



NUCLEAR FUEL SERVICES, INC.
a subsidiary of The Babcock & Wilcox Company

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21G-13-0185
GOV-01-55
ACF-13-0208

August 27, 2013

Director
Office of Nuclear Material Safety & Safeguards
U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555-0001

Reference: Docket No. 70-143; SNM License 124

Subject: **Biannual Effluent Monitoring Report January through June 2013 and
Amendment to Biannual Effluent Monitoring Report July through December
2012**

Dear Sir:

In accordance with the requirements set forth in 10 CFR, Part 70.59, Nuclear Fuel Services, Inc. (NFS) submits the attached reports. Attachment A reports the Radioactivity in Effluent Liquid for the period January through June 2013. Attachment B reports the Radioactivity in Effluent Air for the period January through June 2013. Attachment C summarizes an evaluation of the dose and air activity concentrations for the maximally exposed offsite individual due to gaseous effluents, during the period January through June 2013.

An amendment to the *Biannual Effluent Monitoring Report July through December 2012*, submitted to the NRC February 18, 2013, is also included as Attachments D and E. Attachment D is a revised Page 2 of the Radioactivity in Effluent Air for the period of July through December 2012. Attachment E includes a revised Table 2 for the Report of Gaseous Effluent Dose and Activity Concentrations for the Maximally Exposed Off-Site Individual for the Release Period July – December 2012. The revisions were due to identification of an instrumentation background count time error which affected the calculations associated with Stack 501 and Stack 502. The revisions were minor and did not change the annual dose to the MEI for Gaseous Effluents Released during July through December 2012 listed in Table 3.

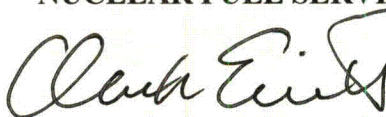
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If you or your staff have any questions, require additional information, or wish to discuss this, please contact me or Mr. Robert Holley, Environmental Safety Unit Manager, at (423) 743-1777. Please reference our unique document identification number (21G-13-0185) in any correspondence concerning this letter.

Sincerely,

NUCLEAR FUEL SERVICES, INC.



Mark P. Elliott
Quality, Safety, & Safeguards
Director

CJB/rrm

Attachments

- A- Report of Radioactivity in Effluent Liquid for the Period January - June 2013*
- B- Report of Radioactivity in Effluent Air for the Period of January - June 2013*
- C- Report of Gaseous Effluent Dose and Activity Concentrations for the Maximally Exposed Off-Site Individual for the Release Period January - June 2013*
- D- Revised Page 2 of Report of Radioactivity in Effluent Air for the Period July - December 2012*
- E- Revised Table 2 of Report of Gaseous Effluent Dose and Activity Concentrations for the Maximally Exposed Off-Site Individual for the Release Period July - December 2012*

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21G-13-0185
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Attachment A
To Letter Dated August 27, 2013

Report of Radioactivity in Effluent Liquid for the Period
January - June 2013

(Two Pages to Follow)

Radioactivity in Effluent Liquid January 1, 2013 to June 30, 2013

Location	Total Volume (l)	Activity Concentration (μCi/ml)	Error Estimate (μCi/ml)	LLD (μCi/ml)	Quantity Released (Ci)	Quantity Released (g)	Fraction of ECV ¹
Banner Spring Down							
Pu-238	489,194,813	0.00E+00	1.01E-10	2.32E-10	0.00E+00	0.00E+00	0.00E+00
Pu-239/240	489,194,813	2.26E-11	1.10E-10	2.23E-10	1.10E-05	1.77E-04	1.13E-03
Tc-99	489,194,813	0.00E+00	3.73E-08	6.67E-08	0.00E+00	0.00E+00	0.00E+00
Th-228	489,194,813	5.16E-11	1.66E-10	3.14E-10	2.52E-05	3.08E-08	2.58E-04
Th-230	489,194,813	1.46E-10	2.05E-10	3.37E-10	7.14E-05	3.53E-03	1.46E-03
Th-232	489,194,813	1.84E-11	1.17E-10	2.35E-10	8.98E-06	8.24E+01	6.12E-04
U-233/234	489,194,813	8.49E-10	3.80E-10	3.54E-10	4.15E-04	6.66E-02	2.83E-03
U-235/236	489,194,813	6.03E-11	1.73E-10	2.90E-10	2.95E-05	1.37E+01	2.01E-04
U-238	489,194,813	3.93E-11	1.56E-10	2.79E-10	1.92E-05	5.75E+01	1.31E-04
						Total:	6.62E-03
BLEU Sewer							
Pu-238	836,741	0.00E+00	6.69E-11	1.57E-10	0.00E+00	0.00E+00	0.00E+00
Pu-239/240	836,741	7.39E-12	6.65E-11	1.60E-10	6.19E-09	9.95E-08	3.70E-05
Tc-99	836,741	0.00E+00	3.53E-08	6.21E-08	0.00E+00	0.00E+00	0.00E+00
Th-228	836,741	0.00E+00	1.65E-10	4.04E-10	0.00E+00	0.00E+00	0.00E+00
Th-230	836,741	9.04E-12	1.99E-10	4.44E-10	7.57E-09	3.75E-07	9.04E-06
Th-232	836,741	0.00E+00	1.27E-10	2.96E-10	0.00E+00	0.00E+00	0.00E+00
U-232	836,741	4.83E-12	7.73E-11	1.63E-10	4.04E-09	1.89E-10	8.04E-06
U-233/234	836,741	3.94E-10	2.09E-10	1.65E-10	3.30E-07	5.28E-05	1.31E-04
U-235/236	836,741	3.07E-11	8.22E-11	1.38E-10	2.57E-08	1.19E-02	1.02E-05
U-238	836,741	9.42E-11	1.11E-10	1.05E-10	7.88E-08	2.35E-01	3.14E-05
						Total:	2.27E-04
Sewer							
Pu-238	11,020,159	0.00E+00	9.20E-11	2.26E-10	0.00E+00	0.00E+00	0.00E+00
Pu-239/240	11,020,159	2.90E-11	7.88E-11	1.72E-10	3.19E-07	5.13E-06	1.45E-04
Tc-99	11,020,159	8.26E-09	3.93E-08	6.79E-08	9.10E-05	5.39E-03	1.38E-05
Th-228	11,020,159	9.00E-11	2.55E-10	4.48E-10	9.92E-07	1.21E-09	4.50E-05
Th-230	11,020,159	1.46E-10	2.77E-10	4.67E-10	1.61E-06	7.96E-05	1.46E-04
Th-232	11,020,159	0.00E+00	1.43E-10	3.15E-10	0.00E+00	0.00E+00	0.00E+00
U-232	11,020,159	3.80E-11	1.20E-10	2.21E-10	4.19E-07	1.96E-08	6.33E-05
U-233/234	11,020,159	1.90E-08	1.55E-09	2.30E-10	2.09E-04	3.35E-02	6.32E-03
U-235/236	11,020,159	7.43E-10	3.22E-10	2.04E-10	8.19E-06	3.79E+00	2.48E-04
U-238	11,020,159	2.85E-09	6.06E-10	1.51E-10	3.14E-05	9.36E+01	9.48E-04
						Total:	7.93E-03
West Ditch							
Pu-238	220,648,317	3.24E-11	8.85E-11	2.04E-10	7.16E-06	4.19E-07	1.62E-03
Pu-239/240	220,648,317	2.46E-13	1.02E-10	2.23E-10	5.43E-08	8.73E-07	1.23E-05
Tc-99	220,648,317	0.00E+00	3.75E-08	6.58E-08	0.00E+00	0.00E+00	0.00E+00
Th-228	220,648,317	0.00E+00	1.36E-10	2.93E-10	0.00E+00	0.00E+00	0.00E+00
Th-230	220,648,317	1.12E-11	1.32E-10	2.88E-10	2.47E-06	1.22E-04	1.12E-04

¹ ECV: Effluent Concentration Value from 10-CFR-20, Appendix B.
Note: A value of "0" was substituted for negative analytical results.

Radioactivity in Effluent Liquid January 1, 2013 to June 30, 2013

Location	Total Volume (l)	Activity Concentration (μCi/ml)	Error Estimate (μCi/ml)	LLD (μCi/ml)	Quantity Released (Ci)	Quantity Released (g)	Fraction of ECV ¹
West Ditch							
Th-232	220,648,317	3.49E-12	9.88E-11	1.99E-10	7.71E-07	7.07E+00	1.16E-04
U-233/234	220,648,317	2.16E-08	1.84E-09	2.76E-10	4.76E-03	7.62E-01	7.19E-02
U-235/236	220,648,317	7.99E-10	4.13E-10	2.70E-10	1.76E-04	8.17E+01	2.66E-03
U-238	220,648,317	3.00E-09	6.93E-10	1.92E-10	6.63E-04	1.98E+03	1.00E-02
						Total:	8.64E-02
WWTF							
Am-241	3,731,818	2.69E-10	1.86E-10	3.97E-10	1.00E-06	2.93E-07	1.35E-02
Cs-137	3,731,818	1.15E-09	1.42E-09	1.66E-09	4.28E-06	4.91E-08	1.15E-03
Na-22	3,731,818	0.00E+00	9.32E-10	1.64E-09	0.00E+00	0.00E+00	0.00E+00
Np-237	3,731,818	0.00E+00	1.45E-10	3.73E-10	0.00E+00	0.00E+00	0.00E+00
Pb-212	3,731,818	2.75E-10	2.87E-09	3.00E-09	1.02E-06	7.41E-13	1.37E-04
Pu-238	3,731,818	4.04E-11	2.25E-10	4.22E-10	1.51E-07	8.81E-09	2.02E-03
Pu-239/240	3,731,818	1.50E-10	2.94E-10	4.83E-10	5.60E-07	9.00E-06	7.50E-03
Pu-241	3,731,818	4.19E-09	3.84E-08	6.59E-08	1.56E-05	1.52E-07	4.19E-03
Ra-224	3,731,818	5.96E-09	4.64E-09	8.67E-09	2.22E-05	1.40E-10	2.98E-02
Tc-99	3,731,818	0.00E+00	1.14E-07	2.00E-07	0.00E+00	0.00E+00	0.00E+00
Th-228	3,731,818	1.26E-10	2.03E-10	2.91E-10	4.71E-07	5.76E-10	6.32E-04
Th-230	3,731,818	1.66E-10	2.37E-10	3.65E-10	6.20E-07	3.07E-05	1.66E-03
Th-231	3,731,818	0.00E+00	3.46E-08	4.22E-08	0.00E+00	0.00E+00	0.00E+00
Th-232	3,731,818	1.43E-11	1.21E-10	2.33E-10	5.32E-08	4.89E-01	4.76E-04
U-232	3,731,818	9.30E-12	7.60E-11	1.57E-10	3.47E-08	1.62E-09	1.55E-04
U-233/234	3,731,818	3.53E-08	1.72E-09	1.83E-10	1.32E-04	2.11E-02	1.18E-01
U-235/236	3,731,818	1.36E-09	3.45E-10	1.24E-10	5.06E-06	2.34E+00	4.52E-03
U-238	3,731,818	2.81E-10	1.70E-10	1.40E-10	1.05E-06	3.13E+00	9.38E-04
						Total:	1.84E-01

¹ ECV: Effluent Concentration Value from 10-CFR-20, Appendix B.
Note: A value of "0" was substituted for negative analytical results.

21G-13-0185
GOV-01-55
ACF-13-0208

Attachment B
To Letter Dated August 27, 2013

Report of Radioactivity in Effluent Air for the Period
January - June 2013

(Four Pages to Follow)

Radioactivity in Effluent Air January 1, 2013 to June 30, 2013

Location	Total Volume (m ³)	Activity Concentration (μCi/ml)	Error Estimate (μCi/ml)	LLD (μCi/ml)	Quantity Released (Ci)	Quantity Released (g)	Fraction of ECV ¹
Main Stack 416		1062.87 m³/min		17.71 m³/sec			
Th-228	273,971,110	3.98E-16	7.75E-17	4.03E-17	1.09E-07	1.33E-10	1.99E-02
Th-230	273,971,110	7.96E-16	1.55E-16	8.07E-17	2.18E-07	1.08E-05	3.98E-02
Th-232	273,971,110	3.98E-16	7.75E-17	4.03E-17	1.09E-07	1.00E+00	9.95E-02
U-234	273,971,110	1.88E-13	3.66E-14	1.91E-14	5.15E-05	8.26E-03	3.76E+00
U-235	273,971,110	6.97E-15	1.36E-15	7.06E-16	1.91E-06	8.83E-01	1.16E-01
U-238	273,971,110	2.39E-15	4.65E-16	2.42E-16	6.54E-07	1.95E+00	3.98E-02
						Total:	4.08E+00
Stack 185 Bldg. 131		107.83 m³/min		1.80 m³/sec			
Pu-241	27,794,406	0.00E+00	8.80E-16	1.84E-15	0.00E+00	0.00E+00	0.00E+00
Tc-99	27,794,406	0.00E+00	2.85E-14	5.95E-14	0.00E+00	0.00E+00	0.00E+00
U-234	27,794,406	3.60E-15	9.24E-15	2.03E-14	1.00E-07	1.60E-05	7.20E-02
U-235	27,794,406	1.11E-16	2.86E-16	6.28E-16	3.09E-09	1.43E-03	1.86E-03
						Total:	7.38E-02
Stack 234 Bldg. 234		299.28 m³/min		4.99 m³/sec			
Am-241	75,819,834	4.85E-17	2.69E-17	4.60E-17	3.68E-09	1.07E-09	2.42E-03
Pu-238	75,819,834	5.93E-17	3.28E-17	5.62E-17	4.49E-09	2.63E-10	2.96E-03
Pu-239/240	75,819,834	2.10E-16	1.16E-16	1.99E-16	1.59E-08	2.56E-07	1.05E-02
Pu-241	75,819,834	0.00E+00	4.31E-15	8.05E-15	0.00E+00	0.00E+00	0.00E+00
Th-228	75,819,834	3.23E-17	1.79E-17	3.07E-17	2.45E-09	2.99E-12	1.62E-03
Th-230	75,819,834	4.04E-16	2.24E-16	3.83E-16	3.06E-08	1.52E-06	2.02E-02
Th-232	75,819,834	5.12E-16	2.84E-16	4.85E-16	3.88E-08	3.56E-01	1.28E-01
U-234	75,819,834	1.10E-15	6.12E-16	1.05E-15	8.37E-08	1.34E-05	2.21E-02
U-238	75,819,834	3.23E-16	1.79E-16	3.07E-16	2.45E-08	7.32E-02	5.39E-03
						Total:	1.93E-01
Stack 327 Bldg. 330		1141.37 m³/min		19.02 m³/sec			
Pu-241	292,856,580	3.43E-15	6.38E-16	8.22E-16	1.00E-06	9.74E-09	4.28E-03
Tc-99	292,856,580	1.11E-13	2.06E-14	2.66E-14	3.25E-05	1.92E-03	1.23E-04
U-234	292,856,580	2.07E-13	1.77E-14	1.00E-14	6.06E-05	9.70E-03	4.14E+00
U-235	292,856,580	6.40E-15	5.46E-16	3.09E-16	1.87E-06	8.67E-01	1.07E-01
						Total:	4.25E+00
Stack 421 Bldg. 100		18.77 m³/min		0.31 m³/sec			
Pu-241	4,839,205	3.32E-15	1.53E-15	2.38E-15	1.61E-08	1.56E-10	4.15E-03
Tc-99	4,839,205	1.07E-13	4.95E-14	7.70E-14	5.19E-07	3.07E-05	1.19E-04
U-234	4,839,205	3.72E-13	4.26E-14	2.44E-14	1.80E-06	2.88E-04	7.43E+00
U-235	4,839,205	1.15E-14	1.32E-15	7.53E-16	5.56E-08	2.58E-02	1.92E-01
						Total:	7.63E+00
Stack 424 Bldg. 100		26.48 m³/min		0.44 m³/sec			
Pu-241	6,824,519	0.00E+00	9.22E-16	1.80E-15	0.00E+00	0.00E+00	0.00E+00
Tc-99	6,824,519	0.00E+00	2.98E-14	5.83E-14	0.00E+00	0.00E+00	0.00E+00

¹ ECV: Effluent Concentration Value from 10-CFR-20, Appendix B. Fraction of ECV at the stack is provided for reference only. Concentrations at off-site locations are significantly less than those reported here (at stack) due to the atmospheric dispersion that occurs before the effluent exits the site.

Note: A value of "0" was substituted for negative analytical results.

Radioactivity in Effluent Air January 1, 2013 to June 30, 2013

Location	Total Volume (m ³)	Activity Concentration (μCi/ml)	Error Estimate (μCi/ml)	LLD (μCi/ml)	Quantity Released (Ci)	Quantity Released (g)	Fraction of ECV ¹
Stack 424 Bldg. 100		26.48 m³/min		0.44 m³/sec			
U-234	6,824,519	6.92E-15	1.09E-14	1.99E-14	4.72E-08	7.56E-06	1.38E-01
U-235	6,824,519	2.14E-16	3.39E-16	6.16E-16	1.46E-09	6.76E-04	3.57E-03
						Total:	1.42E-01
Stack 501 Bldg. 510		79.17 m³/min		1.32 m³/sec			
Pu-241	20,179,847	1.98E-14	1.61E-14	2.43E-14	3.99E-07	3.88E-09	2.47E-02
Th-228	20,179,847	0.00E+00	2.75E-15	6.02E-15	0.00E+00	0.00E+00	0.00E+00
Th-230	20,179,847	0.00E+00	3.53E-15	7.75E-15	0.00E+00	0.00E+00	0.00E+00
Th-232	20,179,847	0.00E+00	2.35E-15	5.16E-15	0.00E+00	0.00E+00	0.00E+00
U-234	20,179,847	0.00E+00	7.26E-15	1.59E-14	0.00E+00	0.00E+00	0.00E+00
U-235	20,179,847	0.00E+00	1.27E-15	2.80E-15	0.00E+00	0.00E+00	0.00E+00
U-238	20,179,847	0.00E+00	2.55E-15	5.59E-15	0.00E+00	0.00E+00	0.00E+00
						Total:	2.47E-02
Stack 502 OCB		213.96 m³/min		3.57 m³/sec			
Pu-241	56,075,192	7.31E-15	3.94E-15	5.39E-15	4.10E-07	3.98E-09	9.14E-03
Th-228	56,075,192	0.00E+00	6.59E-16	1.26E-15	0.00E+00	0.00E+00	0.00E+00
Th-230	56,075,192	0.00E+00	8.47E-16	1.62E-15	0.00E+00	0.00E+00	0.00E+00
Th-232	56,075,192	0.00E+00	5.65E-16	1.08E-15	0.00E+00	0.00E+00	0.00E+00
U-234	56,075,192	0.00E+00	1.74E-15	3.33E-15	0.00E+00	0.00E+00	0.00E+00
U-235	56,075,192	0.00E+00	3.06E-16	5.84E-16	0.00E+00	0.00E+00	0.00E+00
U-238	56,075,192	0.00E+00	6.12E-16	1.17E-15	0.00E+00	0.00E+00	0.00E+00
						Total:	9.14E-03
Stack 573 Bldg 306-W		93.16 m³/min		1.55 m³/sec			
Pu-241	24,013,550	0.00E+00	8.26E-16	1.78E-15	0.00E+00	0.00E+00	0.00E+00
Tc-99	24,013,550	0.00E+00	2.67E-14	5.76E-14	0.00E+00	0.00E+00	0.00E+00
U-234	24,013,550	0.00E+00	6.68E-15	1.99E-14	0.00E+00	0.00E+00	0.00E+00
U-235	24,013,550	0.00E+00	2.07E-16	6.17E-16	0.00E+00	0.00E+00	0.00E+00
						Total:	0.00E+00
Stack 600 Bldg. 110		309.16 m³/min		5.15 m³/sec			
Pu-241	79,689,950	1.67E-15	6.85E-16	1.11E-15	1.33E-07	1.30E-09	2.09E-03
Tc-99	79,689,950	5.42E-14	2.22E-14	3.58E-14	4.32E-06	2.55E-04	6.02E-05
U-234	79,689,950	6.69E-14	1.18E-14	1.33E-14	5.33E-06	8.54E-04	1.34E+00
U-235	79,689,950	2.07E-15	3.66E-16	4.13E-16	1.65E-07	7.63E-02	3.45E-02
						Total:	1.37E+00
Stack 615 Bldg. 306-W		38.48 m³/min		0.64 m³/sec			
Pu-241	9,919,275	0.00E+00	8.60E-16	1.83E-15	0.00E+00	0.00E+00	0.00E+00
Tc-99	9,919,275	0.00E+00	2.78E-14	5.92E-14	0.00E+00	0.00E+00	0.00E+00
U-234	9,919,275	0.00E+00	7.64E-15	2.02E-14	0.00E+00	0.00E+00	0.00E+00
U-235	9,919,275	0.00E+00	2.36E-16	6.26E-16	0.00E+00	0.00E+00	0.00E+00
						Total:	0.00E+00

¹ ECV: Effluent Concentration Value from 10-CFR-20, Appendix B. Fraction of ECV at the stack is provided for reference only. Concentrations at off-site locations are significantly less than those reported here (at stack) due to the atmospheric dispersion that occurs before the effluent exits the site.

Note: A value of "0" was substituted for negative analytical results.

Radioactivity in Effluent Air January 1, 2013 to June 30, 2013

Location	Total Volume (m ³)	Activity Concentration (μCi/ml)	Error Estimate (μCi/ml)	LLD (μCi/ml)	Quantity Released (Ci)	Quantity Released (g)	Fraction of ECV ¹
Stack 646 Bldg. 110		49.36 m³/min		0.82 m³/sec			
Pu-241	12,722,072	0.00E+00	8.36E-16	1.79E-15	0.00E+00	0.00E+00	0.00E+00
Tc-99	12,722,072	0.00E+00	2.70E-14	5.78E-14	0.00E+00	0.00E+00	0.00E+00
U-234	12,722,072	0.00E+00	7.64E-15	1.98E-14	0.00E+00	0.00E+00	0.00E+00
U-235	12,722,072	0.00E+00	2.36E-16	6.12E-16	0.00E+00	0.00E+00	0.00E+00
Total:						0.00E+00	0.00E+00
Stack 701 Bldg. 307		149.65 m³/min		2.49 m³/sec			
Pu-241	38,574,957	0.00E+00	8.28E-16	1.80E-15	0.00E+00	0.00E+00	0.00E+00
Tc-99	38,574,957	0.00E+00	2.68E-14	5.83E-14	0.00E+00	0.00E+00	0.00E+00
U-234	38,574,957	9.82E-16	8.41E-15	1.99E-14	3.79E-08	6.07E-06	1.96E-02
U-235	38,574,957	3.04E-17	2.60E-16	6.16E-16	1.17E-09	5.42E-04	5.06E-04
Total:						2.01E-02	2.01E-02
Stack 702 Bldg. 307		157.95 m³/min		2.63 m³/sec			
Pu-241	40,713,550	0.00E+00	8.27E-16	1.80E-15	0.00E+00	0.00E+00	0.00E+00
Tc-99	40,713,550	0.00E+00	2.68E-14	5.83E-14	0.00E+00	0.00E+00	0.00E+00
U-234	40,713,550	1.70E-15	8.48E-15	1.99E-14	6.92E-08	1.11E-05	3.40E-02
U-235	40,713,550	5.26E-17	2.62E-16	6.16E-16	2.14E-09	9.91E-04	8.76E-04
Total:						3.49E-02	3.49E-02
Stack 703 Exhaust Room Air		711.87 m³/min		11.86 m³/sec			
Pu-241	183,490,538	0.00E+00	2.46E-14	5.34E-14	0.00E+00	0.00E+00	0.00E+00
Th-228	183,490,538	7.54E-16	1.02E-15	1.80E-15	1.38E-07	1.69E-10	3.77E-02
Th-230	183,490,538	4.34E-16	5.87E-16	1.04E-15	7.96E-08	3.94E-06	2.17E-02
Th-232	183,490,538	6.17E-16	8.35E-16	1.48E-15	1.13E-07	1.04E+00	1.54E-01
U-234	183,490,538	4.72E-15	6.39E-15	1.13E-14	8.66E-07	1.39E-04	9.44E-02
U-235	183,490,538	4.87E-16	6.60E-16	1.17E-15	8.94E-08	4.14E-02	8.12E-03
U-238	183,490,538	5.94E-16	8.04E-16	1.42E-15	1.09E-07	3.25E-01	9.89E-03
Total:						3.26E-01	3.26E-01
Stack 773 Bldg. 440		183.49 m³/min		3.06 m³/sec			
Pu-241	47,282,402	4.04E-14	3.78E-14	7.03E-14	1.91E-06	1.86E-08	5.06E-02
Th-228	47,282,402	3.09E-17	1.30E-15	3.41E-15	1.46E-09	1.78E-12	1.55E-03
Th-230	47,282,402	3.97E-17	1.68E-15	4.38E-15	1.88E-09	9.30E-08	1.99E-03
Th-232	47,282,402	2.65E-17	1.12E-15	2.92E-15	1.25E-09	1.15E-02	6.62E-03
U-234	47,282,402	8.17E-17	3.45E-15	9.00E-15	3.86E-09	6.19E-07	1.63E-03
U-235	47,282,402	1.43E-17	6.06E-16	1.58E-15	6.78E-10	3.14E-04	2.39E-04
U-238	47,282,402	2.87E-17	1.21E-15	3.16E-15	1.36E-09	4.05E-03	4.78E-04
Total:						6.31E-02	6.31E-02
Stack 774 Bldg. 301		327.23 m³/min		5.45 m³/sec			
Th-228	84,346,681	3.95E-17	3.48E-17	6.51E-17	3.33E-09	4.07E-12	1.98E-03
Th-230	84,346,681	5.08E-17	4.47E-17	8.37E-17	4.28E-09	2.12E-07	2.54E-03
Th-232	84,346,681	3.95E-17	3.48E-17	6.51E-17	3.33E-09	3.06E-02	9.88E-03

¹ ECV: Effluent Concentration Value from 10-CFR-20, Appendix B. Fraction of ECV at the stack is provided for reference only. Concentrations at off-site locations are significantly less than those reported here (at stack) due to the atmospheric dispersion that occurs before the effluent exits the site.

Note: A value of "0" was substituted for negative analytical results.

Radioactivity in Effluent Air January 1, 2013 to June 30, 2013

Location	Total Volume (m ³)	Activity Concentration (μCi/ml)	Error Estimate (μCi/ml)	LLD (μCi/ml)	Quantity Released (Ci)	Quantity Released (g)	Fraction of ECV ¹
Stack 774 Bldg. 301		327.23 m³/min	5.45 m³/sec				
U-234	84,346,681	5.18E-15	4.56E-15	8.54E-15	4.37E-07	7.00E-05	1.04E-01
U-235	84,346,681	2.14E-16	1.89E-16	3.53E-16	1.81E-08	8.37E-03	3.57E-03
U-238	84,346,681	1.24E-16	1.09E-16	2.05E-16	1.05E-08	3.13E-02	2.07E-03
						Total:	1.24E-01

¹ ECV: Effluent Concentration Value from 10-CFR-20, Appendix B. Fraction of ECV at the stack is provided for reference only. Concentrations at off-site locations are significantly less than those reported here (at stack) due to the atmospheric dispersion that occurs before the effluent exits the site.

Note: A value of "0" was substituted for negative analytical results.

21G-13-0185
GOV-01-55
ACF-13-0208

Attachment C
To Letter Dated August 27, 2013

Report of Gaseous Effluent Dose and Activity Concentrations
for the Maximally Exposed
Off-Site Individual for the Release Period
January - June 2013

(Three Pages to Follow)

Report of Potential Gaseous Effluent Dose to the Maximally Exposed Offsite Individual and on the Maximum Radionuclide Concentrations for the Period: January through June 2013

Introduction

During this biannual period, NRC License SNM-124, Section 9.1.1.3 required NFS to assess the total effective dose equivalent (TEDE) to the maximally exposed offsite receptor and the maximum radioactive air concentrations at the site boundary, attributable to NFS' air effluents. The required biannual assessment has been completed and the details of the assessment are provided in the subsequent sections.

Summary of Methods

In accordance with SNM-124, Section 9.1.1.4 and internal procedure NFS-HS-A-27, the U.S. Department of Energy's CAP88-PC computer program was used to estimate off-site doses and activity concentrations for gaseous effluents. NFS operated seventeen (17) radiological stacks during the 1st half of 2013. Based on effluent types and stack physical characteristics, releases from these stacks were grouped into effective stacks for modeling purposes. To accommodate the co-location limitation of the model, the effective stacks were taken to be at the approximate center of the plant site. The distance to the site boundary (nearest model receptor distance) was conservatively taken to be 150 meters for all sectors. Meteorological data were based on five-year average wind speed and direction frequencies as presented in NFS' 1996 Environmental Report. Atmospheric stability class D (neutral atmosphere) was used for all releases (default value recommended by the U.S. Environmental Protection Agency in "User's Guide for COMPLY"). The most conservative inhalation class was assumed for each radionuclide released. A particle size (activity median aerodynamic diameter or AMAD) of 1.0 microns was assumed for modeling purposes since no information on actual particle sizes exists.

Because CAP88-PC models releases over an entire year, the six-month source term (i.e., total curies of each radionuclide released over the period, given in Attachment B) was annualized (i.e., transformed into a 12-month release) so that airborne activity concentrations would not be under-estimated during the release period.

Summary of Results

Doses are reported in table 1 below and are derived from the CAP88-PC "Synopsis Report." These doses are at the location of the maximally exposed (off-site) individual (MEI). The results include an adjustment (using the normalization factor mentioned above) to convert the "annualized" doses back to those doses that were actually received in the six-month release period. Activity concentrations reported in table 2 come directly from the CAP88-PC "Concentration Tables" report; no adjustments are needed for these concentrations. The CAP88-PC output reports are available for review at NFS.

Table 1 summarizes the six-month dose to a hypothetical individual at the MEI location, which was determined to be approximately 450 meters North Northeast from the center of the plant site. The TEDE to the MEI was estimated to be 4.2E-03 mrem for gaseous effluents released during the 1st half of 2013. The highest organ committed dose equivalent (CDE) to the MEI was estimated to be 1.7E-03 mrem to the lungs. These MEI doses are well below the Environmental Radiological Monitoring Program action levels and applicable regulatory limits/ALARA constraints.

Table 1. Organ Doses and Total Effective Dose Equivalent at the MEI Location

Organ	Committed Dose Equivalent (mrem per 1st half of 2013)
Adrenals	9.4E-06
Bone Surface	3.8E-04
Breasts	9.5E-06
Stomach Wall	3.0E-04
Upper Large Intestine Wall	2.0E-04
Kidneys	4.5E-05
Lungs	1.7E-03
Ovaries	1.2E-05
Red Bone Marrow	2.6E-05
Spleen	9.4E-06
Thymus	9.4E-06
Uterus	9.4E-06
Bladder Wall	2.6E-05
Brain	9.4E-06
Esophagus	7.6E-04
Small Intestine Wall	3.0E-05
Lower Large Intestine Wall	5.6E-04
Liver	3.5E-05
Muscle	9.5E-06
Pancreas	9.4E-06
Skin	1.1E-05
Testes	1.2E-05
Thyroid	1.4E-04
Total Effective Dose Equivalent	4.2E-03 mrem
Location of MEI:	450 meters North Northeast

Table 2 summarizes the maximum radioactive air concentrations at or beyond the site boundary, as determined by CAP88-PC, for the radionuclides released. The total sum of fractions was estimated to be 5.9E-04 and indicates that exposures to offsite public from gaseous effluents were much less than 1% of the 10 CFR 20, Appendix B, Table 2, Col. 1 values for all offsite receptors including the site boundary. It is noted that the location of the maximum airborne concentration for a given radionuclide does not necessarily correspond to the MEI location. This is due primarily to the fact that the maximum concentrations for individual nuclides can vary due to differences in values input into the dispersion model for each of the effective stacks—such inputs include stack height, stack diameter, flow rate, and total radionuclide activities released per stack. Another reason for the disparity is the fact that the MEI dose includes both inhalation and ingestion pathways.

Table 2. Maximum Predicted Airborne Concentrations at or Beyond the Site Boundary

Maximum Predicted Airborne Concentrations at or Beyond the Site Boundary					
Nuclide	Maximum Concentration (µCi/mL)	Concentration Location		10 CFR 20, App. B, Table 2, Col. 1 Value (µCi/mL)	Ratio of Maximum Concentration to 10 CFR 20 Value
		Sector	Dist. (m)		
⁹⁹ Tc	1.3E-17	NNE	400	9.E-10	1.4E-08
²²⁸ Th	5.8E-20	NNE	450	2.E-14	2.9E-06
²³⁰ Th	6.5E-20	NNE	450	2.E-14	3.2E-06
²³¹ Th	3.2E-21	NNE	450	9.E-09	3.6E-13
²³² Th	7.4E-20	NNE	350	4.E-15	1.9E-05
²³⁴ U	2.7E-17	NNE	450	5.E-14	5.5E-04
²³⁵ U	8.9E-19	NNE	450	6.E-14	1.5E-05
²³⁸ U	1.2E-19	NNE	550	6.E-14	2.0E-06
²³⁸ Pu	4.8E-21	NNE	200	2.E-14	2.4E-07
²³⁹ Pu	1.7E-20	NNE	200	2.E-14	8.6E-07
²⁴¹ Pu	1.8E-18	NNE	350	8.E-13	2.3E-06
²⁴¹ Am	3.9E-21	NNE	200	2.E-14	2.0E-07
Sum of Fractions:					5.9E-04

21G-13-0185
GOV-01-55
ACF-13-0208

Attachment D
To Letter Dated August 27, 2013

Revised Page 2 of
Report of Radioactivity in Effluent Air for the Period
July - December 2012

(One Page to Follow)

Radioactivity in Effluent Air July 1, 2012 to December 31, 2012

Location	Total Volume (m ³)	Activity Concentration (μCi/ml)	Error Estimate (μCi/ml)	LLD (μCi/ml)	Quantity Released (Ci)	Quantity Released (g)	Fraction of ECV ¹
Stack 424 Bldg. 100		26.53 m³/min		0.44 m³/sec			
U-234	7,069,055	5.61E-14	1.40E-14	1.91E-14	3.96E-07	6.35E-05	1.12E+00
U-235	7,069,055	1.73E-15	4.34E-16	5.90E-16	1.23E-08	5.68E-03	2.89E-02
						Total:	1.15E+00
Stack 501 Bldg. 510		75.60 m³/min		1.26 m³/sec			
Pu-241	20,104,166	2.12E-14	1.93E-14	3.06E-14	4.26E-07	4.13E-09	2.65E-02
Th-228	20,104,166	0.00E+00	3.34E-15	6.77E-15	0.00E+00	0.00E+00	0.00E+00
Th-230	20,104,166	0.00E+00	4.29E-15	8.71E-15	0.00E+00	0.00E+00	0.00E+00
Th-232	20,104,166	0.00E+00	2.86E-15	5.81E-15	0.00E+00	0.00E+00	0.00E+00
U-234	20,104,166	0.00E+00	8.82E-15	1.79E-14	0.00E+00	0.00E+00	0.00E+00
U-235	20,104,166	0.00E+00	1.55E-15	3.14E-15	0.00E+00	0.00E+00	0.00E+00
U-238	20,104,166	0.00E+00	3.10E-15	6.29E-15	0.00E+00	0.00E+00	0.00E+00
						Total:	2.65E-02
Stack 502 OCB		211.89 m³/min		3.53 m³/sec			
Pu-241	55,512,316	5.29E-15	5.11E-15	8.24E-15	2.93E-07	2.85E-09	6.61E-03
Th-228	55,512,316	6.43E-16	9.89E-16	1.60E-15	3.57E-08	4.36E-11	3.21E-02
Th-230	55,512,316	8.26E-16	1.27E-15	2.05E-15	4.59E-08	2.27E-06	4.13E-02
Th-232	55,512,316	5.51E-16	8.48E-16	1.37E-15	3.06E-08	2.81E-01	1.38E-01
U-234	55,512,316	1.70E-15	2.61E-15	4.22E-15	9.43E-08	1.51E-05	3.40E-02
U-235	55,512,316	2.98E-16	4.59E-16	7.41E-16	1.66E-08	7.67E-03	4.97E-03
U-238	55,512,316	5.97E-16	9.19E-16	1.48E-15	3.31E-08	9.89E-02	9.95E-03
						Total:	2.67E-01
Stack 573 Bldg 306-W		74.18 m³/min		1.24 m³/sec			
Pu-241	18,997,131	0.00E+00	7.91E-16	1.59E-15	0.00E+00	0.00E+00	0.00E+00
Tc-99	18,997,131	0.00E+00	2.56E-14	5.13E-14	0.00E+00	0.00E+00	0.00E+00
U-234	18,997,131	0.00E+00	7.14E-15	1.99E-14	0.00E+00	0.00E+00	0.00E+00
U-235	18,997,131	0.00E+00	2.21E-16	6.16E-16	0.00E+00	0.00E+00	0.00E+00
						Total:	0.00E+00
Stack 600 Bldg. 110		313.33 m³/min		5.22 m³/sec			
Pu-241	83,511,338	6.37E-15	7.29E-16	9.58E-16	5.32E-07	5.16E-09	7.96E-03
Tc-99	83,511,338	2.06E-13	2.36E-14	3.10E-14	1.72E-05	1.02E-03	2.29E-04
U-234	83,511,338	1.17E-13	1.25E-14	1.25E-14	9.75E-06	1.56E-03	2.33E+00
U-235	83,511,338	3.61E-15	3.86E-16	3.86E-16	3.01E-07	1.40E-01	6.02E-02
						Total:	2.40E+00
Stack 615 Bldg. 306-W		40.24 m³/min		0.67 m³/sec			
Pu-241	10,736,594	0.00E+00	7.43E-16	1.57E-15	0.00E+00	0.00E+00	0.00E+00
Tc-99	10,736,594	0.00E+00	2.40E-14	5.07E-14	0.00E+00	0.00E+00	0.00E+00
U-234	10,736,594	0.00E+00	7.02E-15	1.87E-14	0.00E+00	0.00E+00	0.00E+00
U-235	10,736,594	0.00E+00	2.17E-16	5.78E-16	0.00E+00	0.00E+00	0.00E+00
						Total:	0.00E+00

¹ ECV: Effluent Concentration Value from 10-CFR-20, Appendix B. Fraction of ECV at the stack is provided for reference only. Concentrations at off-site locations are significantly less than those reported here (at stack) due to the atmospheric dispersion that occurs before the effluent exits the site.

Note: A value of "0" was substituted for negative analytical results.

Attachment E
To Letter Dated August 27, 2013

Revised Table 2 of
Report of Gaseous Effluent Dose and Activity Concentrations
for the Maximally Exposed
Off-Site Individual for the Release Period
July - December 2012

(One Page to Follow)

Table 2. Maximum Predicted Airborne Concentrations at or Beyond the Site Boundary

Maximum Predicted Airborne Concentrations at or Beyond the Site Boundary					
Nuclide	Maximum Concentration (µCi/mL)	Concentration Location		10 CFR 20, App. B, Table 2, Col. 1 Value (µCi/mL)	Ratio of Maximum Concentration to 10 CFR 20 Value
		Sector	Dist. (m)		
⁹⁹ Tc	1.8E-17	NNE	300	9.E-10	2.0E-08
²²⁸ Th	1.1E-19	NNE	450	2.E-14	5.7E-06
²³⁰ Th	1.0E-19	NNE	500	2.E-14	5.0E-06
²³¹ Th	2.4E-21	NNE	400	9.E-09	2.7E-13
²³² Th	9.9E-20	NNE	450	4.E-15	2.5E-05
²³⁴ U	1.8E-17	NNE	400	5.E-14	3.6E-04
²³⁵ U	6.5E-19	NNE	400	6.E-14	1.1E-05
²³⁸ U	1.9E-19	NNE	500	6.E-14	3.1E-06
²³⁸ Pu	0.0E+00	NNE	n/a	2.E-14	0.0E+00
²³⁹ Pu	0.0E+00	NNE	n/a	2.E-14	0.0E+00
²⁴⁰ Pu	0.0E+00	NNE	n/a	2.E-14	0.0E+00
²⁴¹ Pu	7.7E-19	NNE	300	8.E-13	9.6E-07
²⁴¹ Am	0.0E+00	NNE	n/a	2.E-14	0.0E+00
Sum of Fractions:					4.1E-04

The TEDE to the MEI for gaseous effluents released during 2012 is provided in Table 3. The results for the 1st half of 2012 were previously reported in *Biannual Effluent Monitoring Report January through June 2012* (21G-12-0167). The annual dose is well below the Environmental Radiological Monitoring Program action levels and applicable regulatory limits/ALARA constraints.

Table 3. Annual Dose to the MEI for Gaseous Effluents Released During 2012

Period Covered	Direction	Distance (m)	TEDE (mrem)
2 nd Half	NNE	400	3.0E-03
1 st Half	NNE	500	2.9E-03
Annual Total			5.9E-03