0 00E+00	1 65E-06	3 30E-06
Am-241	2 5251E-03	822 01	1,644 03	0 00E+00	2 08E+00	4 15E+00
Am-242m	3 9624E-07	822 01	1,644 03	0 00E+00	3.26E-04	6 51E-04
Am-243	1 4880E-06	822 01	1,644 03	0 00E+00	1.22E-03	2 45E-03
C-14	5.7053E-09	822 01	1,644 03	0 00E+00	4 69E-06	9 38E-06
Cl-36	1.3124E-32	822 01	1,644 03	0 00E+00	1 08E-29	2.16E-29
Cm-243	1.1419E-07	822 01	1,644 03	0 00E+00	9 39E-05	1 88E-04
Cm-244	1 6522E-05	822 01	1,644 03	0 00E+00	1 36E-02	2 72E-02
Co-60	7 4047E-07	822 01	1,644 03	0 00E+00	6 09E-04	1.22E-03
Cs-134	2 0455E-05	822 01	1,644 03	0 00E+00	1 68E-02	3 36E-02
Cs-135	3 4477E-06	822 01	1,644 03	0 00E+00	2 83E-03	5 67E-03
Cs-137	1 4365E+00	822.01	1,644 03	0 00E+00	1 18E+03	2 36E+03
Eu-154	7 3230E-03	822.01	1,644 03	0 00E+00	6 02E+00	1 20E+01
Eu-155	5 9259E-04	822.01	1,644 03	0 00E+00	4.87E-01	9 74E-01
Fe-55	2.2791E-06	822 01	1,644 03	0 00E+00	1.87E-03	3.75E-03
H-3	1 9698E-03	822 01	1,644 03	0 00E+00	1.62E+00	3 24E+00
I-129	7.5300E-07	822 01	1,644 03	0 00E+00	6 19E-04	1.24E-03
Kr-85	4 1176E-02	822 01	1,644 03	0 00E+00	3 38E+01	6.77E+01
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
Tl-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

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg MeV	
0 0150	1.211E+14
0 0250	2.514E+13
0 0375	2 185E+13
0 0575	2.352E+13
0 0850	1 417E+13
0 1250	9 362E+12
0.2250	1.224E+13
0.3750	5 323E+12
0.5750	8 798E+13
0.8500	1 075E+12
1.2500	5 198E+11
1 7500	2.925E+10
2.2500	2 446E+06
2 7500	2.335E+06
3 5000	1.354E+03
5 0000	5 532E+02
7 0000	6 054E+01
11.0000	6 750E+00

Thermal Power

Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
1.38E+01	2.75E+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 13598185	60 to 100

Basis for Parameter Differences:

Burnup Summary (MWd)[2]

	From SFD	Estimated
Nominal		822 01
Bounding	37.46	1,644 03

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	0.28	
Bounding	0 56	43 88

Estimated EOL HM/Given EOL HM: 1.01

[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: RPI (UALX-LEU) PORTUGAL
SNF ID #: 943
Fuel Units & Descr: 39 - ASSEMBLY
Heavy Metal Mass: BOL=30 381kg EOL=29.23kg
ROD Storage Site: SRS

[1]Fuel decay start date: 1998
Estimates as of: 2030
Template: ATR (Light Water, Alum , 60 to 100% U)
[2]Template Burnup(MWd): 367.2
Template BOL Heavy Metal Mass (MT): 0 00116689
Template Decay Time: 25 years

Estimated Canister usage 18"x10": 1 63

II. Estimates

Radionuclide	m: C/MWd From Template	x_n: Nominal Fuel Burnup (MWd)[2]	x_b: Bounding Fuel Burnup (MWd)[2]	b: Initial Activity (Ci)	y_n: Nominal Fuel Inventories(Ci)	y_b: Bounding Fuel Inventories(Ci)
Ac-227	1 1465E-09	1,089 55	2,179 09	0 00E+00	1 25E-06	2 50E-06
Am-241	2 3056E-03	1,089 55	2,179 09	0 00E+00	2 51E+00	5 02E+00
Am-242m	4 1476E-07	1,089 55	2,179 09	0 00E+00	4 52E-04	9 04E-04
Am-243	1 4894E-06	1,089 55	2,179 09	0 00E+00	1 62E-03	3.25E-03
C-14	5 7108E-09	1,089 55	2,179 09	0 00E+00	6 22E-06	1.24E-05
Cl-36	1 3124E-32	1,089 55	2,179 09	0.00E+00	1 43E-29	2 86E-29
Cm-243	1 4562E-07	1,089 55	2,179 09	0.00E+00	1 59E-04	3 17E-04
Cm-244	2 4221E-05	1,089 55	2,179 09	0 00E+00	2 64E-02	5.28E-02
Co-60	2 7560E-06	1,089 55	2,179 09	0 00E+00	3 00E-03	6 01E-03
Cs-134	5 8851E-04	1,089 55	2,179 09	0 00E+00	6 41E-01	1.28E+00
Cs-135	3 4477E-06	1 089 55	2,179 09	0 00E+00	3 76E-03	7 51E-03
Cs-137	1 8099E+00	1,089 55	2,179 09	0 00E+00	1 97E+03	3.94E+03
Eu-154	1 6386E-02	1,089 55	2,179 09	0 00E+00	1.79E+01	3.57E+01
Eu-155	2 3957E-03	1,089 55	2,179 09	0 00E+00	2 61E+00	5.22E+00
Fe-55	3 2707E-05	1,089 55	2,179 09	0 00E+00	3 56E-02	7.13E-02
H-3	3 4504E-03	1,089 55	2,179 09	0 00E+00	3.76E+00	7.52E+00
I-129	7 5300E-07	1,089 55	2,179 09	0 00E+00	8.20E-04	1 64E-03
Kr-85	7 8540E-02	1,089 55	2,179 09	0 00E+00	8 56E+01	1 71E+02
Np-237	9 5615E-06	1,089.55	2,179 09	0 00E+00	1.04E-02	2 08E-02
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
Tl-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

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg MeV	
0.0150	2 039E+14
0 0250	4.236E+13
0.0375	3 689E+13
0 0575	3 961E+13
0 0850	2.390E+13
0 1250	1 601E+13
0.2250	2 064E+13
0.3750	8 972E+12
0 5750	1 471E+14
0.8500	2 119E+12
1.2500	1 179E+12
1 7500	5.823E+10
2.2500	4 150E+06
2.7500	3 398E+06
3 5000	2 608E+03
5.0000	8.812E+02
7 0000	9 705E+01
11 0000	1 086E+01

Thermal Power

Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
2.30E+01	4 61E+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 %:	19 83094182	60 to 100

Basis for Parameter Drfferences:

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:		1 089.55
Bounding:		2,179 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 11	
Bounding	0.23	

Estimated EOL HM/Given EOL HM: 1 00

[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: 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

[1]Fuel decay start date: 1999
Estimates as of: 2030
Template: ATR (Light Water, Alum , 60 to 100% U)
[2]Template Burnup(MWd): 367.2
Template BOL Heavy Metal Mass (MT): 0 00116689
Template Decay Time: 25 years

Estimated Canister usage
18"x10'
1 96

II. Estimates

Radionuclide	m Ci/MWd From Template	x_n Nominal Fuel Burnup (MWd)[2]	x_b Bounding Fuel Burnup (MWd)[2]	b Initial Activity (Ci)	y_n Nominal Fuel Inventories(Ci)	y_b Bounding Fuel Inventories(Ci)
Ac-227	1 1465E-09	4,459 89	8,919 79	0 00E+00	5 11E-06	1 02E-05
Am-241	2 3056E-03	4,459 89	8,919 79	0 00E+00	1 03E+01	2 06E+01
Am-242m	4 1476E-07	4,459 89	8 919 79	0 00E+00	1 85E-03	3.70E-03
Am-243	1 4894E-06	4,459 89	8,919.79	0 00E+00	6 64E-03	1.33E-02
C-14	5 7108E-09	4,459 89	8,919 79	0 00E+00	2 55E-05	5 09E-05
Cl-36	1.3124E-32	4,459 89	8,919 79	0 00E+00	5 85E-29	1 17E-28
Cm-243	1 4562E-07	4,459 89	8,919 79	0 00E+00	6 49E-04	1 30E-03
Cm-244	2 4221E-05	4,459 89	8,919 79	0 00E+00	1 08E-01	2 16E-01
Co-60	2 7560E-06	4,459 89	8,919 79	0 00E+00	1 23E-02	2 46E-02
Cs-134	5 8851E-04	4,459 89	8,919 79	0 00E+00	2 62E+00	5 25E+00
Cs-135	3 4477E-06	4,459 89	8,919 79	0 00E+00	1.54E-02	3 08E-02
Cs-137	1 8099E+00	4,459 89	8,919 79	0 00E+00	8 07E+03	1 61E+04
Eu-154	1 6386E-02	4,459 89	8,919 79	0 00E+00	7.31E+01	1.46E+02
Eu-155	2.3957E-03	4,459 89	8,919 79	0 00E+00	1 07E+01	2 14E+01
Fe-55	3.2707E-05	4,459 89	8,919 79	0 00E+00	1 46E-01	2 92E-01
H-3	3 4504E-03	4,459 89	8,919 79	0 00E+00	1.54E+01	3 08E+01
I-129	7 5300E-07	4,459 89	8,919 79	0 00E+00	3 36E-03	6 72E-03
Kr-85	7 8540E-02	4,459 89	8,919 79	0 00E+00	3 50E+02	7 01E+02
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
Tl-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

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg MeV	
0 0150	8 347E+14
0 0250	1 734E+14
0 0375	1.510E+14
0 0575	1.622E+14
0 0850	9 784E+13
0 1250	6.553E+13
0 2250	8 447E+13
0 3750	3 672E+13
0 5750	6 021E+14
0.8500	8 676E+12
1.2500	4 825E+12
1 7500	2.384E+11
2 2500	1.699E+07
2 7500	1.391E+07
3 5000	1 058E+04
5 0000	3.565E+03
7.0000	3 924E+02
11 0000	4 391E+01

Thermal Power

Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
9 43E+01	1.89E+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 %	19 68299334	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		4 459 89
Bounding		8 919 79

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 25	
Bounding	0 50	

Estimated EOL HM/Given EOL HM: 1 01

[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: 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

[1]Fuel decay start date: 1998
Estimates as of: 2030
Template: ATR (Light Water, Alum 60 to 100%, U)
[2]Template Burnup(MWd): 367 2
Template BOL Heavy Metal Mass (MT): 0 00116689
Template Decay Time: 25 years

Estimated Canister usage: 18"x10" 0 11

II. Estimates

Radionuclide	m: Ci/MWd From Template	x_n: Nominal Fuel Burnup (MWd)[2]	x_b: Bounding Fuel Burnup (MWd)[2]	b: Initial Activity (Ci)	y_n: Nominal Fuel Inventories(Ci)	y_b: Bounding Fuel Inventories(Ci)
Ac-227	1 1465E-09	1 89	3 79	0 00E+00	2 17E-09	4 34E-09
Am-241	2 3056E-03	1 89	3 79	0 00E+00	4 37E-03	8 73E-03
Am-242m	4 1476E-07	1 89	3 79	0 00E+00	7 86E-07	1 57E-06
Am-243	1 4894E-06	1 89	3.79	0 00E+00	2 82E-06	5 64E-06
C-14	5.7108E-09	1 89	3.79	0 00E+00	1 08E-08	2 16E-08
Cl-36	1.3124E-32	1 89	3.79	0 00E+00	2 49E-32	4 97E-32
Cm-243	1 4562E-07	1 89	3 79	0 00E+00	2.76E-07	5 52E-07
Cm-244	2 4221E-05	1 89	3 79	0 00E+00	4.59E-05	9 18E-05
Co-60	2 7560E-06	1 89	3 79	0 00E+00	5.22E-06	1.04E-05
Cs-134	5 8851E-04	1 89	3 79	0 00E+00	1 11E-03	2.23E-03
Cs-135	3 4477E-06	1 89	3 79	0 00E+00	6 53E-06	1.31E-05
Cs-137	1 8099E+00	1 89	3 79	0 00E+00	3 43E+00	6 86E+00
Eu-154	1 6386E-02	1 89	3 79	0 00E+00	3 10E-02	6 21E-02
Eu-155	2 3957E-03	1 89	3 79	0 00E+00	4 54E-03	9 08E-03
Fe-55	3 2707E-05	1 89	3 79	0 00E+00	6 19E-05	1.24E-04
H-3	3 4504E-03	1 89	3 79	0 00E+00	6 54E-03	1 31E-02
I-129	7 5300E-07	1 89	3 79	0 00E+00	1 43E-06	2 85E-06
Kr-85	7 8540E-02	1 89	3 79	0 00E+00	1 49E-01	2 98E-01
Np-237	9 5615E-06	1 89	3.79	0 00E+00	1 81E-05	3 62E-05
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
Tl-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

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg MeV	
0 0150	3 545E+11
0 0250	7 364E+10
0 0375	6 413E+10
0 0575	6.886E+10
0 0850	4 155E+10
0 1250	2.784E+10
0.2250	3 589E+10
0 3750	1 560E+10
0 5750	2 557E+11
0 8500	3 684E+09
1.2500	2 049E+09
1 7500	1 012E+08
2.2500	7 221E+03
2.7500	5 911E+03
3 5000	7 520E+00
5 0000	2.815E+00
7 0000	3 164E-01
11 0000	3 587E-02

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

	From SFD	Used
Reactor Moderator	LIGHT WATER	LIGHT WATER
Fuel Cladding	ALUM	ALUM
BOL HM Constituents	U	U
BOL Enrichment %	19 81060606	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	0.00	1 89
Bounding		3 79

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	448 40
Bounding	0 01	

Estimated EOL HM/Given EOL HM: 1 00

[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 RU-1 (UALX LEU) URAGUAY
SNF ID #: 1073
Fuel Units & Descr* 15 - ASSEMBLY
Heavy Metal Mass BOL=7 92kg EOL=7 912kg
ROD Storage Site SRS

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

Estimated Canister usage
18"x10'
0 42

II. Estimates

Radionuclide	m Ci/MWd From Template	x_n Nominal Fuel Burnup (MWd)[2]	x_b Bounding Fuel Burnup (MWd)[2]	b Initial Activity (Ci)	y_n Nominal Fuel Inventories(Ci)	y_b Bounding Fuel Inventories(Ci)
Ac-227	1 1465E-09	7.10	14.21	0 00E+00	8 14E-09	1 63E-08
Am-241	2.3056E-03	7.10	14.21	0 00E+00	1 64E-02	3 28E-02
Am-242m	4 1476E-07	7 10	14.21	0 00E+00	2 95E-06	5 89E-06
Am-243	1 4894E-06	7 10	14.21	0 00E+00	1 06E-05	2 12E-05
C-14	5 7108E-09	7 10	14.21	0 00E+00	4 06E-08	8 11E-08
Cl-36	1 3124E-32	7 10	14 21	0 00E+00	9 32E-32	1.86E-31
Cm-243	1 4562E-07	7 10	14 21	0 00E+00	1.03E-06	2.07E-06
Cm-244	2 4221E-05	7 10	14 21	0 00E+00	1.72E-04	3 44E-04
Co-60	2 7560E-06	7.10	14.21	0 00E+00	1.96E-05	3 91E-05
Cs-134	5 8851E-04	7.10	14.21	0 00E+00	4 18E-03	8 36E-03
Cs-135	3 4477E-06	7.10	14.21	0 00E+00	2 45E-05	4 90E-05
Cs-137	1 8099E+00	7 10	14.21	0 00E+00	1.29E+01	2 57E+01
Eu-154	1 6386E-02	7 10	14.21	0 00E+00	1 16E-01	2 33E-01
Eu-155	2 3957E-03	7 10	14.21	0 00E+00	1 70E-02	3 40E-02
Fe-55	3 2707E-05	7 10	14 21	0 00E+00	2 32E-04	4.65E-04
H-3	3 4504E-03	7 10	14 21	0 00E+00	2 45E-02	4 90E-02
I-129	7 5300E-07	7 10	14 21	0 00E+00	5.35E-06	1 07E-05
Kr-85	7 8540E-02	7 10	14 21	0 00E+00	5.58E-01	1 12E+00
Np-237	9 5615E-06	7.10	14.21	0 00E+00	6 79E-05	1 36E-04
Pa-231	2 7968E-09	7.10	14.21	0 00E+00	1 99E-08	3 97E-08
Pb-210	1.2612E-10	7 10	14.21	0 00E+00	8 96E-10	1 79E-09
Pm-147	1.2952E-02	7 10	14.21	0 00E+00	9 20E-02	1 84E-01
Pu-238	1 7549E-02	7.10	14.21	0 00E+00	1 25E-01	2.49E-01
Pu-239	4 2810E-04	7 10	14 21	0 00E+00	3 04E-03	6 08E-03
Pu-240	2 4357E-04	7 10	14 21	0 00E+00	1 73E-03	3 46E-03
Pu-241	2 6277E-02	7 10	14 21	0 00E+00	1.87E-01	3 73E-01
Pu-242	3 6329E-07	7 10	14 21	0 00E+00	2.58E-06	5 16E-06
Ra-226	4 4444E-10	7 10	14.21	0 00E+00	3 16E-09	6 31E-09
Ra-228	1.9714E-14	7.10	14.21	0 00E+00	1 40E-13	2 80E-13
Ru-106	2 0477E-07	7.10	14.21	0 00E+00	1 45E-06	2 91E-06
Se-79	1.2933E-05	7.10	14.21	0 00E+00	9 19E-05	1 84E-04
Sn-126	1 1574E-05	7 10	14.21	0 00E+00	8 22E-05	1.64E-04
Sr-90	1 7092E+00	7 10	14.21	0 00E+00	1 21E+01	2.43E+01
Tc-99	4 2239E-04	7 10	14 21	0 00E+00	3 00E-03	6 00E-03
Th-229	7 7260E-12	7 10	14 21	0 00E+00	5 49E-11	1 10E-10
Th-230	5 8497E-08	7 10	14 21	0 00E+00	4 15E-07	8 31E-07
Th-232	2 6906E-14	7 10	14.21	0 00E+00	1 91E-13	3 82E-13
Tl-208	4 4336E-08	7.10	14.21	0 00E+00	3 15E-07	6 30E-07
U-232	1.2037E-07	7.10	14.21	0 00E+00	8 55E-07	1.71E-06
U-233	3 0011E-09	7.10	14.21	0 00E+00	2 13E-08	4.26E-08
U-234	1 8497E-04	7 10	14.21	0 00E+00	1 31E-03	2 63E-03
U-235	-2 7235E-06	7 10	0 00	3.39E-03	3 37E-03	3 39E-03
U-236	1 5493E-05	7 10	14.21	0.00E+00	1.10E-04	2 20E-04
U-238	-4.2851E-09	7 10	0 00	2 13E-03	2.13E-03	2 13E-03
Y-90	1 7094E+00	7 10	14 21	0 00E+00	1.21E+01	2 43E+01
Other Radionuclides					1.22E+01	2 45E+01

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg MeV	
0 0150	1.329E+12
0 0250	2 761E+11
0 0375	2.405E+11
0 0575	2.582E+11
0 0850	1.558E+11
0 1250	1.044E+11
0.2250	1.346E+11
0 3750	5.849E+10
0 5750	9 588E+11
0 8500	1.382E+10
1.2500	7 683E+09
1 7500	3 796E+08
2.2500	2.708E+04
2 7500	2.217E+04
3.5000	2.820E+01
5 0000	1.056E+01
7 0000	1 187E+00
11 0000	1.345E-01

Thermal Power

Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
1.50E-01	3 01E-01
Total	Total

III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary

	From SFD	Used
Reactor Moderator*	LIGHT WATER	LIGHT WATER
Fuel Cladding	ALUM	ALUM
BOL HM Constituents	U	U
BOL Enrichment %	19 81060606	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	0 02	7 10
Bounding		14.21

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	448 40
Bounding	0 01	

Estimated EOL HM/Given EOL HM: 1 00

[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: 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

[1]Fuel decay start date: 1997
Estimates as of: 2030
Template: ATR (Light Water Alum , 60 to 100%, U)
[2]Template Burnup(MWd): 367.2
Template BOL Heavy Metal Mass (MT): 0 00116689
Template Decay Time: 25 years

Estimated Canister usage 18"x10": 2 33

II. Estimates

Radionuclide	m: Ci/MWd From Template	x_n: Nominal Fuel Burnup (MWd)[2]	x_b: Bounding Fuel Burnup (MWd)[2]	b: Initial Activity (Ci)	y_n: Nominal Fuel Inventories(Ci)	y_b: Bounding Fuel Inventories(Ci)
Ac-227	1.1465E-09	933 38	1,866 76	0 00E+00	1 07E-06	2 14E-06
Am-241	2.3056E-03	933.38	1,866.76	0 00E+00	2 15E+00	4 30E+00
Am-242m	4 1476E-07	933.38	1,866.76	0 00E+00	3 87E-04	7 74E-04
Am-243	1 4894E-06	933 38	1,866 76	0 00E+00	1 39E-03	2 78E-03
C-14	5 7108E-09	933 38	1,866 76	0 00E+00	5 33E-06	1 07E-05
Cl-36	1 3124E-32	933 38	1,866 76	0 00E+00	1.22E-29	2 45E-29
Cm-243	1 4562E-07	933 38	1,866 76	0 00E+00	1 36E-04	2.72E-04
Cm-244	2 4221E-05	933 38	1,866 76	0 00E+00	2.26E-02	4 52E-02
Co-60	2 7560E-06	933 38	1,866 76	0 00E+00	2.57E-03	5 14E-03
Cs-134	5 8851E-04	933 38	1,866 76	0 00E+00	5 49E-01	1 10E+00
Cs-135	3 4477E-06	933 38	1,866 76	0 00E+00	3 22E-03	6 44E-03
Cs-137	1 8099E+00	933.38	1,866.76	0 00E+00	1 69E+03	3 38E+03
Eu-154	1 6386E-02	933.38	1,866.76	0 00E+00	1 53E+01	3 06E+01
Eu-155	2 3957E-03	933 38	1,866.76	0 00E+00	2 24E+00	4 47E+00
Fe-55	3 2707E-05	933 38	1,866 76	0 00E+00	3 05E-02	6 11E-02
H-3	3 4504E-03	933 38	1,866 76	0 00E+00	3 22E+00	6 44E+00
I-129	7 5300E-07	933 38	1,866 76	0 00E+00	7 03E-04	1 41E-03
Kr-85	7 8540E-02	933 38	1,866 76	0 00E+00	7.33E+01	1.47E+02
Np-237	9 5615E-06	933 38	1,866 76	0 00E+00	8 92E-03	1.78E-02
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
Tl-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

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg. MeV	
0 0150	1 747E+14
0 0250	3 629E+13
0 0375	3 160E+13
0 0575	3.394E+13
0 0850	2.048E+13
0 1250	1.372E+13
0 2250	1 768E+13
0 3750	7 686E+12
0 5750	1.260E+14
0 8500	1 816E+12
1.2500	1 010E+12
1 7500	4 988E+10
2.2500	3 555E+06
2 7500	2 911E+06
3.5000	2.254E+03
5.0000	7 636E+02
7 0000	8 415E+01
11 0000	9 422E+00

Thermal Power

Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
1 97E+01	3 95E+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 %	19 1126847	60 to 100

Basis for Parameter Drifferences:

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		933.38
Bounding		1 866.76

Basis for burnup used in estimate:

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

Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup
Nominal	0 07	
Bounding	0 15	

Estimated EOL HM/Given EOL HM: 1 00

[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: SAPHIR U3Si2-LEU (SWITZERLAND)
SNF ID #: 443
Fuel Units & Descr: 39 - MTR TYPE
Heavy Metal Mass: BOL=79 732kg EOL=71 191kg
ROD Storage Site: SRS

[1]Fuel decay start date: 1993
Estimates as of: 2030
Template: ATR (Light Water, Alum , 60 to 100%, U)
[2]Template Burnup(MWd): 367.2
Template BOL Heavy Metal Mass (MT): 0 00116689
Template Decay Time: 35 years

Estimated Canister usage 18"x10": 1 63

II. Estimates

Radionuclide	m: Ci/MWd From Template	x_n: Nominal Fuel Burnup (MWd)[2]	x_b: Bounding Fuel Burnup (MWd)[2]	b: Initial Activity (Ci)	y_n: Nominal Fuel Inventories(Ci)	y_b: Bounding Fuel Inventories(Ci)
Ac-227	2 0068E-09	8,088 49	16,176 99	0 00E+00	1 62E-05	3 25E-05
Am-241	2.5251E-03	8,088 49	16,176 99	0 00E+00	2 04E+01	4 08E+01
Am-242m	3.9624E-07	8,088 49	16,176 99	0 00E+00	3.20E-03	6 41E-03
Am-243	1.4880E-06	8,088 49	16,176.99	0 00E+00	1.20E-02	2 41E-02
C-14	5 7053E-09	8,088 49	16,176 99	0 00E+00	4 61E-05	9 23E-05
Cl-36	1.3124E-32	8,088 49	16,176.99	0 00E+00	1.06E-28	2 12E-28
Cm-243	1 1419E-07	8,088 49	16,176 99	0 00E+00	9.24E-04	1 85E-03
Cm-244	1 6522E-05	8,088 49	16,176 99	0 00E+00	1.34E-01	2 67E-01
Co-60	7 4047E-07	8,088 49	16,176 99	0 00E+00	5 99E-03	1.20E-02
Cs-134	2 0455E-05	8,088 49	16,176 99	0 00E+00	1 65E-01	3.31E-01
Cs-135	3 4477E-06	8,088 49	16,176 99	0 00E+00	2 79E-02	5 58E-02
Cs-137	1 4365E+00	8,088 49	16,176 99	0 00E+00	1 16E+04	2.32E+04
Eu-154	7.3230E-03	8,088 49	16,176 99	0 00E+00	5 92E+01	1 18E+02
Eu-155	5 9259E-04	8,088 49	16,176 99	0 00E+00	4 79E+00	9 59E+00
Fe-55	2 2791E-06	8,088 49	16,176 99	0 00E+00	1 84E-02	3 69E-02
H-3	1 9698E-03	8,088 49	16,176 99	0 00E+00	1 59E+01	3 19E+01
I-129	7.5300E-07	8,088 49	16,176 99	0 00E+00	6 09E-03	1.22E-02
Kr-85	4 1176E-02	8,088 49	16,176 99	0 00E+00	3 33E+02	6 66E+02
Np-237	9 5752E-06	8,088 49	16,176 99	0 00E+00	7.74E-02	1.55E-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
Tl-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
U-233	3 6275E-09	8,088 49	16,176 99	0 00E+00	2 93E-05	5 87E-05
U-234	1 8562E-04	8,088 49	16,176 99	0 00E+00	1 50E+00	3 00E+00
U-235	-2 7235E-06	8,088 49	0 00	3 42E-02	1.22E-02	3 42E-02
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

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg MeV	
0 0150	1 191E+15
0 0250	2 474E+14
0 0375	2 150E+14
0 0575	2 315E+14
0 0850	1 395E+14
0 1250	9 212E+13
0 2250	1 204E+14
0.3750	5.238E+13
0 5750	8 657E+14
0 8500	1 057E+13
1.2500	5 114E+12
1 7500	2.878E+11
2.2500	2 407E+07
2 7500	2.297E+07
3 5000	1.342E+04
5 0000	5 486E+03
7 0000	6 006E+02
11.0000	6 698E+01

Thermal Power

Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
1.35E+02	2 71E+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 %	19.83740991	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		8 088 49
Bounding		16 176 99

Basis for burnup used in estimate:

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

Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup
Nominal	0.32	
Bounding	0 64	

Estimated EOL HM/Given EOL HM: 1 01

[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: 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

[1]Fuel decay start date: 1993
Estimates as of: 2030
Template. ATR (Light Water, Alum , 60 to 100% U)
[2]Template Burnup(MWd): 367.2
Template BOL Heavy Metal Mass (MT). 0 00116689
Template Decay Time 35 years

Estimated Canister usage 18"x10' = 3.17

II. Estimates

Radionuclide	m Ci/MWd From Template	x_n Nominal Fuel Burnup (MWd)[2]	x_b Bounding Fuel Burnup (MWd)[2]	b Initial Actvrty (Ci)	y_n Nominal Fuel Inventories(Ci)	y_b Bounding Fuel Inventones(Ci)
Ac-227	2 0068E-09	8,946.30	17,892 61	0 00E+00	1 80E-05	3 59E-05
Am-241	2 5251E-03	8,946 30	17,892 61	0 00E+00	2.26E+01	4 52E+01
Am-242m	3 9624E-07	8,946 30	17,892 61	0 00E+00	3 54E-03	7.09E-03
Am-243	1 4880E-06	8,946 30	17,892 61	0 00E+00	1 33E-02	2 66E-02
C-14	5 7053E-09	8,946 30	17,892 61	0 00E+00	5 10E-05	1 02E-04
Cl-36	1 3124E-32	8,946 30	17,892 61	0 00E+00	1.17E-28	2 35E-28
Cm-243	1 1419E-07	8,946 30	17,892 61	0 00E+00	1.02E-03	2 04E-03
Cm-244	1 6522E-05	8,946 30	17,892 61	0 00E+00	1 48E-01	2 96E-01
Co-60	7 4047E-07	8,946 30	17,892 61	0 00E+00	6 62E-03	1 32E-02
Cs-134	2 0455E-05	8,946 30	17,892 61	0 00E+00	1 83E-01	3 66E-01
Cs-135	3 4477E-06	8 946 30	17,892 61	0 00E+00	3 08E-02	6 17E-02
Cs-137	1 4365E+00	8,946 30	17,892 61	0 00E+00	1 29E+04	2 57E+04
Eu-154	7.3230E-03	8,946.30	17,892 61	0 00E+00	6 55E+01	1.31E+02
Eu-155	5 9259E-04	8,946.30	17,892 61	0 00E+00	5 30E+00	1.06E+01
Fe-55	2.2791E-06	8,946.30	17,892 61	0 00E+00	2 04E-02	4 08E-02
H-3	1.9698E-03	8 946 30	17,892 61	0 00E+00	1 76E+01	3 52E+01
I-129	7.5300E-07	8,946 30	17,892 61	0 00E+00	6 74E-03	1.35E-02
Kr-85	4 1176E-02	8,946 30	17,892 61	0.00E+00	3 68E+02	7 37E+02
Np-237	9 5752E-06	8,946 30	17,892 61	0 00E+00	8 57E-02	1.71E-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
Tl-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

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg MeV	
0 0150	1.318E+15
0 0250	2.736E+14
0 0375	2.379E+14
0 0575	2.560E+14
0 0850	1 543E+14
0 1250	1 019E+14
0 2250	1 332E+14
0 3750	5 794E+13
0 5750	9 575E+14
0 8500	1 170E+13
1.2500	5 657E+12
1 7500	3 184E+11
2.2500	2 662E+07
2 7500	2 541E+07
3.5000	1 472E+04
5.0000	6 015E+03
7 0000	6.582E+02
11 0000	7.338E+01

Thermal Power

Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
1.50E+02	2 99E+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 %	90 62318257	60 to 100

Basis for Parameter Drfferences:

Burnup Summary (MWd)[2]

	From SFD	Estimated
Nominal		8 946.30
Bounding		17 892.61

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:	1.33	
Bounding:	2 65	

Estimated EOL HM/Given EOL HM: 1 05

[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: 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

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

Estimated Canister usage

18"x10'
2.17

II. Estimates

Radionuclide	m: Ci/MWd From Template	x_n: Nominal Fuel Burnup (MWd)[2]	x_b: Bounding Fuel Burnup (MWd)[2]	b: Initial Activity (Ci)	y_n: Nominal Fuel Inventories(Ci)	y_b: Bounding Fuel Inventories(Ci)
Ac-227	2.0068E-09	6,795.81	13,591.62	0.00E+00	1.36E-05	2.73E-05
Am-241	2.5251E-03	6,795.81	13,591.62	0.00E+00	1.72E+01	3.43E+01
Am-242m	3.9624E-07	6,795.81	13,591.62	0.00E+00	2.69E-03	5.39E-03
Am-243	1.4880E-06	6,795.81	13,591.62	0.00E+00	1.01E-02	2.02E-02
C-14	5.7053E-09	6,795.81	13,591.62	0.00E+00	3.88E-05	7.75E-05
Cl-36	1.3124E-32	6,795.81	13,591.62	0.00E+00	8.92E-29	1.78E-28
Cm-243	1.1419E-07	6,795.81	13,591.62	0.00E+00	7.76E-04	1.55E-03
Cm-244	1.6522E-05	6,795.81	13,591.62	0.00E+00	1.12E-01	2.25E-01
Co-60	7.4047E-07	6,795.81	13,591.62	0.00E+00	5.03E-03	1.01E-02
Cs-134	2.0455E-05	6,795.81	13,591.62	0.00E+00	1.39E-01	2.78E-01
Cs-135	3.4477E-06	6,795.81	13,591.62	0.00E+00	2.34E-02	4.69E-02
Cs-137	1.4365E+00	6,795.81	13,591.62	0.00E+00	9.76E+03	1.95E+04
Eu-154	7.3230E-03	6,795.81	13,591.62	0.00E+00	4.98E+01	9.95E+01
Eu-155	5.9259E-04	6,795.81	13,591.62	0.00E+00	4.03E+00	8.05E+00
Fe-55	2.2791E-06	6,795.81	13,591.62	0.00E+00	1.55E-02	3.10E-02
H-3	1.9698E-03	6,795.81	13,591.62	0.00E+00	1.34E+01	2.68E+01
I-129	7.5300E-07	6,795.81	13,591.62	0.00E+00	5.12E-03	1.02E-02
Kr-85	4.1176E-02	6,795.81	13,591.62	0.00E+00	2.80E+02	5.60E+02
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
Tl-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

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg MeV	
0.0150	1.001E+15
0.0250	2.079E+14
0.0375	1.807E+14
0.0575	1.945E+14
0.0850	1.172E+14
0.1250	7.740E+13
0.2250	1.012E+14
0.3750	4.401E+13
0.5750	7.273E+14
0.8500	8.884E+12
1.2500	4.297E+12
1.7500	2.418E+11
2.2500	2.022E+07
2.7500	1.930E+07
3.5000	1.121E+04
5.0000	4.583E+03
7.0000	5.016E+02
11.0000	5.593E+01

Thermal Power

Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
1.14E+02	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 %	45.07146122	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		6,795.81
Bounding		13,591.62

Basis for burnup used in estimate:

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

Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup
Nominal	0.60	
Bounding	1.20	

Estimated EOL HM/Given EOL HM: 1.01

[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: SAXTON (MOX SST)
SNF ID #: 883
Fuel Units & Descr: 25 - ELEMENT
Heavy Metal Mass: BOL= , EOL=95 588kg
ROD Storage Site: INEEL

[1]Fuel decay start date: 1972
Estimates as of: 2030
Template: (Worst Case)
[2]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

Radionuclide	m Ci/MWd From Template	x_n Nominal Fuel Burnup (MWd)[2]	x_b Bounding Fuel Burnup (MWd)[2]	b Initial Activity (Ci)	y_n Nominal Fuel Inventories(Ci)	y_b Bounding Fuel Inventories(Ci)
Ac-227	2 5200E-06	95 69	95 69	0 00E+00	2.41E-04	2 41E-04
Am-241	8 6432E+00	95 69	95 69	0 00E+00	8.27E+02	8.27E+02
Am-242m	1 5728E-02	95 69	95 69	0 00E+00	1 50E+00	1.50E+00
Am-243	1 6288E-02	95 69	95 69	0 00E+00	1 56E+00	1.56E+00
C-14	1 2068E-01	95 69	95 69	0 00E+00	1 15E+01	1.15E+01
Cl-36	2 2849E-03	95 69	95 69	0 00E+00	2.19E-01	2.19E-01
Cm-243	6 0144E-04	95 69	95 69	0 00E+00	5 76E-02	5.76E-02
Cm-244	9 4880E-02	95 69	95 69	0 00E+00	9 08E+00	9 08E+00
Co-60	3 9052E+00	95 69	95 69	0 00E+00	3 74E+02	3 74E+02
Cs-134	2.2139E-06	95 69	95 69	0 00E+00	2 12E-04	2.12E-04
Cs-135	4.3976E-04	95 69	95 69	0 00E+00	4 21E-02	4.21E-02
Cs-137	1 4887E+01	95 69	95 69	0 00E+00	1 42E+03	1 42E+03
Eu-154	3.7342E-01	95 69	95 69	0 00E+00	3 57E+01	3 57E+01
Eu-155	8 4893E-03	95 69	95 69	0.00E+00	8 12E-01	8 12E-01
Fe-55	5.3750E-03	95 69	95 69	0 00E+00	5 14E-01	5 14E-01
H-3	1 0472E-01	95 69	95 69	0 00E+00	1.00E+01	1 00E+01
I-129	1 0618E-05	95 69	95 69	0 00E+00	1 02E-03	1 02E-03
Kr-85	2.2717E-01	95 69	95 69	0 00E+00	2.17E+01	2.17E+01
Np-237	1 6400E-04	95 69	95 69	0 00E+00	1 57E-02	1 57E-02
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
Tl-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

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg. MeV	
0 0150	1 798E+14
0 0250	1 602E+13
0 0375	1.375E+13
0 0575	2.562E+13
0 0850	8 615E+12
0 1250	6.076E+12
0.2250	7 426E+12
0.3750	3.216E+12
0.5750	5.315E+13
0 8500	1 164E+12
1.2500	2.854E+13
1 7500	3 430E+10
2.2500	1 518E+08
2.7500	2.573E+08
3 5000	1 945E+06
5 0000	8.206E+05
7 0000	9 287E+04
11 0000	1 058E+04

Thermal Power

Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
5.74E+02	5 79E+02
Total	Total

III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary

	From SFD	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

Basis for Parameter Drfferences:

This fuel didn't closely match any existing templates, therefore the worst case template was used.

Burnup Summary (MWd)[2]

	From SFD	Estimated
Nominal		95 69
Bounding		95 69

Basis for burnup used in estimate:

Nominal burnup set equal to bounding burnup
Bounding burnup taken from SFD and converted to MWd using BOL=95.688kg

Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup
Nominal	0 03	
Bounding	0 03	

Estimated EOL HM/Given EOL HM: 1 40

[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: SAXTON (MOX ZR)
SNF ID #: 787
Fuel Units & Descr: 43 - ELEMENT
Heavy Metal Mass: BOL= , EOL=239.88kg
ROD Storage Site: INEEL

[1]Fuel decay start date: 1972
Estimates as of: 2030
Template: (Worst Case)
[2]Template Burnup(MWd): 62.5
Template BOL Heavy Metal Mass (MT): 0.00186865
Template Decay Time: 50 years

Estimated Canister usage: 18"x10": 1.34

II. Estimates

Radionuclide	m Ci/MWd From Template	x_n Nominal Fuel Burnup (MWd)[2]	x_b Bounding Fuel Burnup (MWd)[2]	b Initial Activity (Ci)	y_n Nominal Fuel Inventories(Ci)	y_b Bounding Fuel Inventories(Ci)
Ac-227	2.5200E-06	240.13	240.13	0.00E+00	6.05E-04	6.05E-04
Am-241	8.6432E+00	240.13	240.13	0.00E+00	2.08E+03	2.08E+03
Am-242m	1.5728E-02	240.13	240.13	0.00E+00	3.78E+00	3.78E+00
Am-243	1.6288E-02	240.13	240.13	0.00E+00	3.91E+00	3.91E+00
C-14	1.2068E-01	240.13	240.13	0.00E+00	2.90E+01	2.90E+01
Cl-36	2.2849E-03	240.13	240.13	0.00E+00	5.49E-01	5.49E-01
Cm-243	6.0144E-04	240.13	240.13	0.00E+00	1.44E-01	1.44E-01
Cm-244	9.4880E-02	240.13	240.13	0.00E+00	2.28E+01	2.28E+01
Co-60	3.9052E+00	240.13	240.13	0.00E+00	9.38E+02	9.38E+02
Cs-134	2.2139E-06	240.13	240.13	0.00E+00	5.32E-04	5.32E-04
Cs-135	4.3976E-04	240.13	240.13	0.00E+00	1.06E-01	1.06E-01
Cs-137	1.4887E+01	240.13	240.13	0.00E+00	3.57E+03	3.57E+03
Eu-154	3.7342E-01	240.13	240.13	0.00E+00	8.97E+01	8.97E+01
Eu-155	8.4893E-03	240.13	240.13	0.00E+00	2.04E+00	2.04E+00
Fe-55	5.3750E-03	240.13	240.13	0.00E+00	1.29E+00	1.29E+00
H-3	1.0472E-01	240.13	240.13	0.00E+00	2.51E+01	2.51E+01
I-129	1.0618E-05	240.13	240.13	0.00E+00	2.55E-03	2.55E-03
Kr-85	2.2717E-01	240.13	240.13	0.00E+00	5.46E+01	5.46E+01
Np-237	1.6400E-04	240.13	240.13	0.00E+00	3.94E-02	3.94E-02
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
Tl-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

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg MeV	
0.0150	4.512E+14
0.0250	4.020E+13
0.0375	3.451E+13
0.0575	6.429E+13
0.0850	2.162E+13
0.1250	1.525E+13
0.2250	1.864E+13
0.3750	8.070E+12
0.5750	1.334E+14
0.8500	2.922E+12
1.2500	7.161E+13
1.7500	8.608E+10
2.2500	3.810E+08
2.7500	6.457E+08
3.5000	4.880E+06
5.0000	2.059E+06
7.0000	2.331E+05
11.0000	2.654E+04

Thermal Power

Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
1.44E+03	1.45E+03
Total	Total

III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary

	From SFD	Used
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

Basis for Parameter Differences:

This fuel didn't closely match any existing templates, therefore the worst case template was used

Burnup Summary (MWd)[2]

	From SFD	Estimated
Nominal		240.13
Bounding		240.13

Basis for burnup used in estimate:

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
Nominal	0.03	
Bounding	0.03	

Estimated EOL HM/Given EOL HM: 1.40

[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: SAXTON (UO2 SST)
SNF ID #: 882
Fuel Units & Descr. 20 - ELEMENT
Heavy Metal Mass BOL= , EOL=10 402kg
ROD Storage Site INEEL

[1]Fuel decay start date: 1972
Estimates as of: 2030
Template: Pathfinder (Light Water, SST 60 to 100%, U)
[2]Template Burnup(MWd): 6 01
Template BOL Heavy Metal Mass (MT): 0 00012882
Template Decay Time: 50 years

Estimated Canister usage

18"x10"
0 69

II. Estimates

	m	x_n	x_b	b	y_n	y_b
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	3 4276E-08	16 67	16 67	0 00E+00	5 71E-07	5 71E-07
Am-241	1 1458E-04	16 67	16.67	0 00E+00	1 91E-03	1.91E-03
Am-242m	7 9468E-09	16 67	16 67	0 00E+00	1 32E-07	1.32E-07
Am-243	9 8386E-10	16 67	16 67	0 00E+00	1 64E-08	1 64E-08
C-14	2 2978E-04	16 67	16 67	0 00E+00	3 83E-03	3 83E-03
Cl-36	1 2261E-06	16 67	16 67	0 00E+00	2.04E-05	2 04E-05
Cm-243	1 7271E-10	16 67	16 67	0 00E+00	2 88E-09	2 88E-09
Cm-244	1 3058E-09	16 67	16 67	0 00E+00	2.18E-08	2 18E-08
Co-60	9 8636E-03	16 67	16 67	0 00E+00	1 64E-01	1 64E-01
Cs-134	1 9617E-08	16 67	16 67	0 00E+00	3 27E-07	3 27E-07
Cs-135	3 0316E-05	16 67	16 67	0 00E+00	5 05E-04	5 05E-04
Cs-137	1 0263E+00	16 67	16 67	0 00E+00	1 71E+01	1 71E+01
Eu-154	2 0017E-04	16 67	16 67	0 00E+00	3 34E-03	3 34E-03
Eu-155	8 5957E-05	16 67	16 67	0 00E+00	1 43E-03	1 43E-03
Fe-55	2.2646E-05	16 67	16 67	0 00E+00	3 78E-04	3 78E-04
H-3	1 0835E-03	16 67	16 67	0 00E+00	1 81E-02	1 81E-02
I-129	7.3195E-07	16 67	16 67	0 00E+00	1 22E-05	1.22E-05
Kr-85	1.5661E-02	16 67	16 67	0 00E+00	2 61E-01	2.61E-01
Np-237	1.1494E-06	16 67	16 67	0 00E+00	1 92E-05	1.92E-05
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
Tl-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

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg MeV	
0 0150	8 698E+11
0 0250	1.807E+11
0 0375	1 566E+11
0 0575	1 685E+11
0 0850	1 018E+11
0 1250	6 614E+10
0.2250	8 812E+10
0.3750	3 825E+10
0.5750	6 369E+11
0.8500	6.288E+09
1.2500	1 432E+10
1 7500	1 619E+08
2.2500	8 206E+04
2.7500	1 118E+04
3 5000	2 892E+00
5 0000	1.208E+00
7 0000	1 352E-01
11 0000	1.529E-02

Thermal Power

Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
1 95E-01	1 95E-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	SST	SST
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)[1]

	From SFD	Estimated
Nominal		16 67
Bounding		16.67

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

Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup
Nominal	0 03	
Bounding	0 03	

Estimated EOL HM/Given EOL HM: 1 00

[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. SAXTON (UO2 ZR)
SNF ID #: 788
Fuel Units & Descr 9 - ELEMENT
Heavy Metal Mass BOL= ; EOL=41 482kg
ROD Storage Site INEEL

[1]Fuel decay start date 1972
Estimates as of 2030
Template PWR (Light Water Zirc, 0 to 5%, U)
[2]Template 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

	m	x_n	x_b	b	y_n	y_b
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	1 0733E-09	66 48	66 48	0 00E+00	7.14E-08	7 14E-08
Am-241	1 4751E-01	66 48	66 48	0 00E+00	9 81E+00	9 81E+00
Am-242m	2 6809E-04	66 48	66 48	0 00E+00	1 78E-02	1 78E-02
Am-243	6 2484E-04	66 48	66 48	0 00E+00	4 15E-02	4 15E-02
C-14	4 7820E-05	66 48	66 48	0 00E+00	3 18E-03	3 18E-03
Cl-36	8 0297E-07	66 48	66 48	0 00E+00	5 34E-05	5.34E-05
Cm-243	1 7426E-04	66 48	66 48	0 00E+00	1.16E-02	1 16E-02
Cm-244	2 7616E-02	66 48	66 48	0 00E+00	1 84E+00	1 84E+00
Co-60	3 5610E-04	66 48	66 48	0 00E+00	2.37E-02	2 37E-02
Cs-134	2 6260E-07	66 48	66 48	0 00E+00	1 75E-05	1 75E-05
Cs-135	1 4433E-05	66 48	66 48	0 00E+00	9 60E-04	9 60E-04
Cs-137	9 8870E-01	66 48	66 48	0.00E+00	6 57E+01	6 57E+01
Eu-154	6 0320E-03	66 48	66 48	0 00E+00	4 01E-01	4 01E-01
Eu-155	2.1770E-04	66 48	66 48	0 00E+00	1 45E-02	1 45E-02
Fe-55	7 9296E-07	66 48	66 48	0 00E+00	5.27E-05	5 27E-05
H-3	8 9486E-03	66 48	66 48	0 00E+00	5 95E-01	5 95E-01
I-129	9 8288E-07	66 48	66 48	0 00E+00	6 53E-05	6 53E-05
Kr-85	1 0707E-02	66 48	66 48	0.00E+00	7 12E-01	7.12E-01
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
Tl-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

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg MeV	
0.0150	2.530E+12
0 0250	5 070E+11
0 0375	4 777E+11
0 0575	5 978E+11
0 0850	2 793E+11
0 1250	1 858E+11
0.2250	2.385E+11
0.3750	1 030E+11
0.5750	2 425E+12
0 8500	2.368E+10
1.2500	1.507E+10
1 7500	6 625E+08
2.2500	1 090E+05
2 7500	3 839E+05
3.5000	2.745E+04
5 0000	1 173E+04
7 0000	1.352E+03
11 0000	1.552E+02

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

	From SFD	Used
Reactor Moderator	LIGHT WATER	LIGHT 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		66 48
Bounding		66 48

Basis for burnup used in estimate:

Nominal burnup set equal to bounding burnup
Bounding burnup taken from SFD and converted to MWd using BOL=41.552kg

Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup
Nominal	0 05	
Bounding	0 05	

Estimated EOL HM/Given EOL HM: 1 00

[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: 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

[1]Fuel decay start date: 1959
Estimates as of: 2030
Template: PWR (Light Water, Zirc 0 to 5%, U)
[2]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_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	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		
Tl-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		
U-233	2 6647E-08	744 60	1,489.19	0 00E+00	1 98E-05	3 97E-05		
U-234	5 5023E-05	744 60	1,489.19	0 00E+00	4 10E-02	8.19E-02		
U-235	-1 4485E-06	744 60	0 00	2.60E-04	0 00E+00	2.60E-04		
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		

Thermal Power	
Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
1.09E+01	2.19E+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	ZIRC	ZIRC
BOL HM Constituents	U	U
BOL Enrichment %	0 710999907	0 to 5

Basis for Parameter Differences:

Burnup Summary (MWd)[2]

	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

[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

Estimated Canister usage: 18"x10' = 0 04

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

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

II. Estimates

Radionuclide	m CI/MWd From Template	x_n Nominal Fuel Burnup (MWd)[2]	x_b Bounding Fuel Burnup (MWd)[2]	b Initial Activity (Ci)	y_n Nominal Fuel Inventories(Ci)	y_b Bounding Fuel Inventories(Ci)
Ac-227	6 6313E-10	12 53	25 06	0 00E+00	8.31E-09	1 66E-08
Am-241	2 0060E-03	12 53	25 06	0 00E+00	2 51E-02	5 03E-02
Am-242m	4 2429E-07	12 53	25 06	0 00E+00	5 32E-06	1 06E-05
Am-243	1 4899E-06	12 53	25 06	0 00E+00	1 87E-05	3.73E-05
C-14	5 7135E-09	12 53	25 06	0 00E+00	7.16E-08	1 43E-07
Cl-36	1.3124E-32	12.53	25 06	0 00E+00	1 64E-31	3 29E-31
Cm-243	1 6443E-07	12.53	25 06	0 00E+00	2.06E-06	4 12E-06
Cm-244	2 9330E-05	12 53	25 06	0 00E+00	3 67E-04	7 35E-04
Co-60	5 3186E-06	12 53	25 06	0 00E+00	6 66E-05	1.33E-04
Cs-134	3 1563E-03	12 53	25 06	0 00E+00	3 95E-02	7 91E-02
Cs-135	3 4477E-06	12 53	25.06	0 00E+00	4.32E-05	8 64E-05
Cs-137	2 0313E+00	12 53	25 06	0 00E+00	2.54E+01	5 09E+01
Eu-154	2 4513E-02	12.53	25 06	0 00E+00	3 07E-01	6 14E-01
Eu-155	4 8175E-03	12 53	25 06	0 00E+00	6 04E-02	1.21E-01
Fe-55	1.2397E-04	12 53	25 06	0 00E+00	1 55E-03	3 11E-03
H-3	4 5697E-03	12 53	25 06	0 00E+00	5 73E-02	1 15E-01
I-129	7 5300E-07	12 53	25 06	0 00E+00	9 43E-06	1 89E-05
Kr-85	1 0850E-01	12 53	25 06	0 00E+00	1.36E+00	2 72E+00
Np-237	9 5561E-06	12.53	25 06	0 00E+00	1.20E-04	2 39E-04
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
Tl-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

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg MeV	
0 0150	2.645E+12
0 0250	5.500E+11
0 0375	4 797E+11
0 0575	5 138E+11
0 0850	3 105E+11
0 1250	2.101E+11
0 2250	2.679E+11
0 3750	1 166E+11
0.5750	1 902E+12
0.8500	3.216E+10
1.2500	1 836E+10
1 7500	8 429E+08
2 2500	7.394E+04
2.7500	4 180E+04
3.5000	1.922E+02
5 0000	1 092E+01
7 0000	1.205E+00
11 0000	1.351E-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

[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

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

Estimated Canister usage: 18"x10": 0 04

II. Estimates

	m	x_n	x_b	b	y_n	y_b
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	12 53	25 06	0 00E+00	8 31E-09	1 66E-08
Am-241	2 0060E-03	12 53	25 06	0 00E+00	2 51E-02	5 03E-02
Am-242m	4.2429E-07	12 53	25 06	0 00E+00	5 32E-06	1 06E-05
Am-243	1.4899E-06	12 53	25 06	0 00E+00	1 87E-05	3 73E-05
C-14	5.7135E-09	12 53	25 06	0 00E+00	7 16E-08	1 43E-07
Cl-36	1 3124E-32	12 53	25 06	0 00E+00	1 64E-31	3 29E-31
Cm-243	1 6443E-07	12 53	25 06	0 00E+00	2 06E-06	4 12E-06
Cm-244	2 9330E-05	12 53	25 06	0 00E+00	3 67E-04	7 35E-04
Co-60	5 3186E-06	12 53	25 06	0 00E+00	6 66E-05	1.33E-04
Cs-134	3 1563E-03	12 53	25 06	0 00E+00	3 95E-02	7 91E-02
Cs-135	3 4477E-06	12 53	25 06	0 00E+00	4.32E-05	8 64E-05
Cs-137	2 0313E+00	12 53	25 06	0 00E+00	2 54E+01	5 09E+01
Eu-154	2 4513E-02	12 53	25 06	0 00E+00	3 07E-01	6.14E-01
Eu-155	4 8175E-03	12.53	25 06	0 00E+00	6 04E-02	1.21E-01
Fe-55	1 2397E-04	12.53	25 06	0 00E+00	1 55E-03	3.11E-03
H-3	4 5697E-03	12 53	25 06	0 00E+00	5 73E-02	1 15E-01
I-129	7 5300E-07	12 53	25 06	0 00E+00	9 43E-06	1 89E-05
Kr-85	1 0850E-01	12 53	25 06	0 00E+00	1 36E+00	2 72E+00
Np-237	9 5561E-06	12 53	25 06	0 00E+00	1 20E-04	2 39E-04
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
Tl-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

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg MeV	
0 0150	2 645E+12
0 0250	5.500E+11
0 0375	4 797E+11
0 0575	5 138E+11
0 0850	3 105E+11
0 1250	2.101E+11
0.2250	2.679E+11
0 3750	1 166E+11
0 5750	1 902E+12
0 8500	3.216E+10
1.2500	1 836E+10
1 7500	8 429E+08
2.2500	7 394E+04
2.7500	4 180E+04
3.5000	1 922E+02
5.0000	1 092E+01
7 0000	1 205E+00
11 0000	1 351E-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	Basis for burnup used in estimate:
Nominal	12.53	4 74	Nominal burnup taken directly from SFD (converted to MWd).
Bounding		25.06	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: SPERT-III
SNF ID #: 209
Fuel Units & Descr: 3 - CANISTER OF SCRAP
Heavy Metal Mass: BOL= ; EOL=9 74kg
ROD Storage Site: INEEL

[1]Fuel decay start date: 1966
Estimates as of: 2030
Template: PWR (Light Water Zirc, 0 to 5% U)
[2]Template Burnup(MWd): 61.92
Template BOL Heavy Metal Mass (MT): 0 00176911
Template Decay Time: 50 years

Estimated Canister usage: HIC = 1 00

II. Estimates

Radionuclide	m: Ci/MWd From Template	x_n: Nominal Fuel Burnup (MWd)[2]	x_b: Bounding Fuel Burnup (MWd)[2]	b: Initial Activity (Ci)	y_n: Nominal Fuel Inventories(Ci)	y_b: Bounding Fuel Inventories(Ci)
Ac-227	1 0733E-09	9,262.37	9,262 37	0 00E+00	9 94E-06	9 94E-06
Am-241	1 4751E-01	9,262.37	9,262 37	0 00E+00	1.37E+03	1 37E+03
Am-242m	2 6809E-04	9,262.37	9,262.37	0 00E+00	2 48E+00	2 48E+00
Am-243	6.2484E-04	9,262.37	9,262.37	0 00E+00	5 79E+00	5 79E+00
C-14	4 7820E-05	9,262.37	9,262 37	0 00E+00	4 43E-01	4 43E-01
Cl-36	8 0297E-07	9,262 37	9,262 37	0 00E+00	7 44E-03	7 44E-03
Cm-243	1 7426E-04	9,262 37	9,262 37	0 00E+00	1 61E+00	1 61E+00
Cm-244	2 7616E-02	9,262 37	9,262 37	0 00E+00	2 56E+02	2 56E+02
Co-60	3 5610E-04	9,262 37	9,262.37	0 00E+00	3 30E+00	3 30E+00
Cs-134	2 6260E-07	9,262 37	9,262.37	0 00E+00	2 43E-03	2 43E-03
Cs-135	1.4433E-05	9,262.37	9,262.37	0 00E+00	1.34E-01	1.34E-01
Cs-137	9 8870E-01	9,262 37	9,262 37	0 00E+00	9 16E+03	9.16E+03
Eu-154	6 0320E-03	9,262 37	9,262 37	0 00E+00	5 59E+01	5 59E+01
Eu-155	2 1770E-04	9,262 37	9,262 37	0 00E+00	2 02E+00	2 02E+00
Fe-55	7 9296E-07	9,262 37	9,262 37	0 00E+00	7.34E-03	7 34E-03
H-3	8 9486E-03	9,262 37	9,262 37	0 00E+00	8.29E+01	8 29E+01
I-129	9 8288E-07	9,262 37	9,262.37	0 00E+00	9 10E-03	9 10E-03
Kr-85	1 0707E-02	9,262.37	9,262.37	0 00E+00	9 92E+01	9 92E+01
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
Tl-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

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg MeV	
0 0150	3 524E+14
0.0250	7 063E+13
0 0375	6 655E+13
0 0575	8.328E+13
0 0850	3 891E+13
0 1250	2.589E+13
0.2250	3.322E+13
0.3750	1 435E+13
0.5750	3 379E+14
0.8500	3.299E+12
1.2500	2 099E+12
1 7500	9 230E+10
2 2500	1.517E+07
2.7500	5.347E+07
3.5000	3.815E+06
5.0000	1 630E+06
7 0000	1.878E+05
11 0000	2 157E+04

Thermal Power

Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
1.68E+02	1.68E+02
Total	Total

III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary

	From SFD	Used
Reactor Moderator	LIGHT WATER	LIGHT WATER
Fuel Cladding	ZIRC	ZIRC
BOL HM Constituents	U	U
BOL Enrichment %		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		9,262.37
Bounding		9,262.37

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	13.58	
Bounding	13.58	

Estimated EOL HM/Given EOL HM: 1.58

[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	THOR (UALX-HEU) TAIWAN	[1]Fuel decay start date:	1997
SNF ID #:	629	Estimates as of	2030
Fuel Units & Descr	35 - MTR TYPE	Template	TRIGA-Al (LW/U-Zrx, Alum , 10 to 20%, U)
Heavy Metal Mass:	BOL=5.061kg; EOL=4 098kg	[2]Template Burnup(MWd):	6 65
ROD Storage Site	SRS	Template BOL Heavy Metal Mass (MT)	0 00018
		Template Decay Time	25 years

Estimated Canister usage: 18"x10" = 1 46

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	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 661E+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		
Tl-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		

Thermal Power	
Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
2.05E+01	4 09E+01
Total	Total

III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary

	From SFD	Used
Reactor Moderator	LW AND U ZIRC HYDRIDE	LW AND U ZIRC HYDRIDE
Fuel Cladding	ALUM	ALUM
BOL HM Constituents	U	U
BOL Enrichment %	93 16330608	10 to 20 1

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		918 72
Bounding		1,837 45

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	4 91	
Bounding	9 83	

Estimated EOL HM/Given EOL HM: 1 01

[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: 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

[1]Fuel decay start date: 1998
Estimates as of: 2030
Template: TRIGA-Al (LW/U-Zrx Alum , 10 to 20% U)
[2]Template 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

Radionuclide	m Ci/MWd From Template	x_n Nominal Fuel Burnup (MWd)[2]	x_b Bounding Fuel Burnup (MWd)[2]	b Initial Activity (Ci)	y_n Nominal Fuel Inventories(Ci)	y_b Bounding Fuel Inventories(Ci)
Ac-227	3.8271E-09	500.07	1,000.14	0.00E+00	1.91E-06	3.83E-06
Am-241	4.4195E-03	500.07	1,000.14	0.00E+00	2.21E+00	4.42E+00
Am-242m	1.8195E-06	500.07	1,000.14	0.00E+00	9.10E-04	1.82E-03
Am-243	2.3278E-07	500.07	1,000.14	0.00E+00	1.16E-04	2.33E-04
C-14	4.3203E-05	500.07	1,000.14	0.00E+00	2.16E-02	4.32E-02
Cl-36	4.3023E-08	500.07	1,000.14	0.00E+00	2.15E-05	4.30E-05
Cm-243	1.6872E-07	500.07	1,000.14	0.00E+00	8.44E-05	1.69E-04
Cm-244	1.4660E-06	500.07	1,000.14	0.00E+00	7.33E-04	1.47E-03
Co-60	2.2376E-03	500.07	1,000.14	0.00E+00	1.12E+00	2.24E+00
Cs-134	1.2525E-04	500.07	1,000.14	0.00E+00	6.26E-02	1.25E-01
Cs-135	3.1549E-05	500.07	1,000.14	0.00E+00	1.58E-02	3.16E-02
Cs-137	1.7368E+00	500.07	1,000.14	0.00E+00	8.69E+02	1.74E+03
Eu-154	2.6947E-01	500.07	1,000.14	0.00E+00	1.35E+02	2.70E+02
Eu-155	2.6857E-02	500.07	1,000.14	0.00E+00	1.34E+01	2.69E+01
Fe-55	4.2105E-05	500.07	1,000.14	0.00E+00	2.11E-02	4.21E-02
H-3	3.5173E-03	500.07	1,000.14	0.00E+00	1.76E+00	3.52E+00
I-129	7.3805E-07	500.07	1,000.14	0.00E+00	3.69E-04	7.38E-04
Kr-85	6.9263E-02	500.07	1,000.14	0.00E+00	3.46E+01	6.93E+01
Np-237	1.4752E-06	500.07	1,000.14	0.00E+00	7.38E-04	1.48E-03
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
Tl-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

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg MeV	
0.0150	9.039E+13
0.0250	1.867E+13
0.0375	1.870E+13
0.0575	1.793E+13
0.0850	1.079E+13
0.1250	1.097E+13
0.2250	9.760E+12
0.3750	4.059E+12
0.5750	6.565E+13
0.8500	5.419E+12
1.2500	5.686E+12
1.7500	1.741E+11
2.2500	2.670E+06
2.7500	6.150E+05
3.5000	1.438E+03
5.0000	5.610E+02
7.0000	6.327E+01
11.0000	7.192E+00

Thermal Power

Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
1.11E+01	2.23E+01
Total	Total

III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary

	From SFD	Used
Reactor Moderator	LW AND U ZIRC HYDRIDE	LW AND U ZIRC HYDRIDE
Fuel Cladding	ALUM	ALUM
BOL HM Constituents	U	U
BOL Enrichment %	89.90758798	10 to 20.1

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		500.07
Bounding		1,000.14

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	2.56	
Bounding	5.11	

Estimated EOL HM/Given EOL HM: 1.00

[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: UMRR (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

[1]Fuel decay start date: 1996
Estimates as of: 2030
Template: ATR (Light Water, Alum , 60 to 100%, U)
[2]Template Burnup(MWd): 367.2
Template BOL Heavy Metal Mass (MT): 0 00116689
Template Decay Time: 25 years

Estimated Canister usage: 18"x10' = 1.17

II. Estimates

Radionuclide	m: Ci/MWd From Template	x_n: Nominal Fuel Burnup (MWd)[2]	x_b: Bounding Fuel Burnup (MWd)[2]	b: Initial Activity (Ci)	y_n: Nominal Fuel Inventories(Ci)	y_b: Bounding Fuel Inventories(Ci)
Ac-227	1 1465E-09	307.59	615 18	0 00E+00	3 53E-07	7 05E-07
Am-241	2 3056E-03	307.59	615 18	0 00E+00	7 09E-01	1 42E+00
Am-242m	4 1476E-07	307.59	615 18	0 00E+00	1 28E-04	2 55E-04
Am-243	1 4894E-06	307.59	615 18	0 00E+00	4 58E-04	9 16E-04
C-14	5 7108E-09	307 59	615 18	0 00E+00	1.76E-06	3 51E-06
Cl-36	1 3124E-32	307 59	615 18	0 00E+00	4 04E-30	8 07E-30
Cm-243	1 4562E-07	307 59	615 18	0 00E+00	4 48E-05	8 96E-05
Cm-244	2 4221E-05	307 59	615 18	0 00E+00	7.45E-03	1 49E-02
Co-60	2.7560E-06	307 59	615 18	0 00E+00	8 48E-04	1.70E-03
Cs-134	5 8851E-04	307 59	615 18	0 00E+00	1.81E-01	3.62E-01
Cs-135	3 4477E-06	307 59	615.18	0 00E+00	1.06E-03	2.12E-03
Cs-137	1 8099E+00	307 59	615.18	0 00E+00	5 57E+02	1 11E+03
Eu-154	1 6386E-02	307 59	615.18	0 00E+00	5 04E+00	1 01E+01
Eu-155	2.3957E-03	307 59	615.18	0 00E+00	7 37E-01	1 47E+00
Fe-55	3.2707E-05	307.59	615.18	0 00E+00	1 01E-02	2 01E-02
H-3	3 4504E-03	307 59	615.18	0 00E+00	1 06E+00	2 12E+00
I-129	7.5300E-07	307 59	615 18	0 00E+00	2 32E-04	4 63E-04
Kr-85	7 8540E-02	307 59	615 18	0 00E+00	2 42E+01	4 83E+01
Np-237	9 5615E-06	307 59	615 18	0 00E+00	2 94E-03	5 88E-03
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
Tl-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

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg. MeV	
0 0150	5.756E+13
0 0250	1 196E+13
0 0375	1 041E+13
0 0575	1 118E+13
0 0850	6 748E+12
0 1250	4 520E+12
0.2250	5 826E+12
0 3750	2 533E+12
0 5750	4 152E+13
0 8500	5 983E+11
1.2500	3 327E+11
1 7500	1 644E+10
2.2500	1 172E+06
2 7500	9 594E+05
3.5000	7.247E+02
5 0000	2 438E+02
7 0000	2 683E+01
11 0000	3 001E+00

Thermal Power

Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
6.51E+00	1.30E+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 40659341	60 to 100

Basis for Parameter Differences:

Burnup Summary (MWd)[2]

	From SFD	Estimated	Basis for burnup used in estimate:
Nominal		307 59	Nominal burnup calculated from the heavy metal mass destroyed
Bounding		615 18	Bounding burnup assumed to be twice nominal burnup.

Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup
Nominal	0 19	
Bounding	0 38	

Estimated EOL HM/Given EOL HM: 1 00

[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: UMRR (LEU) ROLLA
SNF ID # 146
Fuel Units & Descr: 28 - 24 CURVED PLATES
Heavy Metal Mass BOL=31.898kg EOL=26.46kg
ROD Storage Site SRS

[1]Fuel decay start date 2035
Estimates as of 2030
Template ATR (Light Water, Alum , 60 to 100%, U)
[2]Template Burnup(MWd) 367.2
Template BOL Heavy Metal Mass (MT) 0.00116689
Template Decay Time 5 years

Estimated Canister usage: 18"x10' = 0.78

II. Estimates

	m	x_n	x_b	b	y_n	y_b
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	1.4545E-10	5,149.51	10,299.02	0.00E+00	7.49E-07	1.50E-06
Am-241	1.1190E-03	5,149.51	10,299.02	0.00E+00	5.76E+00	1.15E+01
Am-242m	4.5425E-07	5,149.51	10,299.02	0.00E+00	2.34E-03	4.68E-03
Am-243	1.4921E-06	5,149.51	10,299.02	0.00E+00	7.68E-03	1.54E-02
C-14	5.7244E-09	5,149.51	10,299.02	0.00E+00	2.95E-05	5.90E-05
Cl-36	1.3124E-32	5,149.51	10,299.02	0.00E+00	6.76E-29	1.35E-28
Cm-243	2.3676E-07	5,149.51	10,299.02	0.00E+00	1.22E-03	2.44E-03
Cm-244	5.2042E-05	5,149.51	10,299.02	0.00E+00	2.68E-01	5.36E-01
Co-60	3.8208E-05	5,149.51	10,299.02	0.00E+00	1.97E-01	3.94E-01
Cs-134	4.8693E-01	5,149.51	10,299.02	0.00E+00	2.51E+03	5.01E+03
Cs-135	3.4477E-06	5,149.51	10,299.02	0.00E+00	1.78E-02	3.55E-02
Cs-137	2.8731E+00	5,149.51	10,299.02	0.00E+00	1.48E+04	2.96E+04
Eu-154	8.2053E-02	5,149.51	10,299.02	0.00E+00	4.23E+02	8.45E+02
Eu-155	3.9134E-02	5,149.51	10,299.02	0.00E+00	2.02E+02	4.03E+02
Fe-55	6.7429E-03	5,149.51	10,299.02	0.00E+00	3.47E+01	6.94E+01
H-3	1.0599E-02	5,149.51	10,299.02	0.00E+00	5.46E+01	1.09E+02
I-129	7.5300E-07	5,149.51	10,299.02	0.00E+00	3.88E-03	7.76E-03
Kr-85	2.8595E-01	5,149.51	10,299.02	0.00E+00	1.47E+03	2.94E+03
Np-237	9.5479E-06	5,149.51	10,299.02	0.00E+00	4.92E-02	9.83E-02
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
Tl-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

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg MeV	
0.0150	1.987E+15
0.0250	4.281E+14
0.0375	3.950E+14
0.0575	3.884E+14
0.0850	2.476E+14
0.1250	2.144E+14
0.2250	2.099E+14
0.3750	1.016E+14
0.5750	1.395E+15
0.8500	1.954E+14
1.2500	3.636E+13
1.7500	1.525E+12
2.2500	3.198E+12
2.7500	1.840E+10
3.5000	2.040E+09
5.0000	6.119E+03
7.0000	6.822E+02
11.0000	7.690E+01

Thermal Power

Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
2.61E+02	5.22E+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 %	19.7500078	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		5,149.51
Bounding		10,299.02

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	0.51	
Bounding	1.03	

Estimated EOL HM/Given EOL HM: 1.02

[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: 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

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

Estimated Canister usage 18"x10'
7 19

II. Estimates

Radionuclide	m Ci/MWd From Template	x_n Nominal Fuel Burnup (MWd)[2]	x_b Bounding Fuel Burnup (MWd)[2]	b Initial Activity (Ci)	y_n Nominal Fuel Inventories(Ci)	y_b Bounding Fuel Inventories(Ci)
Ac-227	1 4545E-10	49 06	98 11	0 00E+00	7.14E-09	1 43E-08
Am-241	1.1190E-03	49 06	98 11	0 00E+00	5 49E-02	1 10E-01
Am-242m	4 5425E-07	49 06	98.11	0 00E+00	2.23E-05	4 46E-05
Am-243	1 4921E-06	49 06	98 11	0 00E+00	7.32E-05	1 46E-04
C-14	5 7244E-09	49 06	98.11	0 00E+00	2 81E-07	5 62E-07
Cl-36	1 3124E-32	49 06	98.11	0 00E+00	6 44E-31	1 29E-30
Cm-243	2 3676E-07	49 06	98.11	0 00E+00	1 16E-05	2 32E-05
Cm-244	5 2042E-05	49 06	98 11	0 00E+00	2 55E-03	5 11E-03
Co-60	3 8208E-05	49 06	98 11	0 00E+00	1 87E-03	3 75E-03
Cs-134	4 8693E-01	49 06	98 11	0 00E+00	2 39E+01	4 78E+01
Cs-135	3 4477E-06	49 06	98 11	0 00E+00	1 69E-04	3 38E-04
Cs-137	2 8731E+00	49 06	98 11	0 00E+00	1 41E+02	2 82E+02
Eu-154	8 2053E-02	49 06	98 11	0 00E+00	4 03E+00	8 05E+00
Eu-155	3 9134E-02	49 06	98 11	0 00E+00	1 92E+00	3 84E+00
Fe-55	6 7429E-03	49 06	98 11	0 00E+00	3 31E-01	6 62E-01
H-3	1 0599E-02	49 06	98 11	0 00E+00	5 20E-01	1 04E+00
I-129	7 5300E-07	49 06	98 11	0 00E+00	3 69E-05	7 39E-05
Kr-85	2 8595E-01	49 06	98 11	0 00E+00	1 40E+01	2 81E+01
Np-237	9 5479E-06	49 06	98 11	0 00E+00	4 68E-04	9 37E-04
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
Tl-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

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg MeV	
0 0150	1 893E+13
0 0250	4 078E+12
0 0375	3 763E+12
0 0575	3 700E+12
0 0850	2.359E+12
0 1250	2 043E+12
0.2250	1 999E+12
0.3750	9 677E+11
0 5750	1 329E+13
0 8500	1 862E+12
1.2500	3.463E+11
1 7500	1 452E+10
2.2500	3 046E+10
2.7500	1 753E+08
3 5000	1 944E+07
5 0000	5 844E+01
7 0000	6 515E+00
11 0000	7 344E-01

Thermal Power

Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
2.49E+00	4 97E+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 15	60 to 100

Basis for Parameter Differences:

Burnup Summary (MWd)[2]

	From SFD	Estimated
Nominal	28.18	49 06
Bounding		98 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	0 04	1 74
Bounding	0 08	

Estimated EOL HM/Given EOL HM: 1 00

[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: 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

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

Estimated Canister usage: 18"x10' = 0 58

II. Estimates

Radionuclide	m: Ci/MWd From Template	x_n: Nominal Fuel Burnup (MWd)[2]	x_b: Bounding Fuel Burnup (MWd)[2]	b: Initial Activity (Ci)	y_n: Nominal Fuel Inventories(Ci)	y_b: Bounding Fuel Inventories(Ci)
Ac-227	1.4545E-10	0 60	1 19	0 00E+00	8 69E-11	1 74E-10
Am-241	1.1190E-03	0 60	1 19	0.00E+00	6 68E-04	1.34E-03
Am-242m	4 5425E-07	0.60	1 19	0 00E+00	2.71E-07	5 43E-07
Am-243	1.4921E-06	0 60	1 19	0 00E+00	8 91E-07	1 78E-06
C-14	5 7244E-09	0 60	1 19	0 00E+00	3 42E-09	6 84E-09
Cl-36	1.3124E-32	0 60	1 19	0 00E+00	7.84E-33	1 57E-32
Cm-243	2 3676E-07	0 60	1 19	0 00E+00	1.41E-07	2 83E-07
Cm-244	5.2042E-05	0 60	1 19	0 00E+00	3 11E-05	6 22E-05
Co-60	3 8208E-05	0 60	1 19	0 00E+00	2.28E-05	4 56E-05
Cs-134	4 8693E-01	0 60	1 19	0 00E+00	2 91E-01	5 82E-01
Cs-135	3 4477E-06	0 60	1 19	0 00E+00	2 06E-06	4 12E-06
Cs-137	2 8731E+00	0 60	1 19	0 00E+00	1.72E+00	3 43E+00
Eu-154	8 2053E-02	0 60	1 19	0 00E+00	4 90E-02	9 80E-02
Eu-155	3 9134E-02	0 60	1.19	0 00E+00	2.34E-02	4 67E-02
Fe-55	6 7429E-03	0 60	1.19	0 00E+00	4 03E-03	8 05E-03
H-3	1 0599E-02	0 60	1.19	0 00E+00	6 33E-03	1.27E-02
I-129	7.5300E-07	0 60	1.19	0 00E+00	4 50E-07	8 99E-07
Kr-85	2 8595E-01	0 60	1.19	0 00E+00	1 71E-01	3.42E-01
Np-237	9 5479E-06	0 60	1.19	0 00E+00	5 70E-06	1.14E-05
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
Tl-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

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg MeV	
0 0150	2.305E+11
0 0250	4 965E+10
0 0375	4.581E+10
0 0575	4 505E+10
0.0850	2 872E+10
0 1250	2 487E+10
0.2250	2 435E+10
0.3750	1 178E+10
0.5750	1 618E+11
0 8500	2.266E+10
1.2500	4 217E+09
1 7500	1 768E+08
2.2500	3 709E+08
2 7500	2.134E+06
3 5000	2.366E+05
5 0000	1.327E+00
7 0000	1.502E-01
11 0000	1 710E-02

Thermal Power

Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
3 03E-02	6 06E-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 %	19 8359342	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	0 60	
Bounding		1 19

Basis for burnup used in estimate:

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

Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup
Nominal	0.00	0 00
Bounding	0 00	

Estimated EOL HM/Given EOL HM: 1 00

[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: 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

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

Estimated Canister usage, 18"x10': 0 94

II. Estimates

Radionuclide	m Ci/MWd From Template	x_n Nominal Fuel Burnup (MWd)[2]	x_b Bounding Fuel Burnup (MWd)[2]	b Initial Activity (Ci)	y_n Nominal Fuel Inventories(Ci)	y_b Bounding Fuel Inventories(Ci)
Ac-227	1 4545E-10	270 47	540 94	0 00E+00	3 93E-08	7.87E-08
Am-241	1 1190E-03	270 47	540 94	0 00E+00	3 03E-01	6.05E-01
Am-242m	4 5425E-07	270 47	540.94	0 00E+00	1.23E-04	2.46E-04
Am-243	1 4921E-06	270 47	540 94	0 00E+00	4 04E-04	8 07E-04
C-14	5 7244E-09	270 47	540 94	0 00E+00	1 55E-06	3 10E-06
Cl-36	1 3124E-32	270 47	540 94	0 00E+00	3.55E-30	7 10E-30
Cm-243	2 3676E-07	270 47	540 94	0 00E+00	6 40E-05	1 28E-04
Cm-244	5 2042E-05	270 47	540 94	0 00E+00	1 41E-02	2 82E-02
Co-60	3 8208E-05	270 47	540 94	0 00E+00	1 03E-02	2 07E-02
Cs-134	4 8693E-01	270 47	540 94	0 00E+00	1 32E+02	2 63E+02
Cs-135	3 4477E-06	270 47	540 94	0 00E+00	9 32E-04	1 86E-03
Cs-137	2 8731E+00	270.47	540 94	0 00E+00	7 77E+02	1.55E+03
Eu-154	8 2053E-02	270.47	540 94	0 00E+00	2 22E+01	4 44E+01
Eu-155	3 9134E-02	270 47	540 94	0 00E+00	1 06E+01	2.12E+01
Fe-55	6 7429E-03	270 47	540 94	0 00E+00	1 82E+00	3 65E+00
H-3	1 0599E-02	270 47	540 94	0 00E+00	2 87E+00	5.73E+00
I-129	7.5300E-07	270 47	540 94	0 00E+00	2 04E-04	4 07E-04
Kr-85	2 8595E-01	270 47	540 94	0 00E+00	7 73E+01	1.55E+02
Np-237	9 5479E-06	270 47	540 94	0 00E+00	2 58E-03	5 16E-03
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
Tl-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

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg MeV	
0 0150	1 044E+14
0 0250	2.248E+13
0 0375	2 075E+13
0 0575	2 040E+13
0 0850	1 301E+13
0 1250	1 126E+13
0.2250	1 102E+13
0 3750	5 336E+12
0 5750	7 329E+13
0 8500	1 026E+13
1 2500	1 910E+12
1 7500	8 008E+10
2.2500	1 680E+11
2 7500	9 663E+08
3.5000	1 072E+08
5 0000	3.207E+02
7 0000	3.576E+01
11 0000	4 030E+00

Thermal Power

Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
1.37E+01	2.74E+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 16325044	60 to 100

Basis for Parameter Drfferences:

Burnup Summary (MWd)[2]

	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

[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: 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

[1]Fuel decay start date: 2035
Estimates as of: 2030
Template: ATR (Light Water Alum , 60 to 100% U)
[2]Template Burnup(MWd): 367.2
Template BOL Heavy Metal Mass (MT): 0.00116689
Template Decay Time: 5 years

Estimated Canister usage: 18"x10': 1.14

II. Estimates

Radionuclide	m: Ci/MWd From Template	x_n: Nominal Fuel Burnup (MWd)[2]	x_b: Bounding Fuel Burnup (MWd)[2]	b: Initial Activity (Ci)	y_n: Nominal Fuel Inventories(Ci)	y_b: Bounding Fuel Inventories(Ci)
Ac-227	1.4545E-10	271.25	542.50	0.00E+00	3.95E-08	7.89E-08
Am-241	1.1190E-03	271.25	542.50	0.00E+00	3.04E-01	6.07E-01
Am-242m	4.5425E-07	271.25	542.50	0.00E+00	1.23E-04	2.46E-04
Am-243	1.4921E-06	271.25	542.50	0.00E+00	4.05E-04	8.09E-04
C-14	5.7244E-09	271.25	542.50	0.00E+00	1.55E-06	3.11E-06
Cl-36	1.3124E-32	271.25	542.50	0.00E+00	3.56E-30	7.12E-30
Cm-243	2.3676E-07	271.25	542.50	0.00E+00	6.42E-05	1.28E-04
Cm-244	5.2042E-05	271.25	542.50	0.00E+00	1.41E-02	2.82E-02
Co-60	3.8208E-05	271.25	542.50	0.00E+00	1.04E-02	2.07E-02
Cs-134	4.8693E-01	271.25	542.50	0.00E+00	1.32E+02	2.64E+02
Cs-135	3.4477E-06	271.25	542.50	0.00E+00	9.35E-04	1.87E-03
Cs-137	2.8731E+00	271.25	542.50	0.00E+00	7.79E+02	1.56E+03
Eu-154	8.2053E-02	271.25	542.50	0.00E+00	2.23E+01	4.45E+01
Eu-155	3.9134E-02	271.25	542.50	0.00E+00	1.06E+01	2.12E+01
Fe-55	6.7429E-03	271.25	542.50	0.00E+00	1.83E+00	3.66E+00
H-3	1.0599E-02	271.25	542.50	0.00E+00	2.88E+00	5.75E+00
I-129	7.5300E-07	271.25	542.50	0.00E+00	2.04E-04	4.09E-04
Kr-85	2.8595E-01	271.25	542.50	0.00E+00	7.76E+01	1.55E+02
Np-237	9.5479E-06	271.25	542.50	0.00E+00	2.59E-03	5.18E-03
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
Tl-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

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg MeV	
0.0150	1.047E+14
0.0250	2.255E+13
0.0375	2.081E+13
0.0575	2.046E+13
0.0850	1.304E+13
0.1250	1.130E+13
0.2250	1.105E+13
0.3750	5.351E+12
0.5750	7.350E+13
0.8500	1.029E+13
1.2500	1.915E+12
1.7500	8.031E+10
2.2500	1.684E+11
2.7500	9.691E+08
3.5000	1.075E+08
5.0000	3.302E+02
7.0000	3.684E+01
11.0000	4.155E+00

Thermal Power

Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
1.38E+01	2.75E+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 %	19.71401492	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		271.25
Bounding		542.50

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

[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: 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

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

Estimated Canister usage 18"x10' 5 42

II. Estimates

	m	x_n	x_b	b	y_n	y_b
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	10,390 70	20,781 39	0 00E+00	2 09E-05	4 17E-05
Am-241	2 5251E-03	10,390 70	20,781 39	0 00E+00	2 62E+01	5 25E+01
Am-242m	3 9624E-07	10,390 70	20,781 39	0 00E+00	4.12E-03	8 23E-03
Am-243	1 4880E-06	10,390 70	20,781 39	0 00E+00	1.55E-02	3 09E-02
C-14	5 7053E-09	10,390 70	20,781 39	0 00E+00	5 93E-05	1 19E-04
Cl-36	1.3124E-32	10,390 70	20,781 39	0 00E+00	1.36E-28	2 73E-28
Cm-243	1.1419E-07	10,390 70	20,781 39	0 00E+00	1.19E-03	2 37E-03
Cm-244	1.6522E-05	10,390 70	20,781 39	0 00E+00	1 72E-01	3 43E-01
Co-60	7 4047E-07	10,390 70	20,781 39	0 00E+00	7 69E-03	1 54E-02
Cs-134	2 0455E-05	10,390 70	20,781 39	0 00E+00	2.13E-01	4.25E-01
Cs-135	3.4477E-06	10,390 70	20,781 39	0 00E+00	3 58E-02	7 16E-02
Cs-137	1 4365E+00	10,390 70	20,781.39	0 00E+00	1 49E+04	2.99E+04
Eu-154	7 3230E-03	10,390 70	20,781 39	0 00E+00	7 61E+01	1 52E+02
Eu-155	5 9259E-04	10,390 70	20,781.39	0 00E+00	6 16E+00	1.23E+01
Fe-55	2.2791E-06	10,390 70	20,781.39	0 00E+00	2 37E-02	4 74E-02
H-3	1 9698E-03	10,390 70	20,781.39	0 00E+00	2 05E+01	4 09E+01
I-129	7 5300E-07	10,390 70	20,781.39	0 00E+00	7 82E-03	1 56E-02
Kr-85	4 1176E-02	10,390 70	20,781.39	0 00E+00	4 28E+02	8.56E+02
Np-237	9 5752E-06	10,390.70	20,781.39	0 00E+00	9 95E-02	1 99E-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
Th-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
Tl-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
U-233	3 6275E-09	10,390 70	20,781.39	0 00E+00	3.77E-05	7 54E-05
U-234	1 8562E-04	10,390 70	20,781.39	0 00E+00	1 93E+00	3 86E+00
U-235	-2.7235E-06	10,390 70	0 00	4 31E-02	1 48E-02	4 31E-02
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

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg MeV	
0 0150	1 531E+15
0 0250	3 178E+14
0 0375	2 763E+14
0 0575	2 973E+14
0 0850	1 792E+14
0 1250	1 183E+14
0.2250	1.547E+14
0 3750	6 729E+13
0 5750	1 112E+15
0 8500	1.358E+13
1.2500	6.570E+12
1 7500	3 698E+11
2.2500	3.092E+07
2.7500	2.951E+07
3 5000	1 724E+04
5 0000	7 046E+03
7 0000	7 714E+02
11 0000	8.603E+01

Thermal Power

Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
1 74E+02	3 48E+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 %	19 7909823	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		10,390 70
Bounding		20 781 39

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 33	
Bounding	0 65	

Estimated EOL HM/Given EOL HM: 1 01

[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: 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

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

Estimated Canister usage 18"x10"
3 42

II. Estimates

Radionuclide	m Ci/MWd From Template	x_n Nominal Fuel Burnup (MWd)[2]	x_b Bounding Fuel Burnup (MWd)[2]	b Initial Activity (Ci)	y_n Nominal Fuel Inventories(Ci)	y_b Bounding Fuel Inventories(Ci)
Ac-227	1.4545E-10	1,708 42	3,416 85	0 00E+00	2 48E-07	4 97E-07
Am-241	1 1190E-03	1,708 42	3,416 85	0 00E+00	1 91E+00	3 82E+00
Am-242m	4 5425E-07	1,708 42	3,416 85	0 00E+00	7 76E-04	1 55E-03
Am-243	1 4921E-06	1,708 42	3,416 85	0 00E+00	2 55E-03	5 10E-03
C-14	5 7244E-09	1,708 42	3,416 85	0 00E+00	9 78E-06	1 96E-05
Cl-36	1.3124E-32	1,708 42	3,416 85	0 00E+00	2.24E-29	4 48E-29
Cm-243	2 3676E-07	1,708 42	3,416 85	0 00E+00	4 04E-04	8 09E-04
Cm-244	5 2042E-05	1,708 42	3,416 85	0 00E+00	8 89E-02	1 78E-01
Co-60	3 8208E-05	1,708 42	3,416 85	0 00E+00	6.53E-02	1.31E-01
Cs-134	4 8693E-01	1,708 42	3,416 85	0 00E+00	8 32E+02	1 66E+03
Cs-135	3 4477E-06	1,708 42	3,416 85	0 00E+00	5 89E-03	1.18E-02
Cs-137	2 8731E+00	1,708 42	3,416 85	0 00E+00	4 91E+03	9 82E+03
Eu-154	8 2053E-02	1,708 42	3,416 85	0 00E+00	1 40E+02	2.80E+02
Eu-155	3 9134E-02	1,708.42	3,416 85	0 00E+00	6 69E+01	1.34E+02
Fe-55	6.7429E-03	1,708 42	3,416 85	0 00E+00	1 15E+01	2.30E+01
H-3	1.0599E-02	1,708 42	3,416 85	0 00E+00	1 81E+01	3 62E+01
I-129	7.5300E-07	1,708 42	3,416 85	0 00E+00	1.29E-03	2 57E-03
Kr-85	2 8595E-01	1,708 42	3,416 85	0 00E+00	4 89E+02	9 77E+02
Np-237	9 5479E-06	1,708 42	3,416 85	0 00E+00	1 63E-02	3 26E-02
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
Tl-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

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg MeV	
0 0150	6.592E+14
0.0250	1 420E+14
0.0375	1.311E+14
0 0575	1 289E+14
0 0850	8 215E+13
0 1250	7 114E+13
0.2250	6 963E+13
0 3750	3 370E+13
0 5750	4 629E+14
0 8500	6 483E+13
1.2500	1.206E+13
1.7500	5 058E+11
2.2500	1 061E+12
2.7500	6 104E+09
3.5000	6 769E+08
5.0000	2 045E+03
7.0000	2.281E+02
11 0000	2.571E+01

Thermal Power

Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
8.66E+01	1 73E+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 %	19 74999113	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		1,708 42
Bounding		3 416 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 31	

Estimated EOL HM/Given EOL HM: 1 00

[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: 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

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

Estimated Canister usage

18"x10'
9 38

II. Estimates

Radionuclide	m Ci/MWd From Template	x_n Nominal Fuel Burnup (MWd)[2]	x_b Bounding Fuel Burnup (MWd)[2]	b Initial Activity (Ci)	y_n Nominal Fuel Inventories(Ci)	y_b Bounding Fuel Inventories(Ci)
Ac-227	1 4545E-10	15,320 41	30,640 81	0 00E+00	2 23E-06	4 46E-06
Am-241	1 1190E-03	15,320 41	30,640 81	0 00E+00	1.71E+01	3 43E+01
Am-242m	4 5425E-07	15,320 41	30,640 81	0 00E+00	6 96E-03	1.39E-02
Am-243	1 4921E-06	15,320 41	30,640 81	0 00E+00	2.29E-02	4 57E-02
C-14	5 7244E-09	15,320 41	30,640 81	0 00E+00	8 77E-05	1.75E-04
Cl-36	1.3124E-32	15,320 41	30,640 81	0 00E+00	2 01E-28	4 02E-28
Cm-243	2.3676E-07	15,320 41	30,640 81	0 00E+00	3 63E-03	7.25E-03
Cm-244	5.2042E-05	15,320 41	30,640 81	0 00E+00	7.97E-01	1 59E+00
Co-60	3 8208E-05	15,320 41	30,640 81	0 00E+00	5 85E-01	1 17E+00
Cs-134	4 8693E-01	15,320 41	30,640 81	0 00E+00	7 46E+03	1 49E+04
Cs-135	3 4477E-06	15,320 41	30,640 81	0 00E+00	5.28E-02	1 06E-01
Cs-137	2 8731E+00	15,320 41	30,640 81	0 00E+00	4 40E+04	8 80E+04
Eu-154	8.2053E-02	15,320 41	30,640 81	0 00E+00	1 26E+03	2 51E+03
Eu-155	3 9134E-02	15,320 41	30,640 81	0 00E+00	6 00E+02	1 20E+03
Fe-55	6 7429E-03	15,320 41	30,640 81	0 00E+00	1 03E+02	2 07E+02
H-3	1 0599E-02	15,320 41	30,640 81	0 00E+00	1 62E+02	3 25E+02
I-129	7 5300E-07	15,320 41	30,640 81	0 00E+00	1 15E-02	2.31E-02
Kr-85	2 8595E-01	15,320 41	30,640 81	0 00E+00	4 38E+03	8 76E+03
Np-237	9 5479E-06	15,320 41	30,640 81	0 00E+00	1 46E-01	2 93E-01
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
Tl-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

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg. MeV	
0.0150	5 911E+15
0.0250	1.274E+15
0 0375	1 175E+15
0.0575	1 156E+15
0 0850	7.367E+14
0 1250	6.380E+14
0.2250	6.244E+14
0.3750	3 022E+14
0.5750	4 151E+15
0 8500	5.814E+14
1.2500	1.082E+14
1 7500	4.536E+12
2.2500	9.514E+12
2.7500	5 474E+10
3 5000	6.070E+09
5 0000	1 826E+04
7 0000	2.037E+03
11 0000	2.296E+02

Thermal Power

Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
7 77E+02	1 55E+03
Total	Total

III. Template Selection Summary, Burnup Summary, and Checks

Template Selection Summary

	From SFD	Used
Reactor Moderator	LIGHT WATER	LIGHT WATER
Fuel Cladding	ALUM	ALUM
BOL HM Constituents	U	U
BOL Enrichment %	19 74999113	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		15,320 41
Bounding		30 640 81

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

Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup
Nominal	0.26	
Bounding	0 51	

Estimated EOL HM/Given EOL HM: 1 01

[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: 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

[1]Fuel decay start date: 1993
Estimates as of: 2030
Template: ATR (Light Water, Alum , 60 to 100% U)
[2]Template Burnup(MWd): 367.2
Template BOL Heavy Metal Mass (MT): 0 00116689
Template Decay Time: 35 years

Estimated Canister usage 18"x10": 0 83

II. Estimates

Radionuclide	m: Ci/MWd From Template	x_n: Nominal Fuel Burnup (MWd)[2]	x_b: Bounding Fuel Burnup (MWd)[2]	b: Initial Activity (Ci)	y_n: Nominal Fuel Inventories(Ci)	y_b: Bounding Fuel Inventories(Ci)
Ac-227	2 0068E-09	327.67	655 34	0.00E+00	6 58E-07	1.32E-06
Am-241	2.5251E-03	327.67	655 34	0.00E+00	8.27E-01	1.65E+00
Am-242m	3 9624E-07	327 67	655 34	0 00E+00	1 30E-04	2 60E-04
Am-243	1 4880E-06	327 67	655 34	0 00E+00	4 88E-04	9 75E-04
C-14	5 7053E-09	327 67	655 34	0 00E+00	1 87E-06	3 74E-06
Cl-36	1 3124E-32	327 67	655 34	0 00E+00	4 30E-30	8 60E-30
Cm-243	1 1419E-07	327 67	655.34	0 00E+00	3 74E-05	7 48E-05
Cm-244	1 6522E-05	327 67	655.34	0 00E+00	5 41E-03	1.08E-02
Co-60	7 4047E-07	327 67	655.34	0 00E+00	2 43E-04	4 85E-04
Cs-134	2 0455E-05	327 67	655 34	0 00E+00	6 70E-03	1.34E-02
Cs-135	3 4477E-06	327.67	655 34	0 00E+00	1 13E-03	2.26E-03
Cs-137	1.4365E+00	327.67	655 34	0.00E+00	4 71E+02	9.41E+02
Eu-154	7.3230E-03	327 67	655 34	0 00E+00	2 40E+00	4 80E+00
Eu-155	5 9259E-04	327 67	655 34	0 00E+00	1 94E-01	3 88E-01
Fe-55	2 2791E-06	327 67	655 34	0 00E+00	7 47E-04	1.49E-03
H-3	1 9698E-03	327 67	655 34	0 00E+00	6 45E-01	1 29E+00
I-129	7 5300E-07	327 67	655.34	0 00E+00	2 47E-04	4.93E-04
Kr-85	4 1176E-02	327 67	655.34	0 00E+00	1.35E+01	2.70E+01
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
Tl-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

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg. MeV	
0 0150	4.827E+13
0 0250	1 002E+13
0 0375	8 712E+12
0 0575	9 377E+12
0 0850	5 650E+12
0 1250	3 732E+12
0.2250	4 878E+12
0.3750	2.122E+12
0.5750	3.507E+13
0 8500	4.284E+11
1.2500	2 072E+11
1 7500	1 166E+10
2.2500	9 750E+05
2.7500	9 306E+05
3.5000	5 742E+02
5 0000	2.354E+02
7 0000	2.584E+01
11 0000	2.887E+00

Thermal Power

Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
5 48E+00	1 10E+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 %	19 77478682	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		327 67
Bounding		655 34

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 04	
Bounding	0 09	

Estimated EOL HM/Given EOL HM: 1 00

[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: 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

[1]Fuel decay start date: 1966
Estimates as of: 2030
Template: ATR (Light Water, Alum , 60 to 100%, U)
[2]Template Burnup(MWd): 367.2
Template BOL Heavy Metal Mass (MT): 0 00116689
Template Decay Time: 50 years

Estimated Canister usage 18"x10': 1 83

II. Estimates

Radionuclide	m Ci/MWd From Template	x_n Nominal Fuel Burnup (MWd)[2]	x_b Bounding Fuel Burnup (MWd)[2]	b Initial Activity (Ci)	y_n Nominal Fuel Inventories(Ci)	y_b Bounding Fuel Inventories(Ci)
Ac-227	2 9739E-09	1,012.55	2,025.11	0 00E+00	3 01E-06	6 02E-06
Am-241	2 5986E-03	1,012.55	2,025.11	0 00E+00	2 63E+00	5 26E+00
Am-242m	3 7010E-07	1,012 55	2,025 11	0 00E+00	3 75E-04	7 49E-04
Am-243	1 4858E-06	1,012 55	2,025 11	0 00E+00	1 50E-03	3 01E-03
C-14	5 6944E-09	1,012 55	2,025 11	0 00E+00	5 77E-06	1 15E-05
Cl-36	1 3124E-32	1,012 55	2,025 11	0 00E+00	1.33E-29	2 66E-29
Cm-243	7.9303E-08	1,012 55	2,025 11	0 00E+00	8.03E-05	1 61E-04
Cm-244	9.3083E-06	1,012 55	2,025 11	0 00E+00	9 43E-03	1 89E-02
Co-60	1 0310E-07	1,012 55	2,025 11	0 00E+00	1 04E-04	2 09E-04
Cs-134	1 3254E-07	1,012 55	2,025 11	0 00E+00	1 34E-04	2 68E-04
Cs-135	3 4477E-06	1,012 55	2,025 11	0 00E+00	3 49E-03	6 98E-03
Cs-137	1 0161E+00	1,012 55	2,025 11	0 00E+00	1 03E+03	2 06E+03
Eu-154	2 1879E-03	1,012.55	2,025 11	0 00E+00	2 22E+00	4 43E+00
Eu-155	7 2930E-05	1,012.55	2,025 11	0 00E+00	7 38E-02	1 48E-01
Fe-55	4 1912E-08	1,012.55	2,025.11	0 00E+00	4 24E-05	8 49E-05
H-3	8 4913E-04	1,012.55	2,025.11	0 00E+00	8 60E-01	1 72E+00
I-129	7 5300E-07	1,012 55	2,025 11	0 00E+00	7 62E-04	1 52E-03
Kr-85	1 5615E-02	1,012 55	2,025 11	0 00E+00	1 58E+01	3 16E+01
Np-237	9 5861E-06	1,012 55	2,025 11	0 00E+00	9 71E-03	1 94E-02
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
Tl-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

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg. MeV	
0 0150	1 043E+14
0 0250	2 166E+13
0 0375	1.882E+13
0 0575	2.027E+13
0 0850	1.220E+13
0 1250	7 973E+12
0.2250	1 053E+13
0.3750	4 585E+12
0.5750	7 661E+13
0 8500	8.207E+11
1.2500	3.319E+11
1 7500	2.174E+10
2.2500	2.109E+06
2.7500	2 490E+06
3.5000	1 367E+03
5 0000	5 557E+02
7 0000	6 043E+01
11 0000	6 712E+00

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
Reactor Moderator	LIGHT WATER	LIGHT WATER
Fuel Cladding	ALUM	ALUM
BOL HM Constituents	U	U
BOL Enrichment %	92.93756073	60 to 100

Basis for Parameter Differences:

Burnup Summary (MWd)[2]

	From SFD	Estimated	Basis for burnup used in estimate:
Nominal	230.24	1,012.55	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
Nominal	0.41	4 40
Bounding	0 81	7.21

Estimated EOL HM/Given EOL HM: 1 01

[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 VBWR (UO2)
SNF ID # 855
Fuel Units & Descr 7 - ROD
Heavy Metal Mass BOL=6 578kg EOL=4 04kg
ROD Storage Site INEEL

[1]Fuel decay start date 1962
Estimates as of 2030
Template PWR (Light Water, Zirc 0 to 5%, U)
[2]Template 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

Radionuclide	m: Ci/MWd From Template	x_n: Nominal Fuel Burnup (MWd)[2]	x_b: Bounding Fuel Burnup (MWd)[2]	b: Initial Activity (Ci)	y_n: Nominal Fuel Inventories(Ci)	y_b: Bounding Fuel Inventories(Ci)
Ac-227	1.2581E-09	2,413 71	4,827 42	0 00E+00	3 04E-06	6 07E-06
Am-241	1 4761E-01	2,413 71	4,827 42	0 00E+00	3 56E+02	7 13E+02
Am-242m	2 5032E-04	2,413 71	4,827 42	0 00E+00	6 04E-01	1 21E+00
Am-243	6 2387E-04	2,413 71	4,827.42	0 00E+00	1 51E+00	3 01E+00
C-14	4 7739E-05	2,413 71	4,827.42	0 00E+00	1 15E-01	2.30E-01
Cl-36	8 0297E-07	2,413 71	4,827.42	0 00E+00	1 94E-03	3 88E-03
Cm-243	1 2099E-04	2,413 71	4,827 42	0 00E+00	2 92E-01	5 84E-01
Cm-244	1 5560E-02	2,413 71	4,827 42	0 00E+00	3 76E+01	7.51E+01
Co-60	4 9580E-05	2,413 71	4,827 42	0 00E+00	1.20E-01	2 39E-01
Cs-134	1.7022E-09	2,413 71	4,827 42	0 00E+00	4.11E-06	8 22E-06
Cs-135	1.4433E-05	2,413 71	4,827 42	0 00E+00	3 48E-02	6 97E-02
Cs-137	6 9929E-01	2,413 71	4,827 42	0 00E+00	1 69E+03	3 38E+03
Eu-154	1 8023E-03	2,413 71	4,827 42	0 00E+00	4 35E+00	8 70E+00
Eu-155	2 6793E-05	2,413 71	4,827.42	0 00E+00	6 47E-02	1.29E-01
Fe-55	1 4580E-08	2,413 71	4,827.42	0 00E+00	3 52E-05	7 04E-05
H-3	3 8566E-03	2,413 71	4,827.42	0 00E+00	9 31E+00	1 86E+01
I-129	9 8288E-07	2,413.71	4,827 42	0 00E+00	2 37E-03	4 74E-03
Kr-85	4 0617E-03	2,413 71	4,827 42	0 00E+00	9 80E+00	1 96E+01
Np-237	1.2645E-05	2,413 71	4,827 42	0 00E+00	3.05E-02	6 10E-02
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
Tl-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

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg MeV	
0 0150	1.307E+14
0 0250	2 596E+13
0 0375	2.427E+13
0 0575	3.330E+13
0 0850	1 421E+13
0 1250	9.266E+12
0.2250	1.208E+13
0 3750	5.229E+12
0 5750	1.245E+14
0 8500	9 978E+11
1.2500	4 664E+11
1 7500	2 684E+10
2.2500	4 726E+06
2 7500	2.351E+07
3.5000	1 167E+06
5 0000	4 983E+05
7 0000	5 735E+04
11 0000	6 583E+03

Thermal Power

Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
3.54E+01	7.08E+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	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

[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: 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

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

Estimated Canister usage 18"x10' 0 72

II. Estimates

Radionuclide	m Ci/MWd From Template	x_n Nominal Fuel Burnup (MWd)[2]	x_b Bounding Fuel Burnup (MWd)[2]	b Initial Activity (Ci)	y_n Nominal Fuel Inventories(Ci)	y_b Bounding Fuel Inventories(Ci)
Ac-227	1 4545E-10	22.16	44 32	0 00E+00	3 22E-09	6 45E-09
Am-241	1 1190E-03	22 16	44 32	0 00E+00	2 48E-02	4 96E-02
Am-242m	4 5425E-07	22.16	44 32	0 00E+00	1 01E-05	2 01E-05
Am-243	1 4921E-06	22 16	44 32	0 00E+00	3 31E-05	6 61E-05
C-14	5 7244E-09	22 16	44 32	0 00E+00	1.27E-07	2 54E-07
Cl-36	1.3124E-32	22 16	44 32	0 00E+00	2 91E-31	5 82E-31
Cm-243	2.3676E-07	22 16	44 32	0 00E+00	5.25E-06	1 05E-05
Cm-244	5.2042E-05	22 16	44 32	0 00E+00	1.15E-03	2 31E-03
Co-60	3 8208E-05	22 16	44 32	0 00E+00	8 47E-04	1 69E-03
Cs-134	4 8693E-01	22 16	44 32	0 00E+00	1 08E+01	2 16E+01
Cs-135	3 4477E-06	22 16	44 32	0 00E+00	7 64E-05	1 53E-04
Cs-137	2 8731E+00	22 16	44 32	0 00E+00	6 37E+01	1 27E+02
Eu-154	8 2053E-02	22 16	44 32	0 00E+00	1 82E+00	3 64E+00
Eu-155	3 9134E-02	22 16	44 32	0 00E+00	8 67E-01	1 73E+00
Fe-55	6 7429E-03	22.16	44.32	0 00E+00	1 49E-01	2 99E-01
H-3	1 0599E-02	22 16	44.32	0 00E+00	2 35E-01	4 70E-01
I-129	7 5300E-07	22.16	44.32	0 00E+00	1 67E-05	3 34E-05
Kr-85	2 8595E-01	22.16	44 32	0 00E+00	6 34E+00	1.27E+01
Np-237	9 5479E-06	22.16	44.32	0 00E+00	2 12E-04	4 23E-04
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
Tl-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

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg MeV	
0.0150	8 551E+12
0 0250	1 842E+12
0 0375	1 700E+12
0 0575	1 671E+12
0 0850	1 066E+12
0 1250	9.228E+11
0.2250	9 033E+11
0 3750	4 372E+11
0 5750	6 005E+12
0 8500	8.409E+11
1 2500	1 565E+11
1 7500	6.561E+09
2.2500	1 376E+10
2.7500	7 917E+07
3 5000	8 781E+06
5 0000	4 043E+01
7 0000	4 559E+00
11 0000	5 175E-01

Thermal Power

Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
1 12E+00	2 25E+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 %	19 8630137	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		22.16
Bounding		44 32

Basis for burnup used in estimate:

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

Checks

	Burnup Multiplier	Estimated Burnup/ Given Burnup
Nominal:	0 00	
Bounding:	0 01	

Estimated EOL HM/Given EOL HM: 1 00

[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: 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

[1]Fuel decay start date: 1997
Estimates as of: 2030
Template: ATR (Light Water Alum , 60 to 100% U)
[2]Template Burnup(MWd): 367.2
Template BOL Heavy Metal Mass (MT): 0 00116689
Template Decay Time: 25 years

Estimated Canister usage: 18"x10' = 0 97

II. Estimates

Radionuclide	m: Ci/MWd From Template	x_n: Nominal Fuel Burnup (MWd)[2]	x_b: Bounding Fuel Burnup (MWd)[2]	b: Initial Activity (Ci)	y_n: Nominal Fuel Inventories(Ci)	y_b: Bounding Fuel Inventories(Ci)
Ac-227	1 1465E-09	377 86	755 72	0 00E+00	4 33E-07	8 66E-07
Am-241	2 3056E-03	377 86	755 72	0 00E+00	8 71E-01	1.74E+00
Am-242m	4 1476E-07	377 86	755 72	0 00E+00	1 57E-04	3 13E-04
Am-243	1 4894E-06	377.86	755 72	0 00E+00	5 63E-04	1 13E-03
C-14	5 7108E-09	377.86	755 72	0 00E+00	2.16E-06	4 32E-06
Cl-36	1.3124E-32	377.86	755 72	0 00E+00	4.96E-30	9 92E-30
Cm-243	1 4562E-07	377 86	755 72	0 00E+00	5 50E-05	1.10E-04
Cm-244	2 4221E-05	377 86	755 72	0 00E+00	9 15E-03	1 83E-02
Co-60	2 7560E-06	377 86	755 72	0 00E+00	1 04E-03	2 08E-03
Cs-134	5 8851E-04	377 86	755 72	0 00E+00	2 22E-01	4 45E-01
Cs-135	3 4477E-06	377 86	755 72	0 00E+00	1 30E-03	2 61E-03
Cs-137	1 8099E+00	377 86	755 72	0 00E+00	6 84E+02	1 37E+03
Eu-154	1 6386E-02	377.86	755 72	0 00E+00	6 19E+00	1 24E+01
Eu-155	2.3957E-03	377.86	755 72	0 00E+00	9 05E-01	1 81E+00
Fe-55	3.2707E-05	377.86	755.72	0 00E+00	1.24E-02	2 47E-02
H-3	3 4504E-03	377.86	755 72	0 00E+00	1.30E+00	2.61E+00
I-129	7 5300E-07	377 86	755 72	0 00E+00	2 85E-04	5 69E-04
Kr-85	7 8540E-02	377 86	755 72	0 00E+00	2 97E+01	5 94E+01
Np-237	9 5615E-06	377 86	755 72	0 00E+00	3 61E-03	7.23E-03
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
Tl-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 Radionuclides					6 51E+02	1.30E+03

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg MeV	
0 0150	7 072E+13
0 0250	1 469E+13
0 0375	1.279E+13
0 0575	1.374E+13
0 0850	8.290E+12
0 1250	5.552E+12
0.2250	7 157E+12
0 3750	3 111E+12
0 5750	5 101E+13
0 8500	7.350E+11
1.2500	4 088E+11
1 7500	2.019E+10
2.2500	1.439E+06
2 7500	1 179E+06
3 5000	9.236E+02
5 0000	3 138E+02
7 0000	3 461E+01
11 0000	3 877E+00

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

	From SFD	Used
Reactor Moderator	LIGHT WATER	LIGHT WATER
Fuel Cladding	ALUM	ALUM
BOL HM Constituents	U	U
BOL Enrichment %	19 74998117	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		377.86
Bounding		755 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 05	
Bounding	0 10	

Estimated EOL HM/Given EOL HM: 1 00

[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)

2030 Summary, Totals for all Spent Fuels

Radionuclide	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)
Ac-227	2 96E+02	3 52E+02
Am-241	2 81E+06	4 01E+06
Am-242m	6 08E+03	9 59E+03
Am-243	5 44E+03	8 47E+03
C-14	2 92E+04	3 85E+04
Cl-36	5 09E+02	6 82E+02
Cm-243	1 19E+03	2.12E+03
Cm-244	1 44E+05	2.52E+05
Co-60	4 51E+06	8.25E+06
Cs-134	6 41E+05	1 28E+06
Cs-135	4 00E+02	5 77E+02
Cs-137	2 98E+07	4 77E+07
Eu-154	3 97E+05	6 96E+05
Eu-155	9 86E+04	1 88E+05
Fe-55	2.04E+06	4 07E+06
H-3	1.18E+05	1 97E+05
I-129	2 23E+01	3 28E+01
Kr-85	9 96E+05	1.77E+06
Np-237	2 08E+02	3 22E+02
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
Tl-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

Gamma Sources	
Photon Energy Group	Total Photons/sec (bounding)
Avg. MeV	
0 0150	2 404E+18
0 0250	4 961E+17
0 0375	4 459E+17
0 0575	5 107E+17
0 0850	2 801E+17
0 1250	2 005E+17
0 2250	2 407E+17
0 3750	1 062E+17
0 5750	1 847E+18
0 8500	7 223E+16
1 2500	6 333E+17
1.7500	1 149E+15
2.2500	7.981E+14
2.7500	1.512E+15
3.5000	5.204E+11
5 0000	1 695E+09
7 0000	1 947E+08
11 0000	2.233E+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)
Ac-227	3 31E+00	7 53E+00
Am-241	1 40E+06	1 91E+06
Am-242m	2 51E+03	3 49E+03
Am-243	2 60E+03	3 61E+03
C-14	2.26E+04	2 91E+04
Cl-36	4 18E+02	5.42E+02
Cm-243	1.42E+02	2.21E+02
Cm-244	2.18E+04	3.29E+04
Co-60	9 36E+05	1 29E+06
Cs-134	6 16E+05	1 23E+06
Cs-135	9 74E+01	1 47E+02
Cs-137	1 07E+07	1 93E+07
Eu-154	2.29E+05	4 12E+05
Eu-155	6.25E+04	1.23E+05
Fe-55	4.73E+04	9.18E+04
H-3	4.30E+04	7.10E+04
I-129	5.20E+00	8.83E+00
Kr-85	5 60E+05	1 09E+06
Np-237	7 64E+01	1.29E+02
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
Tl-208	3 43E+02	8 12E+02
U-232	9 30E+02	2 20E+03
U-233	1 85E+03	1 96E+03
U-234	3 90E+03	5 19E+03
U-235	1 09E+02	1 51E+02
U-236	1.11E+02	1.82E+02
U-238	2 69E+01	3.34E+01
Y-90	9 96E+06	1 80E+07
Other Radionuclides	1 99E+07	3 32E+07

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg MeV	
0 0150	1.117E+18
0 0250	2.334E+17
0 0375	2 087E+17
0 0575	2 396E+17
0 0850	1 321E+17
0.1250	1 017E+17
0.2250	1 131E+17
0.3750	5 167E+16
0 5750	7.924E+17
0 8500	5.598E+16
1.2500	1.097E+17
1 7500	6 064E+14
2 2500	7.769E+14
2 7500	3 302E+13
3 5000	4 994E+11
5.0000	2 349E+08
7 0000	2 683E+07
11 0000	3 066E+06

Thermal Power

Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
2.21E+05	3.73E+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	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)
Ac-227	2 64E+02	2 78E+02
Am-241	5 08E+05	7 93E+05
Am-242m	2.30E+03	4 16E+03
Am-243	1.31E+03	2 20E+03
C-14	3 97E+03	4 44E+03
Cl-36	5 00E+01	5 77E+01
Cm-243	6 71E+02	1 24E+03
Cm-244	6 42E+04	1.13E+05
Co-60	3 50E+06	6 82E+06
Cs-134	2 48E+04	4 72E+04
Cs-135	1 96E+02	2 76E+02
Cs-137	1 06E+07	1 55E+07
Eu-154	1 23E+05	2 06E+05
Eu-155	3 22E+04	5 88E+04
Fe-55	1 99E+06	3 97E+06
H-3	4 52E+04	7 29E+04
I-129	9 51E+00	1 30E+01
Kr-85	2 89E+05	4 40E+05
Np-237	5 40E+01	8 29E+01
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
Tl-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

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg. MeV	
0 0150	7.232E+17
0 0250	1 478E+17
0 0375	1.333E+17
0 0575	1 472E+17
0 0850	8.369E+16
0 1250	5 640E+16
0.2250	7.211E+16
0.3750	3 067E+16
0.5750	5 807E+17
0 8500	1 083E+16
1.2500	5.103E+17
1.7500	3 646E+14
2.2500	2.104E+13
2.7500	1.146E+15
3 5000	1.920E+10
5 0000	7.482E+08
7 0000	8 606E+07
11.0000	9 874E+06

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	0 0	1446.1	0 0	0 0	0 0	0 0

Bare Fuel Transfers

0	Assemblies

2030 Summary, Totals for 24" x 10' Canister

Radionuclide	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)
Ac-227	1 95E-03	3 89E-03
Am-241	2 45E+03	4 90E+03
Am-242m	3 84E-01	7 68E-01
Am-243	1 44E+00	2 88E+00
C-14	5 53E-03	1.11E-02
Cl-36	1.27E-26	2.54E-26
Cm-243	1 11E-01	2 21E-01
Cm-244	1.60E+01	3.20E+01
Co-60	7 18E-01	1.44E+00
Cs-134	1 98E+01	3 97E+01
Cs-135	3 34E+00	6 68E+00
Cs-137	1 39E+06	2 79E+06
Eu-154	7 10E+03	1 42E+04
Eu-155	5 74E+02	1 15E+03
Fe-55	2 21E+00	4 42E+00
H-3	1 91E+03	3 82E+03
I-129	7.30E-01	1 46E+00
Kr-85	3 99E+04	7.98E+04
Np-237	9 28E+00	1.86E+01
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
Tl-208	3 92E-02	7.84E-02
U-232	1.06E-01	2.12E-01
U-233	3 52E-03	7.03E-03
U-234	1.80E+02	3.60E+02
U-235	4.64E+00	7.28E+00
U-236	1.50E+01	3 00E+01
U-238	8 14E-02	8 55E-02
Y-90	1 31E+06	2 61E+06
Other Radionuclides	1 33E+06	2 65E+06

Gamma Sources	
Photon Energy Group	Total Photons/sec (bounding)
Avg. MeV	
0 0150	1 428E+17
0 0250	2.965E+16
0.0375	2.577E+16
0.0575	2.774E+16
0 0850	1.671E+16
0 1250	1.104E+16
0 2250	1 443E+16
0 3750	6.278E+15
0 5750	1 037E+17
0 8500	1.267E+15
1 2500	6 129E+14
1 7500	3 450E+13
2.2500	2 884E+09
2 7500	2 753E+09
3 5000	1.595E+06
5 0000	6 518E+05
7.0000	7.132E+04
11 0000	7.952E+03

Thermal Power	
Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
1.62E+04	3.24E+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	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)
Ac-227	2 74E+01	4 84E+01
Am-241	6 85E+01	1 21E+02
Am-242m	4 17E-01	7 37E-01
Am-243	8 77E-02	1 55E-01
C-14	2 60E+01	4 60E+01
Cl-36	5 10E-01	9 01E-01
Cm-243	8 61E-02	1 52E-01
Cm-244	3 98E+00	7 04E+00
Co-60	2 46E+02	4 35E+02
Cs-134	7 21E+00	1 27E+01
Cs-135	8 06E+00	1 42E+01
Cs-137	4 16E+05	7 35E+05
Eu-154	2 42E+03	4 28E+03
Eu-155	1 86E+02	3 29E+02
Fe-55	6 48E-01	1 14E+00
H-3	5 99E+02	1 06E+03
I-129	4 46E-01	7 89E-01
Kr-85	1.76E+04	3 12E+04
Np-237	3 55E-02	6 28E-02
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
Tl-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

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg. MeV	
0 0150	4 104E+16
0 0250	8 451E+15
0 0375	7.223E+15
0 0575	7 895E+15
0 0850	5 043E+15
0 1250	3 160E+15
0.2250	4 522E+15
0 3750	1 816E+15
0 5750	2 773E+16
0 8500	4 955E+14
1.2500	2 189E+14
1 7500	3 413E+13
2.2500	9 919E+08
2.7500	2 439E+14
3 5000	9 483E+05
5 0000	2 968E+05
7 0000	2 163E+04
11.0000	1 648E+03

Thermal Power

Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
7.83E+03	1 36E+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	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)
Ac-227	1.18E+00	1 75E+01
Am-241	3 26E+04	3 68E+04
Am-242m	3 15E+02	3 23E+02
Am-243	8 98E+01	1 08E+02
C-14	2.40E+01	4 10E+01
Cl-36	3 43E-01	6.73E-01
Cm-243	7 92E+01	8 55E+01
Cm-244	4 62E+03	5.76E+03
Co-60	2 09E+03	3 24E+03
Cs-134	2 36E+02	3 09E+02
Cs-135	1 42E+01	1 95E+01
Cs-137	4 93E+05	7.80E+05
Eu-154	3 69E+03	5 56E+03
Eu-155	1.79E+03	1 95E+03
Fe-55	6.21E+02	1.20E+03
H-3	2.65E+03	3 47E+03
I-129	4 44E-01	7.40E-01
Kr-85	1 05E+04	2.18E+04
Np-237	2 13E+00	2 52E+00
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

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg. MeV	
0 0150	3 328E+16
0 0250	6 815E+15
0 0375	6.252E+15
0 0575	6 814E+15
0 0850	3.919E+15
0 1250	2 554E+15
0.2250	3 410E+15
0.3750	1 427E+15
0 5750	2 899E+16
0 8500	3 842E+14
1.2500	4.276E+14
1 7500	1 791E+13
2 2500	1.551E+11
2 7500	8 829E+13
3 5000	2.316E+08
5 0000	3 757E+07
7.0000	4 322E+06
11 0000	4 959E+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)
Ac-227	4 89E-03	5 94E-03
Am-241	5 66E+05	6 96E+05
Am-242m	3 93E+02	5 45E+02
Am-243	5 05E+02	8 07E+02
C-14	4 86E+02	5 68E+02
Cl-36	3 48E-01	6 96E-01
Cm-243	7 56E+01	1 51E+02
Cm-244	1 33E+04	2 54E+04
Co-60	1.99E+02	3 60E+02
Cs-134	5 73E-01	7 47E-01
Cs-135	5.73E+01	7 02E+01
Cs-137	4.71E+06	5.70E+06
Eu-154	1.27E+04	1.66E+04
Eu-155	2.75E+02	3.93E+02
Fe-55	6.11E-01	9 90E-01
H-3	8.48E+03	1.30E+04
I-129	4.78E+00	5 78E+00
Kr-85	5 60E+04	6 74E+04
Np-237	5 09E+01	6.21E+01
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
Tl-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

Gamma Sources	
Photon Energy Group	Total Photons/sec (bounding)
Avg. MeV	
0 0150	2 296E+17
0 0250	4 657E+16
0 0375	4 304E+16
0 0575	5 228E+16
0 0850	2 573E+16
0 1250	1 687E+16
0 2250	2 203E+16
0 3750	9 543E+15
0 5750	2.105E+17
0 8500	1 836E+15
1.2500	8 630E+14
1.7500	4 947E+13
2.2500	5 404E+09
2.7500	5.126E+09
3.5000	4 631E+08
5.0000	1.973E+08
7 0000	2.263E+07
11 0000	2.593E+06

Thermal Power	
Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
7 67E+04	9.36E+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	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	Gamma Sources: Total Photons/sec (bounding)
	4 49E-02	8 96E-02	Avg MeV	
Ac-227	3 00E+05	5.72E+05	0 0150	1 173E+17
Am-241	5.58E+02	1.07E+03	0 0250	2 344E+16
Am-242m	9.29E+02	1 74E+03	0 0375	2 162E+16
Am-243	2 13E+03	4 26E+03	0.0575	2.920E+16
C-14	4 02E+01	8 03E+01	0 0850	1.287E+16
Cl-36	2.27E+02	4 21E+02	0 1250	8 849E+15
Cm-243	4 02E+04	7 53E+04	0.2250	1 104E+16
Cm-244	6 88E+04	1 38E+05	0 3750	4 764E+15
Co-60	1 91E+01	3 82E+01	0 5750	1 031E+17
Cs-134	2 29E+01	4 32E+01	0 8500	1 435E+15
Cs-135	1 49E+06	2.79E+06	1.2500	1 117E+16
Cs-137	1 93E+04	3.75E+04	1.7500	4 170E+13
Eu-154	1.10E+03	2 15E+03	2.2500	5 828E+10
Eu-155	1.14E+02	2 27E+02	2.7500	1 040E+11
Fe-55	1.66E+04	3 15E+04	3.5000	1.114E+09
H-3	1.21E+00	2 24E+00	5 0000	4.758E+08
I-129	2 34E+04	4 48E+04	7 0000	5 480E+07
Kr-85	1.49E+01	2 75E+01	11 0000	6.291E+06
Np-237	5 17E-02	1.03E-01		
Pa-231	9 51E-04	1.87E-03		
Pb-210	1 80E+02	3.59E+02		
Pm-147	9 96E+04	1.80E+05		
Pu-238	1 70E+04	2.77E+04		
Pu-239	1.78E+04	3 59E+04		
Pu-240	6.70E+05	3 15E+06		
Pu-241	9.65E+01	1 53E+02		
Pu-242	2.18E-03	4.29E-03		
Ra-226	1 04E-02	2 07E-02		
Ra-228	2 85E-04	5 71E-04		
Ru-106	1 63E+01	3 03E+01		
Se-79	2 92E+01	5.36E+01		
Sn-126	1 05E+06	1.97E+06		
Sr-90	5 31E+02	9 87E+02		
Tc-99	3.91E-02	7 81E-02		
Th-229	1.57E-01	3 08E-01		
Th-230	1 04E-02	2 08E-02		
Th-232	1.47E+00	2 92E+00		
Tl-208	3 99E+00	7 91E+00		
U-232	6 25E+00	1.25E+01		
U-233	2 74E+02	5 38E+02		
U-234	1 17E+01	2.31E+01		
U-235	1 21E+01	2.28E+01		
U-236	1 62E+01	1 85E+01		
U-238	1 05E+06	1 97E+06		
Y-90	2 07E+06	3 96E+06		
Other Radionuclides				

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'	HIC	MCO
Number of Canisters	0 0	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)
Ac-227	1.81E-02	3 13E-02
Am-241	1 73E+04	1 96E+04
Am-242m	5 98E+00	1 00E+01
Am-243	1 53E+01	1.98E+01
C-14	7 45E+02	7.80E+02
Cl-36	6 31E-01	1.26E+00
Cm-243	2 69E-01	3 84E-01
Cm-244	1 67E+01	3.14E+01
Co-60	9 63E+02	1.14E+03
Cs-134	5 65E-04	9 21E-04
Cs-135	9 06E+00	1.31E+01
Cs-137	5 41E+05	6 29E+05
Eu-154	4 18E+02	4 54E+02
Eu-155	2 14E+01	3 68E+01
Fe-55	6 22E-02	1.12E-01
H-3	2 94E+03	3 08E+03
I-129	5 77E-01	6 80E-01
Kr-85	4 78E+03	6 08E+03
Np-237	4 02E+00	4 36E+00
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

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg. MeV	
0 0150	3 010E+16
0 0250	6.220E+15
0 0375	5 474E+15
0 0575	6 050E+15
0 0850	3.490E+15
0 1250	2.267E+15
0 2250	3.003E+15
0 3750	1.308E+15
0 5750	2 337E+16
0 8500	2.216E+14
1 2500	1 631E+14
1 7500	5 728E+12
2 2500	1 055E+09
2 7500	2 070E+09
3 5000	3 849E+06
5 0000	1 613E+06
7 0000	1 812E+05
11 0000	2 054E+04

Thermal Power

Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
7.11E+03	8.22E+03
Total	Total

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)
Ac-227	1 99E-03	3 98E-03
Am-241	1 08E+04	2.13E+04
Am-242m	5 94E+01	1 17E+02
Am-243	3 81E+01	7 62E+01
C-14	2.76E+02	5 53E+02
Cl-36	5.20E+00	1 04E+01
Cm-243	7.36E+00	1 44E+01
Cm-244	1 22E+03	2 44E+03
Co-60	3 31E+06	6 62E+06
Cs-134	1 85E+04	3 71E+04
Cs-135	1 38E+00	2.73E+00
Cs-137	1 07E+05	2.13E+05
Eu-154	3 20E+04	6 40E+04
Eu-155	1 05E+04	2 10E+04
Fe-55	1 99E+06	3 97E+06
H-3	3 01E+03	6 02E+03
I-129	3 45E-02	6 79E-02
Kr-85	9 70E+03	1 94E+04
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
Tl-208	2 54E-01	5 08E-01
U-232	7.31E-01	1 46E+00
U-233	8 23E-01	1.65E+00
U-234	2 91E+01	5.83E+01
U-235	1 55E+00	2 86E+00
U-236	5 36E-01	1 07E+00
U-238	2.84E-01	5 49E-01
Y-90	9 61E+04	1 92E+05
Other Radionuclides	2.99E+05	5 97E+05

Gamma Sources	
Photon Energy Group	Total Photons/sec (bounding)
Avg MeV	
0 0150	2 713E+16
0 0250	5 306E+15
0 0375	4 631E+15
0 0575	4 516E+15
0 0850	2 451E+15
0 1250	2.599E+15
0 2250	1.657E+15
0 3750	7.841E+14
0 5750	1.035E+16
0 8500	2.584E+15
1.2500	4 911E+17
1.7500	4 464E+13
2.2500	2 094E+13
2 7500	1 747E+11
3 5000	1 744E+10
5 0000	1 582E+07
7 0000	1 820E+06
11 0000	2 089E+05

Thermal Power	
Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
5 67E+04	1.13E+05
Total	Total

Total Canister Usage Summary						
	18" x 10'	18" x 15'	24" x 10'	24" x 15'	HIC	MCO
Number of Canisters	1 2	8 2	0 0	0 0	0 0	0 0

Bare Fuel Transfers	
0	Assemblies

2030 Summary, TSPA Category 4: MOX

Radionuclide	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)
Ac-227	2 31E-01	4 03E-01
Am-241	9 30E+05	1 61E+06
Am-242m	3 37E+03	5 96E+03
Am-243	1 61E+03	2 81E+03
C-14	1.12E+04	1.95E+04
Cl-36	2.12E+02	3 68E+02
Cm-243	4.55E+02	8.16E+02
Cm-244	1.12E+04	1 90E+04
Co-60	6 53E+05	9 29E+05
Cs-134	1 47E+03	2 70E+03
Cs-135	8 79E+01	1 55E+02
Cs-137	2 82E+06	4 94E+06
Eu-154	6 04E+04	9 89E+04
Eu-155	1 45E+04	2 60E+04
Fe-55	4 28E+03	5 03E+03
H-3	1 50E+04	2 52E+04
I-129	2 26E+00	4 00E+00
Kr-85	5 21E+04	8 96E+04
Np-237	1 88E+01	3 30E+01
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
Tl-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

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg. MeV	
0 0150	2 002E+17
0 0250	3 932E+16
0 0375	3 694E+16
0 0575	5 717E+16
0 0850	2.129E+16
0 1250	1.515E+16
0 2250	1 806E+16
0 3750	7 811E+15
0 5750	1 825E+17
0 8500	3 112E+15
1.2500	7 112E+16
1.7500	8 998E+13
2.2500	3 701E+11
2.7500	4 641E+11
3 5000	4 173E+08
5 0000	1 652E+08
7 0000	1 883E+07
11.0000	2.150E+06

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)
Ac-227	3.56E+00	5.21E+00
Am-241	2.83E+03	4 11E+03
Am-242m	2 10E+00	3 01E+00
Am-243	4 11E+01	5 96E+01
C-14	2 06E+01	2 99E+01
Cl-36	9 53E-01	1 38E+00
Cm-243	2 04E+01	2 84E+01
Cm-244	4 95E+03	6 73E+03
Co-60	2 91E+02	3 61E+02
Cs-134	2 32E+01	2.78E+01
Cs-135	2.21E+01	3.20E+01
Cs-137	1 07E+06	1.50E+06
Eu-154	1.09E+04	1.40E+04
Eu-155	6.68E+02	8.26E+02
Fe-55	2 74E-02	3 29E-02
H-3	2 85E+03	3 79E+03
I-129	9 01E-01	1 31E+00
Kr-85	2 83E+04	3 71E+04
Np-237	1 12E+01	1 62E+01
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
Tl-208	5.09E+02	7.25E+02
U-232	1.38E+03	1 96E+03
U-233	1 84E+03	2 67E+03
U-234	2 60E+02	3 78E+02
U-235	3 85E+00	5 40E+00
U-236	7 71E+00	1.12E+01
U-238	4 87E-02	5.37E-02
Y-90	1 02E+06	1.42E+06
Other Radionuclides	1 03E+06	1 44E+06

Gamma Sources	
Photon Energy Group	Total Photons/sec (bounding)
Avg MeV	
0 0150	7 885E+16
0 0250	1 613E+16
0 0375	1 404E+16
0 0575	1.513E+16
0 0850	9 130E+15
0 1250	6 105E+15
0 2250	7.915E+15
0 3750	3.424E+15
0 5750	5 580E+16
0 8500	8 157E+14
1.2500	4 853E+14
1.7500	2 499E+13
2.2500	1 914E+09
2 7500	2 545E+13
3 5000	1 063E+08
5 0000	4.529E+07
7 0000	5.201E+06
11 0000	5.962E+05

Thermal Power	
Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
1.75E+04	2.45E+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	567.2	0 0	0 0	1 0	0 0

Bare Fuel Transfers	
0	Assemblies

2030 Summary, TSPA Category 6: U/Th Oxide

Radionuclide	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)
Ac-227	2 92E+02	3 46E+02
Am-241	2 66E+04	5 27E+04
Am-242m	5 57E+01	1 08E+02
Am-243	5.10E+01	1 01E+02
C-14	6.29E+02	1 05E+03
Cl-36	1.21E+01	2 01E+01
Cm-243	3.30E+00	6 12E+00
Cm-244	5 43E+02	1 07E+03
Co-60	8 69E+04	1 74E+05
Cs-134	1.29E+01	2 70E+01
Cs-135	8.14E+01	9 84E+01
Cs-137	3.18E+06	4 03E+06
Eu-154	1.37E+04	2 20E+04
Eu-155	6 99E+02	1 25E+03
Fe-55	9 01E+02	1 80E+03
H-3	3 85E+03	5 71E+03
I-129	4 46E+00	5 36E+00
Kr-85	8 57E+04	1.20E+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
Tl-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

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg. MeV	
0 0150	2 244E+17
0 0250	4 609E+16
0 0375	3 941E+16
0 0575	4 371E+16
0 0850	2 763E+16
0 1250	1 718E+16
0 2250	2 486E+16
0 3750	9 899E+15
0 5750	1 523E+17
0 8500	2 757E+15
1 2500	1 385E+16
1 7500	2 002E+14
2.2500	7 261E+10
2.7500	1 481E+15
3 5000	2 263E+07
5 0000	9 005E+06
7 0000	9 599E+05
11 0000	1 051E+05

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)
Ac-227	1.77E-02	1 84E-02
Am-241	5 41E+05	6 16E+05
Am-242m	3 03E+02	3 56E+02
Am-243	2.80E+02	3 49E+02
C-14	2.89E+03	2 96E+03
Cl-36	3 72E+01	3 73E+01
Cm-243	1 21E+01	2 29E+01
Cm-244	3 11E+03	4 98E+03
Co-60	1 02E+04	1 02E+04
Cs-134	6 25E-01	7 02E-01
Cs-135	6 05E+01	6 81E+01
Cs-137	4 86E+06	5 49E+06
Eu-154	1.08E+04	1.25E+04
Eu-155	3.43E+02	3 80E+02
Fe-55	9 32E+00	9 40E+00
H-3	8 12E+03	9 27E+03
I-129	4 94E+00	5 57E+00
Kr-85	5 92E+04	6 66E+04
Np-237	5 12E+01	5 80E+01
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
Tl-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

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg MeV	
0 0150	2.262E+17
0 0250	4 602E+16
0 0375	4.221E+16
0 0575	5 074E+16
0 0850	2 547E+16
0.1250	1 665E+16
0.2250	2 182E+16
0 3750	9 461E+15
0 5750	2 028E+17
0 8500	1.754E+15
1 2500	1.507E+15
1 7500	4.675E+13
2.2500	8 650E+09
2.7500	1 757E+09
3.5000	1 619E+08
5 0000	6 854E+07
7 0000	7 795E+06
11 0000	8 894E+05

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	11 7	1 4	0 0	0 0	4 0	385 0

Bare Fuel Transfers

0	Assemblies

2030 Summary, TSPA Category 8: U-Oxide

Radionuclide	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)
Ac-227	3 11E-02	4 32E-02
Am-241	4.76E+05	8 53E+05
Am-242m	8.53E+02	1.56E+03
Am-243	1 92E+03	3.53E+03
C-14	2 74E+03	2 93E+03
Cl-36	3 92E+01	4.16E+01
Cm-243	6 30E+02	1.16E+03
Cm-244	1 11E+05	2 04E+05
Co-60	5 62E+04	7 59E+04
Cs-134	1.11E+03	2 21E+03
Cs-135	7 26E+01	1 19E+02
Cs-137	4 93E+06	8 20E+06
Eu-154	3 73E+04	6 75E+04
Eu-155	3 21E+03	5 65E+03
Fe-55	9 59E+03	1 87E+04
H-3	4 66E+04	8 21E+04
I-129	4 03E+00	6 78E+00
Kr-85	8 15E+04	1 33E+05
Np-237	4 12E+01	7.17E+01
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
Tl-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

Gamma Sources	
Photon Energy Group	Total Photons/sec (bounding)
Avg. MeV	
0 0150	3 360E+17
0 0250	6 806E+16
0 0375	6 313E+16
0 0575	7 435E+16
0.0850	3 779E+16
0 1250	2 540E+16
0.2250	3.238E+16
0.3750	1 401E+16
0 5750	3 034E+17
0 8500	3 533E+15
1 2500	7 691E+15
1 7500	9 811E+13
2 2500	1 534E+12
2 7500	5 222E+10
3 5000	4 846E+09
5 0000	1 287E+09
7 0000	1 483E+08
11 0000	1 703E+07

Thermal Power	
Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
7.98E+04	1 35E+05
Total	Total

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: Al-Based Fuel

Radionuclide	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)
Ac-227	6 27E-03	1.24E-02
Am-241	3 22E+04	6 20E+04
Am-242m	9 41E+00	1 84E+01
Am-243	3 86E+01	6 81E+01
C-14	1.53E+00	3 03E+00
Cl-36	1 45E-03	2 89E-03
Cm-243	6 11E+00	1 08E+01
Cm-244	3 17E+03	5 23E+03
Co-60	2 29E+02	4 46E+02
Cs-134	6 09E+05	1 22E+06
Cs-135	2 17E+01	4 21E+01
Cs-137	1 08E+07	2 09E+07
Eu-154	1 88E+05	3 62E+05
Eu-155	6.38E+04	1.24E+05
Fe-55	9 98E+03	1 97E+04
H-3	2.62E+04	5 10E+04
I-129	4 08E+00	7 94E+00
Kr-85	6 41E+05	1 25E+06
Np-237	6 48E+01	1 21E+02
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
Sn-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
Tl-208	2 11E-01	4.06E-01
U-232	5 87E-01	1.13E+00
U-233	2 05E-02	3 97E-02
U-234	7.82E+02	1.54E+03
U-235	2 21E+01	3 71E+01
U-236	8 48E+01	1 64E+02
U-238	3 51E+00	3 55E+00
Y-90	1 01E+07	1 97E+07
Other Radionuclides	1 32E+07	2 59E+07

Gamma Sources	
Photon Energy Group	Total Photons/sec (bounding)
Avg MeV	
0 0150	1.183E+18
0 0250	2.491E+17
0 0375	2.230E+17
0 0575	2 307E+17
0 0850	1 421E+17
0.1250	1 073E+17
0 2250	1 217E+17
0 3750	5 538E+16
0 5750	8 494E+17
0 8500	5 509E+16
1 2500	1.353E+16
1 7500	5 877E+14
2.2500	7 673E+14
2.7500	4 425E+12
3 5000	4 897E+11
5 0000	3 818E+07
7 0000	4 360E+06
11 0000	4 982E+05

Thermal Power	
Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
1.51E+05	2.93E+05
Total	Total

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)
Ac-227	2 23E-01	2 23E-01
Am-241	7.75E+05	7 77E+05
Am-242m	1.42E+03	1 45E+03
Am-243	1.44E+03	1.45E+03
C-14	1.07E+04	1 07E+04
Cl-36	2 02E+02	2 02E+02
Cm-243	5 87E+01	6 56E+01
Cm-244	8 42E+03	8 45E+03
Co-60	3.46E+05	3 46E+05
Cs-134	2.10E+01	4 77E+01
Cs-135	3.96E+01	4 04E+01
Cs-137	1.34E+06	1.36E+06
Eu-154	3.33E+04	3 36E+04
Eu-155	9.35E+02	1.17E+03
Fe-55	4 81E+02	4 87E+02
H-3	9.32E+03	9.39E+03
I-129	9 57E-01	9 79E-01
Kr-85	2 05E+04	2.10E+04
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

Gamma Sources

Photon Energy Group	Total Photons/sec (bounding)
Avg. MeV	
0 0150	7 646E+16
0 0250	1 502E+16
0 0375	1 276E+16
0 0575	2 400E+16
0 0850	8 043E+15
0 1250	5 691E+15
0 2250	6 955E+15
0 3750	3 010E+15
0 5750	5 074E+16
0 8500	1 093E+15
1 2500	2 642E+16
1 7500	3 217E+13
2 2500	1 373E+11
2 7500	2 367E+11
3 5000	1 490E+08
5 0000	6 281E+07
7 0000	7 153E+06
11 0000	8 161E+05

Thermal Power

Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
5.11E+04	5.24E+04
Total	Total

Total Canister Usage Summary

	18" x 10'	18" x 15'	24" x 10'	24" x 15'	HIC	MCO
Number of Canisters	2 6	0 0	0 0	0 0	0 0	0 0

Bare Fuel Transfers

0	Assemblies

2030 Summary, TSPA Category 11: U-Zr-Hx

Radionuclide	Nominal Fuel Inventories(Ci)	Bounding Fuel Inventories(Ci)
Ac-227	5 49E-04	7.42E-04
Am-241	7.30E+02	1.33E+03
Am-242m	8 92E-01	1.74E+00
Am-243	1 09E+00	2.16E+00
C-14	1 47E+01	2 57E+01
Cl-36	3 10E-01	5 39E-01
Cm-243	8 89E-01	1 76E+00
Cm-244	8 06E+01	1 60E+02
Co-60	4 67E+04	9 33E+04
Cs-134	1.10E+04	2 19E+04
Cs-135	3 49E+00	6 06E+00
Cs-137	2.12E+05	4 03E+05
Eu-154	1.06E+04	2 13E+04
Eu-155	3 92E+03	7.84E+03
Fe-55	2 60E+04	5.20E+04
H-3	6 00E+02	1.19E+03
I-129	8 93E-02	1 57E-01
Kr-85	1 32E+04	2 61E+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
Tl-208	5.80E-03	1.12E-02
U-232	1.62E-02	3.13E-02
U-233	1.32E-02	2.29E-02
U-234	2 07E-01	4 00E-01
U-235	8 49E-01	1.12E+00
U-236	1.58E+00	2.79E+00
U-238	5 20E-01	5 24E-01
Y-90	1 98E+05	3 77E+05
Other Radionuclides	2 46E+05	4 70E+05

Gamma Sources	
Photon Energy Group	Total Photons/sec (bounding)
Avg MeV	
0 0150	2.225E+16
0 0250	4 767E+15
0.0375	4 305E+15
0 0575	4 341E+15
0 0850	2 686E+15
0 1250	2 145E+15
0 2250	2 292E+15
0 3750	1 074E+15
0 5750	1 637E+16
0 8500	1.274E+15
1 2500	7.432E+15
1 7500	1.848E+13
2.2500	7.824E+12
2.7500	6 552E+10
3.5000	7 634E+09
5 0000	1 108E+06
7 0000	1 271E+05
11 0000	1 457E+04

Thermal Power	
Nominal Heat Output (Watts)	Bounding Heat Output (Watts)
3 62E+03	7.00E+03
Total	Total

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 ±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 ± 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. ±1–5% for U-235, U-238, Pu-239, Th-232 concentrations
2. ±10–30% for U-233, U-234, U-236, Np-237, Pu-240 concentrations
3. ±30–50% for other significant concentration higher-order actinides (Pu-238, Pu-241, Pu-242, etc.)
4. ±50–400% for other insignificant concentration higher order actinides and daughter decay products
5. ±1–5% for direct yield fission products
6. ±5–50% for indirect yield and transmutation fission products
7. ±5–50% for major constituent activation products
8. ± factor of 2–3 for activation product impurities (Co-60, C-14, etc.)
9. ±5–10% for decay heat
10. ± 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±X/4, where ±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±Y/10, where ±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:
     - ±5% for U-235, U-238, Pu-239, Th-232
     - ±50% for U-233, U-234, U-236, Pu-240, Np-237
     - ±100% for other significant concentration higher order actinides (Pu-238, Pu-241, Pu-242, etc.)
     - ±200–400% for other insignificant concentration higher order actinides and daughter decay products
   - For fission products:
     - ±1% for all direct yield fission products
     - ±5–50% for all indirect/transmutation fission products
   - For activation products:
     - ±5% for high energy threshold particle reactions (n,p), (n,α)
     - ±5–10% for high energy threshold particle reactions (n,2n)
     - ±>10% for high energy threshold particle reactions (n,3n)
     - ±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:
     - ±<2% for U-233, U-235, U-238, Pu-239, Th-232
     - ±10% for U-234, U-236, Pu-240
   - For activation products:
     - ±2–10% for major structural constituents
     - ±10–200% for impurity generated activation products.