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

■ 1205 banner hill road ■ erwin, tn 37650 ■ phone 423.743.9141
■ www.nuclearfuelservices.com

21G-14-0128
GOV-01-55
ACF-14-0191

August 26, 2014

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 2014**

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 2014. Attachment B reports the Radioactivity in Effluent Air for the period January through June 2014. 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 2014.

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-14-0128) in any correspondence concerning this letter.

Sincerely,

NUCLEAR FUEL SERVICES, INC.

Richard J. Freudenberger
Safety & Safeguards Director

CJB/rrm
Attachments

- *A- Report of Radioactivity in Effluent Liquid for the Period January - June 2014*
- *B- Report of Radioactivity in Effluent Air for the Period of January - June 2014*
- *C- Report of Gaseous Effluent Dose and Activity Concentrations for the Maximally Exposed Off-Site Individual for the Release Period January - June 2014*

NMSS 20

xc: Mr. David Hartland, Project Inspector
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Regional Administrator
U. S. Nuclear Regulatory Commission
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Mr. Kevin Ramsey
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Mr. Charles Stancil
Senior Resident Inspector
U. S. Nuclear Regulatory Commission

Attachment A
To Letter Dated August 26, 2014

Report of Radioactivity in Effluent Liquid for the Period
January - June 2014

(2 Pages to Follow)

Radioactivity in Effluent Liquid
January 1, 2014 to June 30, 2014

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	469,378,233	0.00E+00	9.32E-11	2.15E-10	0.00E+00	0.00E+00	0.00E+00
Pu-239/240	469,378,233	0.00E+00	9.67E-11	2.26E-10	0.00E+00	0.00E+00	0.00E+00
Tc-99	469,378,233	6.03E-09	3.74E-08	6.49E-08	2.83E-03	1.67E-01	1.00E-04
Th-228	469,378,233	2.10E-12	1.44E-10	3.00E-10	9.84E-07	1.20E-09	1.05E-05
Th-230	469,378,233	1.92E-11	1.65E-10	3.53E-10	9.01E-06	4.46E-04	1.92E-04
Th-232	469,378,233	0.00E+00	1.04E-10	2.37E-10	0.00E+00	0.00E+00	0.00E+00
U-233/234	469,378,233	3.68E-10	2.52E-10	2.49E-10	1.73E-04	2.77E-02	1.23E-03
U-235/236	469,378,233	3.69E-11	1.21E-10	2.41E-10	1.73E-05	8.01E+00	1.23E-04
U-238	469,378,233	1.37E-11	1.15E-10	2.34E-10	6.42E-06	1.92E+01	4.56E-05
						Total:	**1.70E-03**
BLEU Sewer							
Pu-238	994,921	2.98E-11	9.02E-11	1.77E-10	2.96E-08	1.73E-09	1.49E-04
Pu-239/240	994,921	0.00E+00	1.05E-10	2.46E-10	0.00E+00	0.00E+00	0.00E+00
Tc-99	994,921	7.11E-10	4.05E-08	7.07E-08	7.07E-07	4.19E-05	1.18E-06
Th-228	994,921	1.98E-11	1.62E-10	3.16E-10	1.97E-08	2.40E-11	9.89E-06
Th-230	994,921	8.82E-11	1.94E-10	3.33E-10	8.77E-08	4.34E-06	8.82E-05
Th-232	994,921	0.00E+00	9.15E-11	2.04E-10	0.00E+00	0.00E+00	0.00E+00
U-232	994,921	0.00E+00	7.84E-11	1.91E-10	0.00E+00	0.00E+00	0.00E+00
U-233/234	994,921	4.15E-10	2.18E-10	1.60E-10	4.13E-07	6.62E-05	1.38E-04
U-235/236	994,921	9.00E-12	7.41E-11	1.46E-10	8.96E-09	4.15E-03	3.00E-06
U-238	994,921	1.34E-10	1.33E-10	1.33E-10	1.33E-07	3.97E-01	4.45E-05
						Total:	**4.34E-04**
Sewer							
Pu-238	14,009,262	0.00E+00	1.18E-10	2.67E-10	0.00E+00	0.00E+00	0.00E+00
Pu-239/240	14,009,262	0.00E+00	1.14E-10	2.59E-10	0.00E+00	0.00E+00	0.00E+00
Tc-99	14,009,262	1.46E-08	4.10E-08	7.05E-08	2.05E-04	1.21E-02	2.44E-05
Th-228	14,009,262	0.00E+00	2.02E-10	4.63E-10	0.00E+00	0.00E+00	0.00E+00
Th-230	14,009,262	2.52E-11	2.50E-10	5.21E-10	3.52E-07	1.74E-05	2.52E-05
Th-232	14,009,262	0.00E+00	1.67E-10	3.63E-10	0.00E+00	0.00E+00	0.00E+00
U-232	14,009,262	0.00E+00	8.76E-11	2.09E-10	0.00E+00	0.00E+00	0.00E+00
U-233/234	14,009,262	1.12E-08	1.03E-09	1.96E-10	1.56E-04	2.51E-02	3.72E-03
U-235/236	14,009,262	5.25E-10	2.33E-10	1.41E-10	7.36E-06	3.41E+00	1.75E-04
U-238	14,009,262	1.83E-09	4.16E-10	1.77E-10	2.56E-05	7.64E+01	6.09E-04
						Total:	**4.56E-03**
West Ditch							
Pu-238	171,175,785	1.13E-12	7.50E-11	1.62E-10	1.94E-07	1.13E-08	5.67E-05
Pu-239/240	171,175,785	6.86E-12	8.55E-11	1.78E-10	1.17E-06	1.89E-05	3.43E-04
Tc-99	171,175,785	4.99E-09	3.82E-08	6.63E-08	8.55E-04	5.06E-02	8.32E-05
Th-228	171,175,785	3.24E-11	1.35E-10	2.62E-10	5.54E-06	6.77E-09	1.62E-04
Th-230	171,175,785	2.26E-11	1.50E-10	3.06E-10	3.86E-06	1.91E-04	2.26E-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, 2014 to June 30, 2014

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	171,175,785	2.38E-11	1.11E-10	2.07E-10	4.08E-06	3.74E+01	7.95E-04
U-233/234	171,175,785	2.40E-08	1.91E-09	2.57E-10	4.11E-03	6.58E-01	8.00E-02
U-235/236	171,175,785	8.88E-10	4.24E-10	2.73E-10	1.52E-04	7.04E+01	2.96E-03
U-238	171,175,785	2.44E-09	6.19E-10	1.90E-10	4.18E-04	1.25E+03	8.13E-03
						Total:	**9.27E-02**
WWTF							
Am-241	3,298,146	2.84E-11	6.16E-11	9.41E-11	9.37E-08	2.73E-08	1.42E-03
Cs-137	3,298,146	2.92E-09	1.61E-09	1.83E-09	9.63E-06	1.11E-07	2.92E-03
Na-22	3,298,146	0.00E+00	1.31E-09	1.81E-09	0.00E+00	0.00E+00	0.00E+00
Np-237	3,298,146	5.46E-13	1.11E-10	2.46E-10	1.80E-09	2.56E-06	2.73E-05
Pb-212	3,298,146	0.00E+00	3.33E-09	3.43E-09	0.00E+00	0.00E+00	0.00E+00
Pu-238	3,298,146	1.23E-11	6.49E-11	1.38E-10	4.07E-08	2.38E-09	6.17E-04
Pu-239/240	3,298,146	1.35E-11	7.28E-11	1.43E-10	4.46E-08	7.17E-07	6.76E-04
Pu-241	3,298,146	0.00E+00	1.09E-08	1.89E-08	0.00E+00	0.00E+00	0.00E+00
Ra-224	3,298,146	6.14E-09	4.04E-09	7.47E-09	2.02E-05	1.27E-10	3.07E-02
Tc-99	3,298,146	4.44E-08	9.90E-08	1.69E-07	1.46E-04	8.67E-03	7.40E-04
Th-228	3,298,146	3.96E-11	1.48E-10	2.78E-10	1.31E-07	1.59E-10	1.98E-04
Th-230	3,298,146	7.62E-11	1.48E-10	2.54E-10	2.51E-07	1.24E-05	7.62E-04
Th-231	3,298,146	7.97E-09	4.16E-08	4.57E-08	2.63E-05	4.94E-11	1.59E-04
Th-232	3,298,146	0.00E+00	7.12E-11	1.67E-10	0.00E+00	0.00E+00	0.00E+00
U-232	3,298,146	0.00E+00	8.66E-11	1.99E-10	0.00E+00	0.00E+00	0.00E+00
U-233/234	3,298,146	4.20E-08	1.73E-09	1.33E-10	1.38E-04	2.22E-02	1.40E-01
U-235/236	3,298,146	1.52E-09	3.32E-10	1.09E-10	5.00E-06	2.31E+00	5.05E-03
U-238	3,298,146	3.48E-10	1.65E-10	9.85E-11	1.15E-06	3.43E+00	1.16E-03
						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.

Attachment B
To Letter Dated August 26, 2014

Report of Radioactivity in Effluent Air for the Period
January - June 2014

(4 Pages to Follow)

Radioactivity in Effluent Air
January 1, 2014 to June 30, 2014

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		**1108.61 m^3/min**		**18.48 m^3/sec**			
U-234	284,908,343	1.07E-13	2.84E-14	1.82E-14	3.06E-05	4.90E-03	2.15E+00
U-235	284,908,343	4.18E-15	1.11E-15	7.08E-16	1.19E-06	5.51E-01	6.96E-02
U-238	284,908,343	1.35E-15	3.59E-16	2.30E-16	3.86E-07	1.15E+00	2.26E-02
						Total:	**2.24E+00**
Stack 185 Bldg. 131		**107.86 m^3/min**		**1.80 m^3/sec**			
Pu-241	28,112,339	0.00E+00	8.37E-16	1.76E-15	0.00E+00	0.00E+00	0.00E+00
Tc-99	28,112,339	0.00E+00	2.71E-14	5.68E-14	0.00E+00	0.00E+00	0.00E+00
U-234	28,112,339	5.97E-16	7.54E-15	1.90E-14	1.68E-08	2.69E-06	1.19E-02
U-235	28,112,339	1.85E-17	2.33E-16	5.87E-16	5.19E-10	2.40E-04	3.08E-04
						Total:	**1.22E-02**
Stack 234 Bldg. 234		**310.62 m^3/min**		**5.18 m^3/sec**			
Am-241	81,689,047	8.61E-17	3.00E-17	4.60E-17	7.03E-09	2.05E-09	4.30E-03
Pu-238	81,689,047	1.05E-16	3.67E-17	5.63E-17	8.59E-09	5.03E-10	5.26E-03
Pu-239/240	81,689,047	3.73E-16	1.30E-16	1.99E-16	3.05E-08	4.90E-07	1.87E-02
Pu-241	81,689,047	0.00E+00	4.19E-15	8.00E-15	0.00E+00	0.00E+00	0.00E+00
Th-228	81,689,047	5.74E-17	2.00E-17	3.07E-17	4.69E-09	5.72E-12	2.87E-03
Th-230	81,689,047	7.17E-16	2.50E-16	3.84E-16	5.86E-08	2.90E-06	3.59E-02
Th-232	81,689,047	9.09E-16	3.17E-16	4.86E-16	7.42E-08	6.81E-01	2.27E-01
U-234	81,689,047	1.96E-15	6.84E-16	1.05E-15	1.60E-07	2.57E-05	3.92E-02
U-238	81,689,047	5.74E-16	2.00E-16	3.07E-16	4.69E-08	1.40E-01	9.56E-03
						Total:	**3.43E-01**
Stack 327 Bldg. 330		**1127.58 m^3/min**		**18.79 m^3/sec**			
Pu-241	294,554,676	1.56E-15	5.50E-16	8.37E-16	4.60E-07	4.46E-09	1.95E-03
Tc-99	294,554,676	5.05E-14	1.78E-14	2.71E-14	1.49E-05	8.80E-04	5.61E-05
U-234	294,554,676	9.14E-14	1.33E-14	1.04E-14	2.69E-05	4.31E-03	1.83E+00
U-235	294,554,676	2.83E-15	4.12E-16	3.22E-16	8.33E-07	3.85E-01	4.71E-02
						Total:	**1.88E+00**
Stack 421 Bldg. 100		**31.97 m^3/min**		**0.53 m^3/sec**			
Pu-241	8,332,589	3.79E-15	1.51E-15	2.30E-15	3.16E-08	3.07E-10	4.74E-03
Tc-99	8,332,589	1.23E-13	4.88E-14	7.44E-14	1.02E-06	6.05E-05	1.36E-04
U-234	8,332,589	1.19E-13	2.57E-14	2.29E-14	9.92E-07	1.59E-04	2.38E+00
U-235	8,332,589	3.68E-15	7.95E-16	7.07E-16	3.07E-08	1.42E-02	6.13E-02
						Total:	**2.45E+00**
Stack 424 Bldg. 100		**30.02 m^3/min**		**0.50 m^3/sec**			
Pu-241	7,823,334	3.42E-16	9.56E-16	1.74E-15	2.67E-09	2.60E-11	4.27E-04
Tc-99	7,823,334	1.10E-14	3.09E-14	5.62E-14	8.64E-08	5.11E-06	1.23E-05
U-234	7,823,334	8.04E-15	1.09E-14	1.88E-14	6.29E-08	1.01E-05	1.61E-01
U-235	7,823,334	2.49E-16	3.37E-16	5.82E-16	1.94E-09	9.00E-04	4.14E-03
						Total:	**1.65E-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.

Radioactivity in Effluent Air
January 1, 2014 to June 30, 2014

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 501 Bldg. 510		**78.69 m^3/min**		**1.31 m^3/sec**			
Pu-241	20,510,420	5.14E-15	3.35E-15	4.65E-15	1.05E-07	1.02E-09	6.42E-03
Th-228	20,510,420	0.00E+00	3.66E-16	7.95E-16	0.00E+00	0.00E+00	0.00E+00
Th-230	20,510,420	0.00E+00	4.71E-16	1.02E-15	0.00E+00	0.00E+00	0.00E+00
Th-232	20,510,420	0.00E+00	3.14E-16	6.82E-16	0.00E+00	0.00E+00	0.00E+00
U-234	20,510,420	0.00E+00	9.68E-16	2.10E-15	0.00E+00	0.00E+00	0.00E+00
U-235	20,510,420	0.00E+00	1.70E-16	3.69E-16	0.00E+00	0.00E+00	0.00E+00
U-238	20,510,420	0.00E+00	3.40E-16	7.38E-16	0.00E+00	0.00E+00	0.00E+00
						Total:	**6.42E-03**
Stack 502 OCB		**196.09 m^3/min**		**3.27 m^3/sec**			
Pu-241	51,674,740	1.44E-14	4.52E-15	4.56E-15	7.44E-07	7.23E-09	1.80E-02
Th-228	51,674,740	5.60E-16	5.16E-16	8.22E-16	2.89E-08	3.53E-11	2.80E-02
Th-230	51,674,740	7.20E-16	6.64E-16	1.06E-15	3.72E-08	1.84E-06	3.60E-02
Th-232	51,674,740	4.80E-16	4.43E-16	7.05E-16	2.48E-08	2.27E-01	1.20E-01
U-234	51,674,740	1.48E-15	1.36E-15	2.17E-15	7.64E-08	1.22E-05	2.96E-02
U-235	51,674,740	2.60E-16	2.40E-16	3.82E-16	1.34E-08	6.22E-03	4.33E-03
U-238	51,674,740	5.20E-16	4.79E-16	7.64E-16	2.69E-08	8.02E-02	8.66E-03
						Total:	**2.44E-01**
Stack 573 Bldg 306-W		**93.39 m^3/min**		**1.56 m^3/sec**			
Pu-241	24,340,901	0.00E+00	8.57E-16	1.76E-15	0.00E+00	0.00E+00	0.00E+00
Tc-99	24,340,901	0.00E+00	2.77E-14	5.69E-14	0.00E+00	0.00E+00	0.00E+00
U-234	24,340,901	0.00E+00	5.94E-15	1.94E-14	0.00E+00	0.00E+00	0.00E+00
U-235	24,340,901	0.00E+00	1.84E-16	6.01E-16	0.00E+00	0.00E+00	0.00E+00
						Total:	**0.00E+00**
Stack 600 Bldg. 110		**322.13 m^3/min**		**5.37 m^3/sec**			
Pu-241	83,960,611	9.12E-16	6.08E-16	1.04E-15	7.65E-08	7.43E-10	1.14E-03
Tc-99	83,960,611	2.95E-14	1.97E-14	3.37E-14	2.47E-06	1.46E-04	3.28E-05
U-234	83,960,611	3.53E-14	8.92E-15	1.26E-14	2.96E-06	4.75E-04	7.05E-01
U-235	83,960,611	1.09E-15	2.76E-16	3.90E-16	9.16E-08	4.24E-02	1.82E-02
						Total:	**7.25E-01**
Stack 615 Bldg. 306-W		**36.73 m^3/min**		**0.61 m^3/sec**			
Pu-241	9,572,513	0.00E+00	8.73E-16	1.86E-15	0.00E+00	0.00E+00	0.00E+00
Tc-99	9,572,513	0.00E+00	2.82E-14	6.00E-14	0.00E+00	0.00E+00	0.00E+00
U-234	9,572,513	0.00E+00	6.59E-15	2.01E-14	0.00E+00	0.00E+00	0.00E+00
U-235	9,572,513	0.00E+00	2.04E-16	6.23E-16	0.00E+00	0.00E+00	0.00E+00
						Total:	**0.00E+00**
Stack 646 Bldg. 110		**47.40 m^3/min**		**0.79 m^3/sec**			
Pu-241	12,354,963	0.00E+00	8.53E-16	1.73E-15	0.00E+00	0.00E+00	0.00E+00
Tc-99	12,354,963	0.00E+00	2.76E-14	5.59E-14	0.00E+00	0.00E+00	0.00E+00
U-234	12,354,963	0.00E+00	6.05E-15	1.87E-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, 2014 to June 30, 2014

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		**47.40 m^3/min**	**0.79 m^3/sec**				
U-235	12,354,963	0.00E+00	1.87E-16	5.79E-16	0.00E+00	0.00E+00	0.00E+00
						Total:	**0.00E+00**
Stack 701 Bldg. 307		**134.56 m^3/min**	**2.24 m^3/sec**				
Pu-241	35,072,154	0.00E+00	8.15E-16	1.73E-15	0.00E+00	0.00E+00	0.00E+00
Tc-99	35,072,154	0.00E+00	2.64E-14	5.59E-14	0.00E+00	0.00E+00	0.00E+00
U-234	35,072,154	7.53E-16	7.53E-15	1.87E-14	2.64E-08	4.23E-06	1.51E-02
U-235	35,072,154	2.33E-17	2.33E-16	5.79E-16	8.17E-10	3.78E-04	3.88E-04
						Total:	**1.55E-02**
Stack 702 Bldg. 307		**164.92 m^3/min**	**2.75 m^3/sec**				
Pu-241	42,984,054	0.00E+00	8.17E-16	1.73E-15	0.00E+00	0.00E+00	0.00E+00
Tc-99	42,984,054	0.00E+00	2.64E-14	5.59E-14	0.00E+00	0.00E+00	0.00E+00
U-234	42,984,054	0.00E+00	6.56E-15	1.87E-14	0.00E+00	0.00E+00	0.00E+00
U-235	42,984,054	0.00E+00	2.03E-16	5.79E-16	0.00E+00	0.00E+00	0.00E+00
						Total:	**0.00E+00**
Stack 703 Exhaust Room Air		**693.46 m^3/min**	**11.56 m^3/sec**				
Pu-241	180,742,870	0.00E+00	2.49E-14	5.12E-14	0.00E+00	0.00E+00	0.00E+00
Th-228	180,742,870	3.41E-16	8.15E-16	1.70E-15	6.16E-08	7.53E-11	1.71E-02
Th-230	180,742,870	1.96E-16	4.70E-16	9.79E-16	3.55E-08	1.76E-06	9.82E-03
Th-232	180,742,870	2.79E-16	6.67E-16	1.39E-15	5.04E-08	4.63E-01	6.98E-02
U-234	180,742,870	2.14E-15	5.11E-15	1.06E-14	3.86E-07	6.19E-05	4.27E-02
U-235	180,742,870	2.20E-16	5.27E-16	1.10E-15	3.99E-08	1.85E-02	3.67E-03
U-238	180,742,870	2.69E-16	6.43E-16	1.34E-15	4.86E-08	1.45E-01	4.48E-03
						Total:	**1.48E-01**
Stack 773 Bldg. 440		**182.09 m^3/min**	**3.03 m^3/sec**				
Pu-241	47,483,470	6.99E-15	3.55E-14	6.91E-14	3.32E-07	3.22E-09	8.74E-03
Th-228	47,483,470	5.59E-16	1.37E-15	3.27E-15	2.66E-08	3.24E-11	2.80E-02
Th-230	47,483,470	7.19E-16	1.76E-15	4.20E-15	3.41E-08	1.69E-06	3.60E-02
Th-232	47,483,470	4.79E-16	1.18E-15	2.80E-15	2.28E-08	2.09E-01	1.20E-01
U-234	47,483,470	1.48E-15	3.63E-15	8.63E-15	7.02E-08	1.12E-05	2.96E-02
U-235	47,483,470	2.60E-16	6.37E-16	1.52E-15	1.23E-08	5.71E-03	4.33E-03
U-238	47,483,470	5.19E-16	1.27E-15	3.03E-15	2.47E-08	7.36E-02	8.66E-03
						Total:	**2.35E-01**
Stack 774 Bldg. 301		**346.03 m^3/min**	**5.77 m^3/sec**				
Th-228	90,189,756	4.44E-16	2.97E-16	4.91E-16	4.01E-08	4.89E-11	2.22E-02
Th-230	90,189,756	1.51E-15	1.01E-15	1.67E-15	1.37E-07	6.76E-06	7.57E-02
Th-232	90,189,756	8.97E-16	6.01E-16	9.93E-16	8.09E-08	7.43E-01	2.24E-01
U-234	90,189,756	4.04E-15	2.71E-15	4.47E-15	3.65E-07	5.84E-05	8.09E-02
U-235	90,189,756	2.63E-16	1.76E-16	2.91E-16	2.37E-08	1.10E-02	4.38E-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, 2014 to June 30, 2014

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		**346.03 m^3/min**		**5.77 m^3/sec**			
U-238	90,189,756	1.90E-15	1.27E-15	2.11E-15	1.72E-07	5.13E-01	3.17E-02
						Total:	**4.39E-01**
Stack 796 Bldg. 100		**25.74 m^3/min**		**0.43 m^3/sec**			
Pu-241	6,708,878	1.46E-16	9.19E-16	1.73E-15	9.80E-10	9.51E-12	1.83E-04
Tc-99	6,708,878	4.72E-15	2.97E-14	5.59E-14	3.17E-08	1.88E-06	5.25E-06
U-234	6,708,878	0.00E+00	6.48E-15	1.87E-14	0.00E+00	0.00E+00	0.00E+00
U-235	6,708,878	0.00E+00	2.00E-16	5.79E-16	0.00E+00	0.00E+00	0.00E+00
						Total:	**1.88E-04**

[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 C
To Letter Dated August 26, 2014

Report of Gaseous Effluent Dose and Activity Concentrations
for the Maximally Exposed
Off-Site Individual for the Release Period
January - June 2014

(3 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 2014

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 eighteen (18) radiological stacks during the 1st half of 2014. 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 2.2E-03 mrem for gaseous effluents released during the 1st half of 2014. The highest organ committed dose equivalent (CDE) to the MEI was estimated to be 8.2E-04 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 2014)
Adrenals	5.2E-06
Bone Surface	4.3E-04
Breasts	5.2E-06
Stomach Wall	1.5E-04
Upper Large Intestine Wall	9.9E-05
Kidneys	2.6E-05
Lungs	8.2E-04
Ovaries	7.9E-06
Red Bone Marrow	2.2E-05
Spleen	5.2E-06
Thymus	5.2E-06
Uterus	5.2E-06
Bladder Wall	1.4E-05
Brain	5.2E-06
Esophagus	3.7E-04
Small Intestine Wall	1.6E-05
Lower Large Intestine Wall	2.8E-04
Liver	2.4E-05
Muscle	5.2E-06
Pancreas	5.2E-06
Skin	5.9E-06
Testes	8.0E-06
Thyroid	7.3E-05
Total Effective Dose Equivalent	**2.2E-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 3.2E-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	6.4E-18	NNE	400	9.E-10	7.1E-09
^{228}Th	5.5E-20	NNE	400	2.E-14	2.8E-06
^{230}Th	1.1E-19	NNE	350	2.E-14	5.6E-06
^{231}Th	1.6E-21	NNE	450	9.E-09	1.8E-13
^{232}Th	1.1E-19	NNE	300	4.E-15	2.8E-05
^{234}U	1.3E-17	NNE	450	5.E-14	2.7E-04
^{235}U	4.5E-19	NNE	450	6.E-14	7.5E-06
^{238}U	1.3E-19	NNE	450	6.E-14	2.2E-06
^{238}Pu	8.9E-21	NNE	200	2.E-14	4.5E-07
^{239}Pu	3.2E-20	NNE	200	2.E-14	1.6E-06
^{241}Pu	6.9E-19	NNE	350	8.E-13	8.7E-07
^{241}Am	7.3E-21	NNE	200	2.E-14	3.7E-07
				Sum of Fractions:	**3.2E-04**