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-10-0165
GOV-01-55
ACF-10-0231

August 18, 2010

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

References: 1) Docket No. 70-143; SNM License 124

Subject: **Biannual Effluent Monitoring Report January through June 2010**

Dear Mr. Reyes:

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 2010. Attachment B reports the Radioactivity in Effluent Air for the period January through June 2010. 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 2010.

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 Manager, at (423) 743-1777. Please reference our unique document identification number (21G-10-0165) in any correspondence concerning this letter.

Sincerely,

NUCLEAR FUEL SERVICES, INC.

Mark P. Elliott
Quality, Safety, & Safeguards
Director

CJB/rrm
Enclosure

- *A- Report of Radioactivity in Effluent Liquid for the Period January – June 2010*
- *B- Report of Radioactivity in Effluent Air for the Period of January – June 2010*
- *C- Report of Gaseous Effluent Dose and Activity Concentrations for the Maximally Exposed Off-Site Individual for the Release Period January – June 2010*

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xc: Mr. Manuel Crespo, Project Inspector
U. S. Nuclear Regulatory Commission
Region II,
245 Peachtree Center Ave., NE
Suite 1200
Atlanta, GA 30303-1257

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

Mr. Kevin Ramsey, Project Manager
Fuel Manufacturing Branch
Division of Fuel Cycle Safety and Safeguards
Office of Nuclear Material Safety & Safeguards
U. S. Nuclear Regulatory Commission
Washington, DC 20555-0001

Mr. Galen Smith
Senior Resident Inspector
U. S. Nuclear Regulatory Commission

21G-10-0165
GOV-01-55
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Attachment A
To Letter Dated August 18, 2010

Report of Radioactivity in Effluent Liquid for the Period
January – June 2010

(Two Pages to Follow)

Radioactivity in Effluent Liquid
January 1, 2010 to June 30, 2010

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]
BLEU Sewer							
Pu-238	1,625,345	5.55E-11	8.96E-11	1.73E-10	9.01E-08	5.27E-09	2.77E-04
Pu-239/240	1,625,345	1.66E-11	7.30E-11	1.69E-10	2.70E-08	4.34E-07	8.31E-05
Tc-99	1,625,345	-1.23E-08	2.35E-08	4.27E-08	-2.00E-05	-1.18E-03	-2.05E-05
Th-228	1,625,345	3.41E-11	1.56E-10	3.70E-10	5.54E-08	6.76E-11	1.70E-05
Th-230	1,625,345	1.50E-11	1.34E-10	2.35E-10	2.45E-08	1.21E-06	1.50E-05
Th-232	1,625,345	3.39E-12	1.20E-10	2.08E-10	5.51E-09	5.06E-02	1.13E-05
U-232	1,625,345	3.46E-11	1.15E-10	3.04E-10	5.62E-08	2.63E-09	5.77E-05
U-233/234	1,625,345	3.46E-10	2.39E-10	1.80E-10	5.62E-07	9.01E-05	1.15E-04
U-235/236	1,625,345	6.40E-11	9.48E-11	1.62E-10	1.04E-07	4.81E-02	2.13E-05
U-238	1,625,345	7.96E-11	1.16E-10	1.80E-10	1.29E-07	3.86E-01	2.65E-05
						Total:	**6.04E-04**
Sewer							
Pu-238	17,469,999	1.97E-11	8.49E-11	1.90E-10	3.44E-07	2.01E-08	9.86E-05
Pu-239/240	17,469,999	7.48E-12	6.28E-11	1.76E-10	1.31E-07	2.10E-06	3.74E-05
Tc-99	17,469,999	-1.06E-08	2.20E-08	4.00E-08	-1.85E-04	-1.10E-02	-1.77E-05
Th-228	17,469,999	5.83E-11	1.75E-10	4.09E-10	1.02E-06	1.24E-09	2.92E-05
Th-230	17,469,999	2.58E-10	2.24E-10	2.37E-10	4.50E-06	2.23E-04	2.58E-04
Th-232	17,469,999	-1.31E-11	1.27E-10	2.48E-10	-2.29E-07	-2.10E+00	-4.38E-05
U-232	17,469,999	7.77E-11	2.29E-10	2.66E-10	1.36E-06	6.34E-08	1.29E-04
U-233/234	17,469,999	1.49E-08	1.58E-09	2.15E-10	2.61E-04	4.19E-02	4.98E-03
U-235/236	17,469,999	6.49E-10	3.15E-10	1.65E-10	1.13E-05	5.25E+00	2.16E-04
U-238	17,469,999	2.23E-09	6.16E-10	2.08E-10	3.90E-05	1.16E+02	7.44E-04
						Total:	**6.43E-03**
WWTF							
Am-241	2,435,527	-1.09E-11	5.56E-11	1.25E-10	-2.65E-08	-7.72E-09	-5.43E-04
Cs-137	2,435,527	-3.48E-11	1.09E-09	1.84E-09	-8.48E-08	-9.74E-10	-3.48E-05
Na-22	2,435,527	4.58E-10	1.01E-09	1.77E-09	1.12E-06	1.79E-10	7.64E-05
Np-237	2,435,527	9.14E-11	1.37E-10	2.46E-10	2.23E-07	3.16E-04	4.57E-03
Pb-212	2,435,527	-5.14E-10	3.47E-09	3.79E-09	-1.25E-06	-9.05E-13	-2.57E-04
Pu-238	2,435,527	-1.05E-12	6.46E-11	1.82E-10	-2.57E-09	-1.50E-10	-5.27E-05
Pu-239/240	2,435,527	2.09E-11	7.58E-11	1.74E-10	5.09E-08	8.19E-07	1.05E-03
Pu-241	2,435,527	-6.45E-10	7.44E-09	1.30E-08	-1.57E-06	-1.52E-08	-6.45E-04
Ra-224	2,435,527	1.24E-08	5.03E-09	9.99E-09	3.01E-05	1.90E-10	6.19E-02
Tc-99	2,435,527	1.66E-09	3.71E-08	6.53E-08	4.04E-06	2.39E-04	2.76E-05
Th-228	2,435,527	4.20E-11	1.22E-10	2.66E-10	1.02E-07	1.25E-10	2.10E-04
Th-230	2,435,527	1.39E-10	1.66E-10	2.16E-10	3.37E-07	1.67E-05	1.39E-03
Th-231	2,435,527	5.34E-09	2.15E-08	2.81E-08	1.30E-05	2.44E-11	1.07E-04
Th-232	2,435,527	1.00E-11	9.70E-11	2.12E-10	2.44E-08	2.23E-01	3.33E-04
U-232	2,435,527	2.27E-11	8.77E-11	3.00E-10	5.54E-08	2.59E-09	3.79E-04
U-233/234	2,435,527	3.30E-08	2.07E-09	1.74E-10	8.03E-05	1.29E-02	1.10E-01

[1] ECV: Effluent Concentration Value from 10-CFR-20, Appendix B.

Radioactivity in Effluent Liquid
January 1, 2010 to June 30, 2010

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]
WWTF							
U-235/236	2,435,527	1.46E-09	4.24E-10	1.67E-10	3.56E-06	1.65E+00	4.87E-03
U-238	2,435,527	5.97E-10	2.91E-10	1.44E-10	1.45E-06	4.34E+00	1.99E-03
						Total:	**1.85E-01**

[1] ECV: Effluent Concentration Value from 10-CFR-20, Appendix B.

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Attachment B
To Letter Dated August 18, 2010

Report of Radioactivity in Effluent Air for the Period
January – June 2010

(Five Pages to Follow)

Radioactivity in Effluent Air
January 1, 2010 to June 30, 2010

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		**1019.11 m^3/min**	**16.99 m^3/sec**				
Tc-99	265,619,968	7.14E-14	3.71E-14	4.88E-14	1.90E-05	1.12E-03	7.93E-05
Th-228	265,619,968	1.36E-16	7.26E-17	9.52E-17	3.61E-08	4.41E-11	6.79E-03
Th-230	265,619,968	7.24E-17	3.87E-17	5.08E-17	1.92E-08	9.53E-07	3.62E-03
Th-232	265,619,968	4.53E-17	2.42E-17	3.17E-17	1.20E-08	1.10E-01	1.13E-02
U-234	265,619,968	4.20E-14	2.24E-14	2.95E-14	1.12E-05	1.79E-03	8.40E-01
U-235	265,619,968	2.67E-15	1.43E-15	1.87E-15	7.10E-07	3.28E-01	4.45E-02
U-238	265,619,968	3.35E-16	1.79E-16	2.35E-16	8.90E-08	2.66E-01	5.58E-03
						Total:	**9.12E-01**
Stack 185 Bldg. 131		**107.60 m^3/min**	**1.79 m^3/sec**				
Tc-99	28,045,914	4.95E-14	3.50E-14	5.09E-14	1.39E-06	8.21E-05	5.50E-05
Th-230	28,045,914	1.40E-19	7.19E-19	1.47E-18	3.93E-12	1.95E-10	7.01E-06
Th-231	28,045,914	6.32E-16	4.46E-16	6.50E-16	1.77E-08	3.33E-14	7.02E-08
U-234	28,045,914	3.13E-15	1.61E-14	3.29E-14	8.78E-08	1.41E-05	6.26E-02
U-235	28,045,914	5.25E-17	2.70E-16	5.52E-16	1.47E-09	6.82E-04	8.76E-04
U-238	28,045,914	6.05E-20	3.11E-19	6.36E-19	1.70E-12	5.06E-06	1.01E-06
						Total:	**6.35E-02**
Stack 234 Bldg. 234		**282.37 m^3/min**	**4.71 m^3/sec**				
Am-241	74,003,292	4.41E-16	7.55E-16	1.31E-15	3.27E-08	9.52E-09	2.21E-02
Pu-238	74,003,292	8.93E-17	1.53E-16	2.65E-16	6.61E-09	3.87E-10	4.47E-03
Pu-239	74,003,292	7.47E-16	1.28E-15	2.22E-15	5.53E-08	8.88E-07	3.73E-02
Pu-240	74,003,292	2.63E-16	4.50E-16	7.80E-16	1.94E-08	8.53E-08	1.31E-02
Pu-241	74,003,292	1.33E-14	5.50E-15	7.71E-15	9.87E-07	9.58E-09	1.67E-02
						Total:	**9.37E-02**
Stack 327 Bldg. 330		**727.89 m^3/min**	**12.13 m^3/sec**				
Tc-99	188,782,605	1.55E-13	3.79E-14	4.50E-14	2.92E-05	1.73E-03	1.72E-04
Th-230	188,782,605	5.65E-18	1.22E-18	1.24E-18	1.07E-09	5.28E-08	2.83E-04
Th-231	188,782,605	1.98E-15	4.84E-16	5.75E-16	3.73E-07	7.01E-13	2.20E-07
U-234	188,782,605	1.26E-13	2.73E-14	2.77E-14	2.38E-05	3.82E-03	2.53E+00
U-235	188,782,605	2.12E-15	4.58E-16	4.65E-16	4.00E-07	1.85E-01	3.53E-02
U-238	188,782,605	2.44E-18	5.28E-19	5.35E-19	4.61E-10	1.38E-03	4.07E-05
						Total:	**2.56E+00**
Stack 421 Bldg. 100		**21.01 m^3/min**	**0.35 m^3/sec**				
Tc-99	5,476,334	2.55E-13	5.64E-14	6.36E-14	1.40E-06	8.26E-05	2.83E-04
Th-230	5,476,334	1.01E-17	2.05E-18	1.79E-18	5.52E-11	2.73E-09	5.04E-04
Th-231	5,476,334	3.26E-15	7.20E-16	8.12E-16	1.78E-08	3.35E-14	3.62E-07
U-234	5,476,334	2.25E-13	4.58E-14	3.99E-14	1.23E-06	1.98E-04	4.51E+00
U-235	5,476,334	3.78E-15	7.69E-16	6.70E-16	2.07E-08	9.59E-03	6.30E-02
U-238	5,476,334	4.35E-18	8.85E-19	7.71E-19	2.38E-11	7.12E-05	7.26E-05
						Total:	**4.57E+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.

Radioactivity in Effluent Air
January 1, 2010 to June 30, 2010

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		**25.54 m^3/min**	**0.43 m^3/sec**				
Tc-99	6,657,214	6.64E-14	3.62E-14	4.83E-14	4.42E-07	2.62E-05	7.38E-05
Th-230	6,657,214	3.69E-19	7.48E-19	1.40E-18	2.46E-12	1.22E-10	1.84E-05
Th-231	6,657,214	8.48E-16	4.62E-16	6.17E-16	5.65E-09	1.06E-14	9.42E-08
U-234	6,657,214	8.24E-15	1.67E-14	3.13E-14	5.49E-08	8.79E-06	1.65E-01
U-235	6,657,214	1.38E-16	2.80E-16	5.25E-16	9.21E-10	4.26E-04	2.31E-03
U-238	6,657,214	1.59E-19	3.23E-19	6.04E-19	1.06E-12	3.17E-06	2.65E-06
						Total:	**1.67E-01**
Stack 501 Bldg. 510		**63.29 m^3/min**	**1.05 m^3/sec**				
Tc-99	16,403,639	2.91E-14	1.56E-14	2.06E-14	4.78E-07	2.83E-05	3.24E-05
Th-228	16,403,639	2.47E-16	1.66E-15	3.40E-15	4.06E-09	4.96E-12	1.24E-02
Th-230	16,403,639	2.78E-16	1.86E-15	3.82E-15	4.57E-09	2.26E-07	1.39E-02
Th-232	16,403,639	2.60E-16	1.74E-15	3.57E-15	4.26E-09	3.91E-02	6.49E-02
U-234	16,403,639	8.45E-16	5.66E-15	1.16E-14	1.39E-08	2.22E-06	1.69E-02
U-235	16,403,639	1.58E-16	1.06E-15	2.17E-15	2.59E-09	1.20E-03	2.63E-03
U-238	16,403,639	2.74E-16	1.84E-15	3.77E-15	4.50E-09	1.34E-02	4.57E-03
						Total:	**1.15E-01**
Stack 502 OCB		**205.54 m^3/min**	**3.43 m^3/sec**				
Tc-99	53,571,652	1.96E-14	6.59E-15	8.06E-15	1.05E-06	6.20E-05	2.17E-05
Th-228	53,571,652	5.48E-16	6.81E-16	1.29E-15	2.93E-08	3.58E-11	2.74E-02
Th-230	53,571,652	6.16E-16	7.66E-16	1.46E-15	3.30E-08	1.63E-06	3.08E-02
Th-232	53,571,652	5.75E-16	7.15E-16	1.36E-15	3.08E-08	2.83E-01	1.44E-01
U-234	53,571,652	1.87E-15	2.33E-15	4.42E-15	1.00E-07	1.61E-05	3.74E-02
U-235	53,571,652	3.50E-16	4.34E-16	8.26E-16	1.87E-08	8.67E-03	5.83E-03
U-238	53,571,652	6.07E-16	7.54E-16	1.43E-15	3.25E-08	9.71E-02	1.01E-02
						Total:	**2.55E-01**
Stack 503 EPB		**5.97 m^3/min**	**0.10 m^3/sec**				
Tc-99	1,565,890	2.10E-14	4.98E-15	4.14E-15	3.29E-08	1.95E-06	2.34E-05
Th-228	1,565,890	1.70E-16	3.70E-16	6.85E-16	2.66E-10	3.25E-13	8.49E-03
Th-230	1,565,890	1.91E-16	4.16E-16	7.71E-16	2.99E-10	1.48E-08	9.55E-03
Th-232	1,565,890	1.78E-16	3.89E-16	7.20E-16	2.79E-10	2.56E-03	4.46E-02
U-234	1,565,890	5.80E-16	1.26E-15	2.34E-15	9.09E-10	1.46E-07	1.16E-02
U-235	1,565,890	1.08E-16	2.36E-16	4.37E-16	1.70E-10	7.86E-05	1.81E-03
U-238	1,565,890	1.88E-16	4.10E-16	7.60E-16	2.95E-10	8.80E-04	3.14E-03
						Total:	**7.92E-02**
Stack 573 Bldg 306-W		**65.04 m^3/min**	**1.08 m^3/sec**				
Tc-99	16,953,017	2.79E-14	2.17E-14	3.26E-14	4.73E-07	2.80E-05	3.10E-05
Th-230	16,953,017	8.74E-20	4.33E-19	8.92E-19	1.48E-12	7.34E-11	4.37E-06
Th-231	16,953,017	3.56E-16	2.77E-16	4.16E-16	6.04E-09	1.13E-14	3.96E-08
U-234	16,953,017	1.95E-15	9.68E-15	1.99E-14	3.31E-08	5.31E-06	3.91E-02

[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.

Radioactivity in Effluent Air
January 1, 2010 to June 30, 2010

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 573 Bldg 306-W		**65.04 m^3/min**	**1.08 m^3/sec**				
U-235	16,953,017	3.28E-17	1.62E-16	3.34E-16	5.56E-10	2.57E-04	5.46E-04
U-238	16,953,017	3.78E-20	1.87E-19	3.85E-19	6.40E-13	1.91E-06	6.29E-07
						Total:	**3.96E-02**
Stack 600 Bldg. 110		**306.13 m^3/min**	**5.10 m^3/sec**				
Tc-99	79,790,626	9.75E-14	2.34E-14	3.06E-14	7.78E-06	4.60E-04	1.08E-04
Th-230	79,790,626	1.00E-18	5.31E-19	8.38E-19	8.00E-11	3.96E-09	5.01E-05
Th-231	79,790,626	1.24E-15	2.99E-16	3.90E-16	9.93E-08	1.87E-13	1.38E-07
U-234	79,790,626	2.24E-14	1.19E-14	1.87E-14	1.79E-06	2.86E-04	4.48E-01
U-235	79,790,626	3.76E-16	1.99E-16	3.14E-16	3.00E-08	1.39E-02	6.27E-03
U-238	79,790,626	4.33E-19	2.29E-19	3.62E-19	3.45E-11	1.03E-04	7.22E-06
						Total:	**4.54E-01**
Stack 615 Bldg. 306-W		**27.89 m^3/min**	**0.46 m^3/sec**				
Tc-99	7,269,796	2.85E-14	2.21E-14	3.32E-14	2.07E-07	1.22E-05	3.16E-05
Th-230	7,269,796	9.14E-20	4.43E-19	9.09E-19	6.65E-13	3.29E-11	4.57E-06
Th-231	7,269,796	3.63E-16	2.82E-16	4.24E-16	2.64E-09	4.96E-15	4.04E-08
U-234	7,269,796	2.04E-15	9.91E-15	2.03E-14	1.49E-08	2.38E-06	4.09E-02
U-235	7,269,796	3.43E-17	1.66E-16	3.41E-16	2.49E-10	1.15E-04	5.71E-04
U-238	7,269,796	3.95E-20	1.91E-19	3.92E-19	2.87E-13	8.57E-07	6.58E-07
						Total:	**4.15E-02**
Stack 646 Bldg. 110		**46.16 m^3/min**	**0.77 m^3/sec**				
Tc-99	12,030,221	5.44E-14	3.46E-14	4.89E-14	6.54E-07	3.87E-05	6.04E-05
Th-230	12,030,221	2.86E-19	7.04E-19	1.42E-18	3.43E-12	1.70E-10	1.43E-05
Th-231	12,030,221	6.94E-16	4.42E-16	6.25E-16	8.35E-09	1.57E-14	7.72E-08
U-234	12,030,221	6.38E-15	1.57E-14	3.17E-14	7.67E-08	1.23E-05	1.28E-01
U-235	12,030,221	1.07E-16	2.64E-16	5.32E-16	1.29E-09	5.96E-04	1.78E-03
U-238	12,030,221	1.23E-19	3.04E-19	6.12E-19	1.48E-12	4.43E-06	2.05E-06
						Total:	**1.29E-01**
Stack 649 Bldg. 330		**9.46 m^3/min**	**0.16 m^3/sec**				
Tc-99	2,466,148	9.24E-14	1.90E-14	2.72E-14	2.28E-07	1.35E-05	1.03E-04
Th-230	2,466,148	2.46E-19	3.68E-19	7.05E-19	6.06E-13	3.00E-11	1.23E-05
Th-231	2,466,148	1.18E-15	2.43E-16	3.48E-16	2.92E-09	5.48E-15	1.31E-07
U-234	2,466,148	5.50E-15	8.22E-15	1.57E-14	1.36E-08	2.17E-06	1.10E-01
U-235	2,466,148	9.25E-17	1.38E-16	2.65E-16	2.28E-10	1.06E-04	1.54E-03
U-238	2,466,148	1.06E-19	1.59E-19	3.04E-19	2.62E-13	7.82E-07	1.77E-06
						Total:	**1.12E-01**
Stack 701 Bldg. 307		**148.47 m^3/min**	**2.47 m^3/sec**				
Tc-99	38,695,981	4.37E-14	2.45E-14	3.33E-14	1.69E-06	1.00E-04	4.85E-05
Th-230	38,695,981	6.62E-19	6.03E-19	9.14E-19	2.56E-11	1.27E-09	3.31E-05
Th-231	38,695,981	5.58E-16	3.12E-16	4.25E-16	2.16E-08	4.06E-14	6.19E-08

[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.

Radioactivity in Effluent Air
January 1, 2010 to June 30, 2010

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 701 Bldg. 307		**148.47 m^3/min**	**2.47 m^3/sec**				
U-234	38,695,981	1.48E-14	1.35E-14	2.04E-14	5.73E-07	9.18E-05	2.96E-01
U-235	38,695,981	2.48E-16	2.26E-16	3.43E-16	9.61E-09	4.45E-03	4.14E-03
U-238	38,695,981	2.86E-19	2.60E-19	3.95E-19	1.11E-11	3.30E-05	4.77E-06
						Total:	**3.00E-01**
Stack 702 Bldg. 307		**149.34 m^3/min**	**2.49 m^3/sec**				
Tc-99	38,924,777	2.93E-14	2.20E-14	3.26E-14	1.14E-06	6.76E-05	3.26E-05
Th-230	38,924,777	1.80E-19	4.63E-19	8.92E-19	7.01E-12	3.47E-10	9.00E-06
Th-231	38,924,777	3.75E-16	2.81E-16	4.16E-16	1.46E-08	2.74E-14	4.16E-08
U-234	38,924,777	4.02E-15	1.03E-14	1.99E-14	1.57E-07	2.51E-05	8.05E-02
U-235	38,924,777	6.75E-17	1.74E-16	3.34E-16	2.63E-09	1.22E-03	1.13E-03
U-238	38,924,777	7.78E-20	2.00E-19	3.85E-19	3.03E-12	9.03E-06	1.30E-06
						Total:	**8.16E-02**
Stack 703 Exhaust Room Air		**739.74 m^3/min**	**12.33 m^3/sec**				
Tc-99	192,804,611	2.67E-14	2.00E-14	2.97E-14	5.16E-06	3.05E-04	2.97E-05
Th-228	192,804,611	3.79E-16	6.68E-16	1.22E-15	7.31E-08	8.92E-11	1.90E-02
Th-230	192,804,611	3.22E-16	5.68E-16	1.04E-15	6.21E-08	3.07E-06	1.61E-02
Th-232	192,804,611	3.59E-16	6.32E-16	1.15E-15	6.92E-08	6.35E-01	8.97E-02
U-234	192,804,611	3.85E-15	6.79E-15	1.24E-14	7.43E-07	1.19E-04	7.71E-02
U-235	192,804,611	5.30E-16	9.34E-16	1.70E-15	1.02E-07	4.73E-02	8.83E-03
U-238	192,804,611	2.05E-16	3.61E-16	6.60E-16	3.95E-08	1.18E-01	3.42E-03
						Total:	**2.14E-01**
Stack 704 Process Exhaust (H2)		**63.32 m^3/min**	**1.06 m^3/sec**				
Tc-99	16,502,806	3.32E-14	2.36E-14	3.45E-14	5.49E-07	3.25E-05	3.69E-05
Th-228	16,502,806	2.93E-16	7.44E-16	1.43E-15	4.84E-09	5.90E-12	1.47E-02
Th-230	16,502,806	2.49E-16	6.32E-16	1.22E-15	4.11E-09	2.03E-07	1.24E-02
Th-232	16,502,806	2.77E-16	7.04E-16	1.35E-15	4.58E-09	4.20E-02	6.93E-02
U-234	16,502,806	2.98E-15	7.56E-15	1.46E-14	4.92E-08	7.88E-06	5.96E-02
U-235	16,502,806	4.10E-16	1.04E-15	2.00E-15	6.76E-09	3.13E-03	6.83E-03
U-238	16,502,806	1.59E-16	4.02E-16	7.74E-16	2.62E-09	7.81E-03	2.64E-03
						Total:	**1.66E-01**
Stack 773 Bldg. 440		**175.57 m^3/min**	**2.93 m^3/sec**				
Tc-99	45,759,531	9.08E-14	4.59E-14	5.97E-14	4.16E-06	2.46E-04	1.01E-04
Th-228	45,759,531	7.52E-16	2.37E-15	4.67E-15	3.44E-08	4.20E-11	3.76E-02
Th-230	45,759,531	8.46E-16	2.67E-15	5.26E-15	3.87E-08	1.92E-06	4.23E-02
Th-232	45,759,531	7.90E-16	2.49E-15	4.91E-15	3.61E-08	3.32E-01	1.97E-01
U-234	45,759,531	2.57E-15	8.10E-15	1.60E-14	1.18E-07	1.89E-05	5.14E-02
U-235	45,759,531	4.80E-16	1.51E-15	2.98E-15	2.20E-08	1.02E-02	8.00E-03
U-238	45,759,531	8.34E-16	2.63E-15	5.18E-15	3.82E-08	1.14E-01	1.39E-02
						Total:	**3.51E-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.

Radioactivity in Effluent Air
January 1, 2010 to June 30, 2010

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		**351.24 m^3/min**		**5.85 m^3/sec**			
Th-230	91,547,769	3.04E-17	1.17E-17	2.13E-17	2.78E-09	1.38E-07	1.52E-03
U-234	91,547,769	9.90E-15	3.81E-15	6.93E-15	9.06E-07	1.45E-04	1.98E-01
U-235	91,547,769	1.89E-16	7.28E-17	1.33E-16	1.73E-08	8.02E-03	3.15E-03
						Total:	**2.03E-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.

21G-10-0165
GOV-01-55
ACF-10-0231

Attachment C
To Letter Dated August 18, 2010

Report of Gaseous Effluent Dose and Activity Concentrations for the Maximally Exposed Off-Site Individual for the Release Period January – June 2010

(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 2010

Introduction

During this biannual period, NRC License SNM-124, Part I, Section 5.1.1.3 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 5.1.1.4 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 twenty (20)[1] radiological stacks during the 1st half of 2010. 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 400 meters North Northeast from the center of the plant site. The TEDE to the MEI was estimated to be 2.1E-03 mrem for gaseous effluents released during the 1st half of 2010. The highest organ committed dose equivalent (CDE) to the MEI was estimated to be 2.0E-03 mrem to the spleen. These MEI doses are well below SNM-124 license action levels and applicable regulatory limits/ALARA constraints.

[1] Sampling of stack #234 was initiated to collect background data although operation of the facility is not expected until later in 2010.

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

Organ	Committed Dose Equivalent (mrem per 1st half of 2010)
Adrenals	2.6E-05
Bone Surface	8.8E-05
Breasts	4.1E-04
Stomach Wall	2.7E-05
Upper Large Intestine Wall	2.9E-05
Kidneys	2.6E-05
Lungs	1.1E-03
Ovaries	1.0E-04
Red Bone Marrow	6.9E-04
Spleen	2.0E-03
Thymus	5.3E-05
Uterus	6.1E-05
Bladder Wall	6.8E-04
Brain	2.8E-05
Esophagus	2.9E-05
Small Intestine Wall	2.6E-05
Lower Large Intestine Wall	4.3E-05
Liver	3.9E-05
Muscle	2.7E-05
Pancreas	3.2E-05
Skin	2.7E-05
Testes	5.2E-04
Thyroid	2.6E-05
Total Effective Dose Equivalent	**2.1E-03 mrem**
Location of MEI:	400 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 2.5E-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 large 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	2.1E-17	NNE	400	9.E-10	2.3E-08
^{228}Th	5.8E-20	NNE	350	2.E-14	2.9E-06
^{230}Th	5.8E-20	NNE	350	2.E-14	2.9E-06
^{231}Th	1.9E-19	NNE	350	9.E-09	2.1E-11
^{232}Th	5.7E-20	NNE	350	4.E-15	1.4E-05
^{234}U	1.1E-17	NNE	400	5.E-14	2.2E-04
^{235}U	2.7E-19	NNE	450	6.E-14	4.5E-06
^{238}U	5.3E-20	NNE	400	6.E-14	8.8E-07
^{238}Pu	7.4E-21	NNE	200	2.E-14	3.7E-07
^{239}Pu	6.2E-20	NNE	200	2.E-14	3.1E-06
^{240}Pu	2.2E-20	NNE	200	2.E-14	1.1E-06
^{241}Pu	1.1E-18	NNE	200	8.E-13	1.4E-06
^{241}Am	3.7E-20	NNE	200	2.E-14	1.9E-06
				Sum of Fractions:	**2.5E-04**