



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

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■ www.nuclearfuelservices.com

21G-11-0172
GOV-01-55
ACF-11-0264

August 29, 2011

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 2011

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 2011. Attachment B reports the Radioactivity in Effluent Air for the period January through June 2011. 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 2011.

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-11-0172) in any correspondence concerning this letter.

Sincerely,

NUCLEAR FUEL SERVICES, INC.

Mark P. Elliott
Quality, Safety, & Safeguards
Director

CJB/rmm

Attachments

- A- Report of Radioactivity in Effluent Liquid for the Period January - June 2011
- B- Report of Radioactivity in Effluent Air for the Period of January - June 2011
- C- Report of Gaseous Effluent Dose and Activity Concentrations for the Maximally Exposed Off-Site Individual for the Release Period January - June 2011

NIMSS01

xc: Mr. John Pelchat, Project Inspector
U. S. Nuclear Regulatory Commission
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245 Peachtree Center Ave., NE
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Atlanta, GA 30303-1257

Regional Administrator
U. S. Nuclear Regulatory Commission
Region II
245 Peachtree Center Ave., NE
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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

Attachment A
To Letter Dated August 29, 2011

Report of Radioactivity in Effluent Liquid for the Period
January – June 2011

(Two Pages to Follow)

Radioactivity in Effluent Liquid January 1, 2011 to June 30, 2011

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	1,093,287	1.72E-11	6.52E-11	1.46E-10	1.88E-08	1.10E-09	8.62E-05
Pu-239/240	1,093,287	1.67E-11	7.36E-11	1.82E-10	1.82E-08	2.93E-07	8.33E-05
Tc-99	1,093,287	0.00E+00	3.07E-08	5.38E-08	0.00E+00	0.00E+00	0.00E+00
Th-228	1,093,287	0.00E+00	1.05E-10	2.85E-10	0.00E+00	0.00E+00	0.00E+00
Th-230	1,093,287	1.55E-11	1.16E-10	2.41E-10	1.69E-08	8.38E-07	1.55E-05
Th-232	1,093,287	0.00E+00	9.72E-11	2.37E-10	0.00E+00	0.00E+00	0.00E+00
U-232	1,093,287	5.38E-11	1.05E-10	1.90E-10	5.88E-08	2.75E-09	8.96E-05
U-233/234	1,093,287	3.19E-10	1.99E-10	2.00E-10	3.49E-07	5.59E-05	1.06E-04
U-235/236	1,093,287	5.69E-11	8.62E-11	1.68E-10	6.22E-08	2.88E-02	1.90E-05
U-238	1,093,287	9.49E-11	1.09E-10	1.32E-10	1.04E-07	3.10E-01	3.16E-05
						Total:	4.31E-04
Sewer							
Pu-238	10,397,316	0.00E+00	6.94E-11	1.78E-10	0.00E+00	0.00E+00	0.00E+00
Pu-239/240	10,397,316	4.46E-11	7.83E-11	1.69E-10	4.63E-07	7.45E-06	2.23E-04
Tc-99	10,397,316	0.00E+00	3.55E-08	6.24E-08	0.00E+00	0.00E+00	0.00E+00
Th-228	10,397,316	3.51E-11	1.75E-10	3.92E-10	3.65E-07	4.46E-10	1.76E-05
Th-230	10,397,316	0.00E+00	1.36E-10	3.28E-10	0.00E+00	0.00E+00	0.00E+00
Th-232	10,397,316	0.00E+00	1.30E-10	2.56E-10	0.00E+00	0.00E+00	0.00E+00
U-232	10,397,316	7.65E-11	1.29E-10	1.74E-10	7.96E-07	3.72E-08	1.28E-04
U-233/234	10,397,316	1.54E-08	1.34E-09	2.15E-10	1.60E-04	2.57E-02	5.14E-03
U-235/236	10,397,316	6.81E-10	2.79E-10	1.46E-10	7.08E-06	3.28E+00	2.27E-04
U-238	10,397,316	2.71E-09	5.55E-10	1.18E-10	2.82E-05	8.41E+01	9.04E-04
						Total:	6.63E-03
WWTF							
Am-241	3,257,297	6.65E-11	9.20E-11	1.41E-10	2.16E-07	6.31E-08	3.32E-03
Cs-137	3,257,297	4.73E-10	1.01E-09	1.73E-09	1.54E-06	1.77E-08	4.73E-04
Na-22	3,257,297	2.34E-10	9.64E-10	1.64E-09	7.61E-07	1.22E-10	3.89E-05
Np-237	3,257,297	1.62E-11	8.40E-11	2.03E-10	5.29E-08	7.51E-05	8.12E-04
Pb-212	3,257,297	0.00E+00	3.26E-09	3.42E-09	0.00E+00	0.00E+00	0.00E+00
Pu-238	3,257,297	0.00E+00	5.10E-11	1.32E-10	0.00E+00	0.00E+00	0.00E+00
Pu-239/240	3,257,297	0.00E+00	4.11E-11	1.18E-10	0.00E+00	0.00E+00	0.00E+00
Pu-241	3,257,297	0.00E+00	7.05E-09	1.24E-08	0.00E+00	0.00E+00	0.00E+00
Ra-224	3,257,297	6.70E-09	2.66E-09	7.07E-09	2.18E-05	1.37E-10	3.35E-02
Tc-99	3,257,297	0.00E+00	7.67E-08	1.35E-07	0.00E+00	0.00E+00	0.00E+00
Th-228	3,257,297	6.12E-11	1.47E-10	3.01E-10	1.99E-07	2.43E-10	3.06E-04
Th-230	3,257,297	6.90E-12	1.07E-10	2.33E-10	2.25E-08	1.11E-06	6.90E-05
Th-231	3,257,297	1.82E-08	3.59E-08	4.58E-08	5.94E-05	1.12E-10	3.65E-04
Th-232	3,257,297	3.13E-11	1.05E-10	1.94E-10	1.02E-07	9.36E-01	1.04E-03
U-232	3,257,297	2.32E-11	1.18E-10	2.91E-10	7.54E-08	3.52E-09	3.86E-04
U-233/234	3,257,297	5.22E-08	2.51E-09	2.16E-10	1.70E-04	2.72E-02	1.74E-01

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, 2011 to June 30, 2011

Location	Total Volume (l)	Activity Concentration ($\mu\text{Ci/ml}$)	Error Estimate ($\mu\text{Ci/ml}$)	LLD ($\mu\text{Ci/ml}$)	Quantity Released (Ci)	Quantity Released (g)	Fraction of ECV ¹
WWTF							
U-235/236	3,257,297	2.90E-09	6.03E-10	1.70E-10	9.43E-06	4.37E+00	9.65E-03
U-238	3,257,297	8.23E-10	3.28E-10	1.74E-10	2.68E-06	8.00E+00	2.74E-03
						Total:	2.27E-01

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

21G-11-0172
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Attachment B
To Letter Dated August 29, 2011

Report of Radioactivity in Effluent Air for the Period
January - June 2011

(Four Pages to Follow)

Radioactivity in Effluent Air January 1, 2011 to June 30, 2011

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		1057.78 m³/min		17.63 m³/sec			
Th-228	281,604,427	4.53E-16	1.18E-16	9.70E-17	1.28E-07	1.56E-10	2.26E-02
Th-230	281,604,427	4.53E-16	1.18E-16	9.70E-17	1.28E-07	6.31E-06	2.26E-02
Th-232	281,604,427	4.53E-16	1.18E-16	9.70E-17	1.28E-07	1.17E+00	1.13E-01
U-234	281,604,427	1.07E-13	2.78E-14	2.29E-14	3.00E-05	4.81E-03	2.13E+00
U-235	281,604,427	4.08E-15	1.06E-15	8.73E-16	1.15E-06	5.31E-01	6.79E-02
U-238	281,604,427	1.13E-15	2.95E-16	2.43E-16	3.19E-07	9.52E-01	1.89E-02
						Total:	2.38E+00
Stack 185 Bldg. 131		102.54 m³/min		1.71 m³/sec			
Pu-241	27,315,408	0.00E+00	9.40E-16	1.83E-15	0.00E+00	0.00E+00	0.00E+00
Tc-99	27,315,408	0.00E+00	3.04E-14	5.91E-14	0.00E+00	0.00E+00	0.00E+00
U-234	27,315,408	1.12E-15	1.10E-14	2.47E-14	3.06E-08	4.91E-06	2.24E-02
U-235	27,315,408	3.47E-17	3.41E-16	7.63E-16	9.47E-10	4.38E-04	5.78E-04
						Total:	2.30E-02
Stack 234 Bldg. 234		374.42 m³/min		6.24 m³/sec			
Am-241	98,127,305	3.85E-17	4.70E-16	9.22E-16	3.78E-09	1.10E-09	1.93E-03
Pu-238	98,127,305	7.81E-18	9.52E-17	1.87E-16	7.67E-10	4.48E-11	3.91E-04
Pu-239	98,127,305	6.53E-17	7.96E-16	1.56E-15	6.41E-09	1.03E-07	3.27E-03
Pu-240	98,127,305	2.30E-17	2.81E-16	5.51E-16	2.26E-09	9.91E-09	1.15E-03
Pu-241	98,127,305	0.00E+00	4.63E-15	8.37E-15	0.00E+00	0.00E+00	0.00E+00
						Total:	6.74E-03
Stack 327 Bldg. 330		791.39 m³/min		13.19 m³/sec			
Pu-241	210,209,956	1.13E-15	7.11E-16	1.12E-15	2.37E-07	2.30E-09	1.41E-03
Tc-99	210,209,956	3.64E-14	2.30E-14	3.63E-14	7.65E-06	4.53E-04	4.04E-05
U-234	210,209,956	6.83E-14	1.33E-14	1.40E-14	1.44E-05	2.30E-03	1.37E+00
U-235	210,209,956	2.11E-15	4.12E-16	4.33E-16	4.44E-07	2.06E-01	3.52E-02
						Total:	1.40E+00
Stack 421 Bldg. 100		18.09 m³/min		0.30 m³/sec			
Pu-241	4,820,366	4.48E-15	1.69E-15	2.47E-15	2.16E-08	2.10E-10	5.60E-03
Tc-99	4,820,366	1.45E-13	5.46E-14	7.98E-14	6.98E-07	4.13E-05	1.61E-04
U-234	4,820,366	2.65E-13	4.54E-14	3.09E-14	1.28E-06	2.05E-04	5.30E+00
U-235	4,820,366	8.19E-15	1.40E-15	9.56E-16	3.95E-08	1.83E-02	1.37E-01
						Total:	5.44E+00
Stack 424 Bldg. 100		17.44 m³/min		0.29 m³/sec			
Pu-241	4,646,863	4.38E-16	9.88E-16	1.76E-15	2.03E-09	1.97E-11	5.47E-04
Tc-99	4,646,863	1.41E-14	3.20E-14	5.68E-14	6.57E-08	3.89E-06	1.57E-05
U-234	4,646,863	3.21E-15	1.14E-14	2.38E-14	1.49E-08	2.39E-06	6.43E-02
U-235	4,646,863	9.94E-17	3.53E-16	7.35E-16	4.62E-10	2.14E-04	1.66E-03
						Total:	6.65E-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.

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

Radioactivity in Effluent Air January 1, 2011 to June 30, 2011

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		62.10 m³/min		1.03 m³/sec			
Pu-241	16,185,445	3.12E-14	1.62E-14	2.06E-14	5.05E-07	4.91E-09	3.90E-02
Th-228	16,185,445	0.00E+00	1.90E-15	4.26E-15	0.00E+00	0.00E+00	0.00E+00
Th-230	16,185,445	0.00E+00	2.45E-15	5.48E-15	0.00E+00	0.00E+00	0.00E+00
Th-232	16,185,445	0.00E+00	1.63E-15	3.65E-15	0.00E+00	0.00E+00	0.00E+00
U-234	16,185,445	0.00E+00	5.03E-15	1.13E-14	0.00E+00	0.00E+00	0.00E+00
U-235	16,185,445	0.00E+00	8.84E-16	1.98E-15	0.00E+00	0.00E+00	0.00E+00
U-238	16,185,445	0.00E+00	1.77E-15	3.96E-15	0.00E+00	0.00E+00	0.00E+00
						Total:	3.90E-02
Stack 502 OCB		200.91 m³/min		3.35 m³/sec			
Pu-241	52,653,982	6.73E-15	3.42E-15	4.33E-15	3.55E-07	3.44E-09	8.42E-03
Th-228	52,653,982	0.00E+00	3.93E-16	8.70E-16	0.00E+00	0.00E+00	0.00E+00
Th-230	52,653,982	0.00E+00	5.06E-16	1.12E-15	0.00E+00	0.00E+00	0.00E+00
Th-232	52,653,982	0.00E+00	3.37E-16	7.45E-16	0.00E+00	0.00E+00	0.00E+00
U-234	52,653,982	0.00E+00	1.04E-15	2.30E-15	0.00E+00	0.00E+00	0.00E+00
U-235	52,653,982	0.00E+00	1.83E-16	4.04E-16	0.00E+00	0.00E+00	0.00E+00
U-238	52,653,982	0.00E+00	3.65E-16	8.08E-16	0.00E+00	0.00E+00	0.00E+00
						Total:	8.42E-03
Stack 573 Bldg 306-W		57.82 m³/min		0.96 m³/sec			
Pu-241	15,404,049	0.00E+00	9.10E-16	1.76E-15	0.00E+00	0.00E+00	0.00E+00
Tc-99	15,404,049	0.00E+00	2.94E-14	5.68E-14	0.00E+00	0.00E+00	0.00E+00
U-234	15,404,049	2.55E-16	1.03E-14	2.38E-14	3.93E-09	6.29E-07	5.10E-03
U-235	15,404,049	7.88E-18	3.18E-16	7.35E-16	1.21E-10	5.62E-05	1.31E-04
						Total:	5.23E-03
Stack 600 Bldg. 110		302.65 m³/min		5.04 m³/sec			
Pu-241	80,626,091	1.31E-14	8.77E-16	1.06E-15	1.06E-06	1.03E-08	1.64E-02
Tc-99	80,626,091	4.25E-13	2.83E-14	3.41E-14	3.42E-05	2.03E-03	4.72E-04
U-234	80,626,091	2.29E-13	1.63E-14	1.51E-14	1.85E-05	2.96E-03	4.59E+00
U-235	80,626,091	7.09E-15	5.05E-16	4.67E-16	5.72E-07	2.65E-01	1.18E-01
						Total:	4.72E+00
Stack 615 Bldg. 306-W		45.82 m³/min		0.76 m³/sec			
Pu-241	12,205,559	0.00E+00	8.87E-16	1.76E-15	0.00E+00	0.00E+00	0.00E+00
Tc-99	12,205,559	0.00E+00	2.87E-14	5.69E-14	0.00E+00	0.00E+00	0.00E+00
U-234	12,205,559	4.32E-16	1.02E-14	2.38E-14	5.27E-09	8.45E-07	8.64E-03
U-235	12,205,559	1.34E-17	3.17E-16	7.36E-16	1.63E-10	7.55E-05	2.23E-04
						Total:	8.86E-03
Stack 646 Bldg. 110		53.12 m³/min		0.89 m³/sec			
Pu-241	14,151,810	0.00E+00	9.10E-16	1.76E-15	0.00E+00	0.00E+00	0.00E+00
Tc-99	14,151,810	0.00E+00	2.94E-14	5.68E-14	0.00E+00	0.00E+00	0.00E+00
U-234	14,151,810	0.00E+00	9.81E-15	2.38E-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, 2011 to June 30, 2011

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		53.12 m³/min		0.89 m³/sec			
U-235	14,151,810	0.00E+00	3.03E-16	7.35E-16	0.00E+00	0.00E+00	0.00E+00
						Total:	0.00E+00
Stack 649 Bldg. 330		10.16 m³/min		0.17 m³/sec			
Pu-241	2,707,748	8.09E-16	6.31E-16	1.10E-15	2.19E-09	2.13E-11	1.01E-03
Tc-99	2,707,748	2.62E-14	2.04E-14	3.55E-14	7.08E-08	4.19E-06	2.91E-05
U-234	2,707,748	6.40E-15	7.51E-15	1.45E-14	1.73E-08	2.78E-06	1.28E-01
U-235	2,707,748	1.98E-16	2.32E-16	4.48E-16	5.36E-10	2.48E-04	3.30E-03
						Total:	1.32E-01
Stack 701 Bldg. 307		135.35 m³/min		2.26 m³/sec			
Pu-241	36,058,450	1.03E-15	1.07E-15	1.76E-15	3.71E-08	3.60E-10	1.29E-03
Tc-99	36,058,450	3.33E-14	3.46E-14	5.68E-14	1.20E-06	7.10E-05	3.70E-05
U-234	36,058,450	3.66E-14	2.03E-14	2.38E-14	1.32E-06	2.12E-04	7.32E-01
U-235	36,058,450	1.13E-15	6.28E-16	7.35E-16	4.08E-08	1.89E-02	1.89E-02
						Total:	7.52E-01
Stack 702 Bldg. 307		144.95 m³/min		2.42 m³/sec			
Pu-241	38,615,734	0.00E+00	9.22E-16	1.81E-15	0.00E+00	0.00E+00	0.00E+00
Tc-99	38,615,734	0.00E+00	2.98E-14	5.86E-14	0.00E+00	0.00E+00	0.00E+00
U-234	38,615,734	1.18E-15	1.09E-14	2.45E-14	4.55E-08	7.29E-06	2.36E-02
U-235	38,615,734	3.64E-17	3.37E-16	7.58E-16	1.41E-09	6.52E-04	6.07E-04
						Total:	2.42E-02
Stack 703 Exhaust Room Air		760.11 m³/min		12.67 m³/sec			
Pu-241	202,494,601	0.00E+00	2.65E-14	5.20E-14	0.00E+00	0.00E+00	0.00E+00
Th-228	202,494,601	3.63E-16	1.03E-15	2.16E-15	7.34E-08	8.97E-11	1.81E-02
Th-230	202,494,601	2.09E-16	5.94E-16	1.24E-15	4.23E-08	2.09E-06	1.04E-02
Th-232	202,494,601	2.97E-16	8.44E-16	1.76E-15	6.01E-08	5.51E-01	7.42E-02
U-234	202,494,601	2.27E-15	6.46E-15	1.35E-14	4.60E-07	7.37E-05	4.54E-02
U-235	202,494,601	2.34E-16	6.67E-16	1.39E-15	4.75E-08	2.20E-02	3.91E-03
U-238	202,494,601	2.86E-16	8.13E-16	1.70E-15	5.78E-08	1.73E-01	4.76E-03
						Total:	1.57E-01
Stack 704 Process Exhaust (H2)		51.51 m³/min		0.86 m³/sec			
Pu-241	13,721,824	0.00E+00	3.02E-14	5.86E-14	0.00E+00	0.00E+00	0.00E+00
Th-228	13,721,824	2.50E-16	1.12E-15	2.43E-15	3.43E-09	4.19E-12	1.25E-02
Th-230	13,721,824	1.44E-16	6.44E-16	1.40E-15	1.98E-09	9.79E-08	7.21E-03
Th-232	13,721,824	2.05E-16	9.16E-16	1.98E-15	2.81E-09	2.58E-02	5.12E-02
U-234	13,721,824	1.57E-15	7.01E-15	1.52E-14	2.15E-08	3.45E-06	3.14E-02
U-235	13,721,824	1.62E-16	7.23E-16	1.57E-15	2.22E-09	1.03E-03	2.70E-03
U-238	13,721,824	1.97E-16	8.82E-16	1.91E-15	2.71E-09	8.08E-03	3.29E-03
						Total:	1.08E-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, 2011 to June 30, 2011

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 773 Bldg. 440		173.87 m³/min		2.90 m³/sec			
Pu-241	46,319,145	5.28E-15	3.85E-14	7.17E-14	2.45E-07	2.38E-09	6.60E-03
Th-228	46,319,145	2.96E-16	1.91E-15	4.19E-15	1.37E-08	1.68E-11	1.48E-02
Th-230	46,319,145	3.81E-16	2.46E-15	5.39E-15	1.76E-08	8.73E-07	1.90E-02
Th-232	46,319,145	2.54E-16	1.64E-15	3.59E-15	1.18E-08	1.08E-01	6.35E-02
U-234	46,319,145	7.83E-16	5.06E-15	1.11E-14	3.63E-08	5.81E-06	1.57E-02
U-235	46,319,145	1.38E-16	8.88E-16	1.95E-15	6.37E-09	2.95E-03	2.29E-03
U-238	46,319,145	2.75E-16	1.78E-15	3.89E-15	1.27E-08	3.80E-02	4.58E-03
						Total:	1.26E-01
Stack 774 Bldg. 301		340.43 m³/min		5.67 m³/sec			
Pu-241	90,689,265	2.12E-14	2.43E-14	4.27E-14	1.92E-06	1.86E-08	2.65E-02
Th-228	90,689,265	1.89E-15	4.70E-16	6.61E-16	1.72E-07	2.10E-10	9.47E-02
Th-230	90,689,265	1.50E-15	3.71E-16	5.22E-16	1.36E-07	6.71E-06	7.48E-02
Th-232	90,689,265	1.64E-15	4.09E-16	5.74E-16	1.49E-07	1.37E+00	4.11E-01
U-234	90,689,265	4.10E-14	1.02E-14	1.43E-14	3.72E-06	5.96E-04	8.20E-01
U-235	90,689,265	1.74E-15	4.33E-16	6.08E-16	1.58E-07	7.32E-02	2.91E-02
U-238	90,689,265	2.04E-15	5.08E-16	7.13E-16	1.85E-07	5.53E-01	3.41E-02
						Total:	1.49E+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.

21G-11-0172
GOV-01-55
ACF-11-0264

Attachment C
To Letter Dated August 29, 2011

Report of Gaseous Effluent Dose and Activity Concentrations
for the Maximally Exposed
Off-Site Individual for the Release Period
January – June 2011

(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 2011

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 nineteen (19) radiological stacks during the 1st half of 2011. 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 2.6E-03 mrem for gaseous effluents released during the 1st half of 2011. The highest organ committed dose equivalent (CDE) to the MEI was estimated to be 1.0E-03 mrem to the lungs. These MEI doses are well below SNM-124 license 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 2011)
Adrenals	8.6E-06
Bone Surface	3.2E-04
Breasts	8.6E-06
Stomach Wall	3.5E-04
Upper Large Intestine Wall	2.2E-04
Kidneys	2.9E-05
Lungs	1.0E-03
Ovaries	1.1E-05
Red Bone Marrow	2.1E-05
Spleen	8.6E-06
Thymus	8.6E-06
Uterus	8.6E-06
Bladder Wall	2.8E-05
Brain	8.6E-06
Esophagus	4.6E-04
Small Intestine Wall	3.2E-05
Lower Large Intestine Wall	6.3E-04
Liver	2.7E-05
Muscle	8.6E-06
Pancreas	8.6E-06
Skin	8.8E-06
Testes	1.1E-05
Thyroid	1.6E-04
Total Effective Dose Equivalent	2.6E-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 3.6E-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	1.6E-17	NNE	350	9.E-10	1.8E-08
²²⁸ Th	8.0E-20	NNE	500	2.E-14	4.0E-06
²³⁰ Th	6.3E-20	NNE	500	2.E-14	3.2E-06
²³² Th	7.0E-20	NNE	500	4.E-15	1.7E-05
²³⁴ U	1.6E-17	NNE	450	5.E-14	3.2E-04
²³⁵ U	5.4E-19	NNE	450	6.E-14	9.1E-06
²³⁸ U	9.7E-20	NNE	550	6.E-14	1.6E-06
²³⁸ Pu	6.9E-22	NNE	250	2.E-14	3.5E-08
²³⁹ Pu	5.8E-21	NNE	250	2.E-14	2.9E-07
²⁴⁰ Pu	2.0E-21	NNE	250	2.E-14	1.0E-07
²⁴¹ Pu	1.5E-18	NNE	400	8.E-13	1.8E-06
²⁴¹ Am	3.4E-21	NNE	250	2.E-14	1.7E-07
Sum of Fractions:					3.6E-04