Designated Original

Nuclear Fuel Services, Inc.
1205 Banner Hill Road
Erwin, TN 37650
(423) 743-9141

Airborne Express
Airbill # 4596441684

21G-04-0036
GOV-01-55
ACF-04-0053

February 27, 2004

Mr. Luis A. Reyes, Regional Administrator
U. S. Nuclear Regulatory Commission
Region II, Atlanta Federal Center
61 Forsyth Street, SW, Suite 23T85
Atlanta, GA 30303

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

Subject: **Biannual Effluent Monitoring Report July through December 2003**

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 July through December 2003. Attachment B reports the Radioactivity in Effluent Air for the period July through December 2003. 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 July through December 2003.

If you or your staff have any questions, require additional information, or wish to discuss this, please contact me or Ms. Janice Greene, Environmental Safety Manager, at (423) 743-1730. Please reference our unique document identification number (21G-04-0036) in any correspondence concerning this letter.

Sincerely,

NUCLEAR FUEL SERVICES, INC.

B. Marie Moore

B. Marie Moore
Vice President
Safety and Regulatory

IE17

BPG/rrm

Attachments

xc: Mr. William Gloersen, Project Inspector
U. S. Nuclear Regulatory Commission
Region II, Atlanta Federal Center
61 Forsyth Street, SW
Suite 23T85
Atlanta, GA 30303

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

Mr. Gary Janosko, Chief
Fuel Cycle Facilities Branch
Division of Fuel Cycle Safety and Safeguards
Office of Nuclear Material Safety & Safeguards
U. S. Nuclear Regulatory Commission
Washington, DC 20555-0001

Mr. Mark G. Poirier, Account Engineer
American Nuclear Insurers
Town Center, Suite 300 S, 29 South Main Street
West Hartford, CT 06107-2430

Mr. Daniel Rich
Senior Resident Inspector
U. S. Nuclear Regulatory Commission

B. M. Moore to Mr. Luis Reyes (NRC)
February 27, 2004

21G-04-0036
GOV-01-55
ACF-04-0053

Attachment A
To Letter Dated February 27, 2004
B. M. Moore to Mr. Luis A. Reyes (NRC)

Report of Radioactivity in Effluent Liquid for the Period
July – December 2003

(One Page to Follow)

Radioactivity in Effluent Liquid
July 1, 2003 to December 31, 2003

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	505,542,544	2.67E-12	4.42E-10	1.19E-10	1.35E-06	7.90E-08	1.34E-04
Pu-239/240	505,542,544	8.65E-11	8.64E-11	1.45E-10	4.38E-05	7.03E-04	4.33E-03
Tc-99	505,542,544	-3.94E-09	1.13E-08	2.43E-08	-1.99E-03	-1.18E-01	-6.57E-05
Th-228	505,542,544	4.82E-11	1.03E-10	2.34E-10	2.44E-05	2.98E-08	2.41E-04
Th-230	505,542,544	3.22E-10	1.57E-10	1.75E-10	1.63E-04	8.05E-03	3.22E-03
Th-232	505,542,544	7.65E-11	8.49E-11	1.42E-10	3.87E-05	3.55E+02	2.55E-03
U-234	505,542,544	6.08E-09	1.07E-09	1.47E-10	3.07E-03	4.92E-01	2.03E-02
U-235/236	505,542,544	4.53E-10	1.96E-10	1.53E-10	2.29E-04	1.06E+02	1.51E-03
U-238	505,542,544	8.74E-10	2.82E-10	1.39E-10	4.42E-04	1.32E+03	2.91E-03
						Total:	**3.51E-02**
Sewer							
Pu-238	44,403,429	-2.23E-12	4.83E-11	1.60E-10	-9.88E-08	-5.78E-09	-1.11E-05
Pu-239/240	44,403,429	5.09E-11	9.08E-11	2.27E-10	2.26E-06	3.64E-05	2.55E-04
Tc-99	44,403,429	1.43E-08	1.27E-08	2.42E-08	6.35E-04	3.76E-02	2.38E-05
Th-228	44,403,429	1.60E-10	1.97E-10	3.75E-10	7.08E-06	8.65E-09	7.98E-05
Th-230	44,403,429	3.95E-10	2.23E-10	2.30E-10	1.76E-05	8.69E-04	3.95E-04
Th-232	44,403,429	8.15E-11	1.05E-10	1.67E-10	3.62E-06	3.32E+01	2.72E-04
U-234	44,403,429	1.64E-08	2.23E-09	3.45E-10	7.28E-04	1.17E-01	5.47E-03
U-235/236	44,403,429	1.36E-09	4.62E-10	3.44E-10	6.04E-05	2.80E+01	4.53E-04
U-238	44,403,429	2.08E-09	5.70E-10	2.84E-10	9.23E-05	2.76E+02	6.93E-04
						Total:	**7.63E-03**
WWTF							
Cs-137	3,929,760	4.18E-08	6.50E-09	3.35E-09	1.64E-04	1.89E-06	4.18E-02
Na-22	3,929,760	8.40E-10	1.96E-09	3.40E-09	3.30E-06	5.29E-10	1.40E-04
Pu-238	3,929,760	-7.51E-12	4.11E-10	3.44E-10	-2.95E-08	-1.73E-09	-3.76E-04
Pu-239/240	3,929,760	1.28E-11	7.42E-11	2.42E-10	5.01E-08	8.06E-07	6.38E-04
Ra-224	3,929,760	2.79E-08	2.09E-08	3.56E-08	1.10E-04	6.90E-10	1.39E-01
Tc-99	3,929,760	1.90E-08	1.56E-08	2.80E-08	7.46E-05	4.41E-03	3.16E-04
Th-228	3,929,760	1.68E-10	3.70E-10	5.33E-10	6.61E-07	8.07E-10	8.41E-04
Th-230	3,929,760	8.57E-10	3.81E-10	3.58E-10	3.37E-06	1.67E-04	8.57E-03
Th-232	3,929,760	1.03E-10	1.46E-10	2.16E-10	4.03E-07	3.70E+00	3.42E-03
U-234	3,929,760	1.10E-07	9.63E-09	4.65E-10	4.30E-04	6.90E-02	3.65E-01
U-235/236	3,929,760	6.12E-09	1.16E-09	3.99E-10	2.40E-05	1.11E+01	2.04E-02
U-238	3,929,760	1.09E-09	4.87E-10	3.62E-10	4.27E-06	1.27E+01	3.62E-03
						Total:	**5.84E-01**

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

B. M. Moore to Mr. Luis Reyes (NRC)
February 27, 2004

21G-04-0036
GOV-01-55
ACF-04-0053

Attachment B
To Letter Dated February 27, 2004
B. M. Moore to Mr. Luis A. Reyes (NRC)

Report of Radioactivity in Effluent Air for the Period
July – December 2003

(Four Pages to Follow)

Radioactivity in Effluent Air
July 1, 2003 to December 31, 2003

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		**946.27 m^3/min**	**15.77 m^3/sec**				
Tc-99	238,431,782	2.01E-13	2.56E-14	3.16E-14	4.79E-05	2.84E-03	2.23E-04
Th-230	238,431,782	8.15E-18	1.12E-18	1.13E-18	1.94E-09	9.62E-08	4.07E-04
Th-231	238,431,782	2.57E-15	3.28E-16	4.05E-16	6.14E-07	1.15E-12	2.86E-07
U-234	238,431,782	1.82E-13	2.50E-14	2.53E-14	4.34E-05	6.96E-03	3.64E+00
U-235	238,431,782	3.07E-15	4.22E-16	4.25E-16	7.31E-07	3.38E-01	5.11E-02
U-238	238,431,782	3.52E-18	4.84E-19	4.88E-19	8.39E-10	2.50E-03	5.86E-05
						Total:	**3.69E+00**
Stack 185 Bldg. 131		**91.21 m^3/min**	**1.52 m^3/sec**				
Tc-99	23,641,670	9.61E-14	3.08E-14	4.15E-14	2.27E-06	1.34E-04	1.07E-04
Th-230	23,641,670	5.06E-19	7.75E-19	1.48E-18	1.20E-11	5.93E-10	2.53E-05
Th-231	23,641,670	1.23E-15	3.94E-16	5.31E-16	2.91E-08	5.47E-14	1.37E-07
U-234	23,641,670	1.13E-14	1.73E-14	3.30E-14	2.68E-07	4.29E-05	2.26E-01
U-235	23,641,670	1.90E-16	2.92E-16	5.55E-16	4.50E-09	2.08E-03	3.17E-03
U-238	23,641,670	2.19E-19	3.35E-19	6.37E-19	5.17E-12	1.54E-05	3.64E-06
						Total:	**2.30E-01**
Stack 234 Bldg. 234		**253.42 m^3/min**	**4.22 m^3/sec**				
Am-241	22,989,984	-1.12E-16	4.43E-16	9.30E-16	-2.58E-09	-7.51E-10	-5.60E-03
Pu-238	22,989,984	-2.27E-17	8.96E-17	1.88E-16	-5.21E-10	-3.05E-11	-1.13E-03
Pu-239	22,989,984	-1.90E-16	7.49E-16	1.57E-15	-4.36E-09	-7.01E-08	-9.48E-03
Pu-240	22,989,984	-6.67E-17	2.64E-16	5.54E-16	-1.53E-09	-6.73E-09	-3.34E-03
Pu-241	22,989,984	-1.08E-15	2.82E-15	5.17E-15	-2.48E-08	-2.40E-10	-1.35E-03
						Total:	**-2.09E-02**
Stack 332 Bldg. 120		**47.03 m^3/min**	**0.78 m^3/sec**				
Tc-99	12,325,482	3.79E-14	2.78E-14	4.13E-14	4.67E-07	2.77E-05	4.21E-05
Th-230	12,325,482	3.15E-19	7.28E-19	1.46E-18	3.88E-12	1.92E-10	1.57E-05
Th-231	12,325,482	4.86E-16	3.56E-16	5.29E-16	5.99E-09	1.13E-14	5.40E-08
U-234	12,325,482	7.03E-15	1.63E-14	3.27E-14	8.67E-08	1.39E-05	1.41E-01
U-235	12,325,482	1.18E-16	2.74E-16	5.50E-16	1.46E-09	6.75E-04	1.97E-03
U-238	12,325,482	1.36E-19	3.14E-19	6.31E-19	1.67E-12	5.00E-06	2.26E-06
						Total:	**1.43E-01**
Stack 376 Bldg. 301		**173.74 m^3/min**	**2.90 m^3/sec**				
Tc-99	45,554,427	1.81E-14	1.66E-14	2.94E-14	8.25E-07	4.88E-05	2.01E-05
Th-230	45,554,427	2.31E-19	4.80E-19	1.04E-18	1.05E-11	5.20E-10	1.15E-05
Th-231	45,554,427	2.32E-16	2.12E-16	3.76E-16	1.06E-08	1.99E-14	2.58E-08
U-234	45,554,427	5.15E-15	1.07E-14	2.33E-14	2.35E-07	3.76E-05	1.03E-01
U-235	45,554,427	8.67E-17	1.81E-16	3.92E-16	3.95E-09	1.83E-03	1.45E-03
U-238	45,554,427	9.96E-20	2.07E-19	4.50E-19	4.54E-12	1.35E-05	1.66E-06
						Total:	**1.05E-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
July 1, 2003 to December 31, 2003

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 421 Bldg. 100		**25.81 m^3/min**		**0.43 m^3/sec**			
Tc-99	6,698,276	5.57E-14	2.06E-14	3.05E-14	3.73E-07	2.21E-05	6.19E-05
Th-230	6,698,276	3.89E-18	9.65E-19	1.08E-18	2.61E-11	1.29E-09	1.95E-04
Th-231	6,698,276	7.13E-16	2.64E-16	3.91E-16	4.78E-09	8.98E-15	7.92E-08
U-234	6,698,276	8.70E-14	2.16E-14	2.42E-14	5.83E-07	9.34E-05	1.74E+00
U-235	6,698,276	1.46E-15	3.63E-16	4.08E-16	9.81E-09	4.54E-03	2.44E-02
U-238	6,698,276	1.68E-18	4.17E-19	4.68E-19	1.13E-11	3.36E-05	2.80E-05
						Total:	**1.77E+00**
Stack 424 Bldg. 100		**33.36 m^3/min**		**0.56 m^3/sec**			
Tc-99	912,654	3.64E-14	1.69E-14	2.05E-14	3.32E-08	1.96E-06	4.04E-05
Th-230	912,654	3.00E-19	4.82E-19	8.96E-19	2.74E-13	1.36E-11	1.50E-05
Th-231	912,654	4.66E-16	2.17E-16	2.63E-16	4.25E-10	8.00E-16	5.18E-08
U-234	912,654	6.71E-15	1.08E-14	2.00E-14	6.13E-09	9.82E-07	1.34E-01
U-235	912,654	1.13E-16	1.81E-16	3.37E-16	1.03E-10	4.77E-05	1.88E-03
U-238	912,654	1.30E-19	2.08E-19	3.87E-19	1.18E-13	3.53E-07	2.16E-06
						Total:	**1.36E-01**
Stack 501 Bldg. 510		**62.35 m^3/min**		**1.04 m^3/sec**			
Actinium-227	14,545,872	4.29E-18	1.89E-18	2.38E-18	6.23E-11	8.53E-14	4.29E-03
Lead-212	14,545,872	2.84E-14	1.25E-14	1.58E-14	4.13E-07	2.99E-13	5.68E-04
Pu-241	14,545,872	5.61E-15	2.47E-15	3.12E-15	8.16E-08	7.92E-10	7.01E-03
U-232	14,545,872	2.89E-17	2.65E-17	3.80E-17	4.20E-10	1.96E-11	2.89E-03
U-233	14,545,872	2.74E-17	2.52E-17	3.61E-17	3.99E-10	4.13E-08	5.48E-04
U-234	14,545,872	5.74E-15	5.28E-15	7.56E-15	8.35E-08	1.34E-05	1.15E-01
U-235	14,545,872	9.50E-17	8.74E-17	1.25E-16	1.38E-09	6.40E-04	1.58E-03
U-236	14,545,872	1.24E-15	1.14E-15	1.63E-15	1.80E-08	2.78E-04	2.06E-02
U-238	14,545,872	2.75E-16	2.53E-16	3.63E-16	4.01E-09	1.20E-02	4.59E-03
						Total:	**1.57E-01**
Stack 547 Bldg. 100		**48.63 m^3/min**		**0.81 m^3/sec**			
Tc-99	11,134,081	2.81E-14	2.72E-14	4.31E-14	3.13E-07	1.85E-05	3.12E-05
Th-230	11,134,081	1.52E-19	6.95E-19	1.50E-18	1.69E-12	8.35E-11	7.58E-06
Th-231	11,134,081	3.60E-16	3.48E-16	5.52E-16	4.01E-09	7.54E-15	4.00E-08
U-234	11,134,081	3.39E-15	1.55E-14	3.34E-14	3.77E-08	6.04E-06	6.77E-02
U-235	11,134,081	5.70E-17	2.61E-16	5.63E-16	6.35E-10	2.94E-04	9.50E-04
U-238	11,134,081	6.54E-20	3.00E-19	6.46E-19	7.29E-13	2.17E-06	1.09E-06
						Total:	**6.87E-02**
Stack 573 Bldg 306-W		**85.29 m^3/min**		**1.42 m^3/sec**			
Tc-99	21,198,723	1.52E-14	1.67E-14	3.00E-14	3.22E-07	1.90E-05	1.69E-05
Th-230	21,198,723	3.67E-19	5.21E-19	1.07E-18	7.79E-12	3.86E-10	1.84E-05
Th-231	21,198,723	1.95E-16	2.14E-16	3.84E-16	4.12E-09	7.75E-15	2.16E-08
U-234	21,198,723	8.21E-15	1.16E-14	2.40E-14	1.74E-07	2.79E-05	1.64E-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
July 1, 2003 to December 31, 2003

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		**85.29 m^3/min**	**1.42 m^3/sec**				
U-235	21,198,723	1.38E-16	1.96E-16	4.03E-16	2.93E-09	1.36E-03	2.30E-03
U-238	21,198,723	1.59E-19	2.25E-19	4.63E-19	3.36E-12	1.00E-05	2.64E-06
						Total:	**1.67E-01**
Stack 600 Bldg. 110		**284.23 m^3/min**	**4.74 m^3/sec**				
Tc-99	70,814,629	9.59E-14	2.23E-14	3.01E-14	6.79E-06	4.02E-04	1.07E-04
Th-230	70,814,629	8.10E-18	1.02E-18	1.07E-18	5.74E-10	2.84E-08	4.05E-04
Th-231	70,814,629	1.23E-15	2.85E-16	3.86E-16	8.70E-08	1.63E-13	1.36E-07
U-234	70,814,629	1.81E-13	2.28E-14	2.39E-14	1.28E-05	2.05E-03	3.62E+00
U-235	70,814,629	3.05E-15	3.83E-16	4.03E-16	2.16E-07	9.99E-02	5.08E-02
U-238	70,814,629	3.50E-18	4.40E-19	4.63E-19	2.48E-10	7.39E-04	5.83E-05
						Total:	**3.67E+00**
Stack 615 Bldg. 306-W		**27.22 m^3/min**	**0.45 m^3/sec**				
Tc-99	6,789,778	1.30E-14	1.65E-14	3.01E-14	8.85E-08	5.24E-06	1.45E-05
Th-230	6,789,778	1.91E-19	4.83E-19	1.07E-18	1.29E-12	6.41E-11	9.53E-06
Th-231	12,276,754	1.90E-16	2.10E-16	3.79E-16	2.33E-09	4.39E-15	2.11E-08
U-234	6,789,778	4.26E-15	1.08E-14	2.38E-14	2.89E-08	4.64E-06	8.52E-02
U-235	6,789,778	7.17E-17	1.82E-16	4.01E-16	4.87E-10	2.25E-04	1.20E-03
U-238	6,789,778	8.23E-20	2.09E-19	4.61E-19	5.59E-13	1.67E-06	1.37E-06
						Total:	**8.64E-02**
Stack 646 Bldg. 110		**66.71 m^3/min**	**1.11 m^3/sec**				
Tc-99	17,485,188	8.08E-15	2.02E-14	3.82E-14	1.41E-07	8.36E-06	8.97E-06
Th-230	17,485,188	5.33E-19	6.75E-19	1.36E-18	9.32E-12	4.61E-10	2.66E-05
Th-231	17,485,188	1.03E-16	2.59E-16	4.89E-16	1.81E-09	3.40E-15	1.15E-08
U-234	17,485,188	1.19E-14	1.51E-14	3.05E-14	2.08E-07	3.34E-05	2.38E-01
U-235	17,485,188	2.00E-16	2.54E-16	5.13E-16	3.50E-09	1.62E-03	3.34E-03
U-238	17,485,188	2.30E-19	2.92E-19	5.89E-19	4.02E-12	1.20E-05	3.83E-06
						Total:	**2.42E-01**
Stack 649 Bldg. 330		**6.48 m^3/min**	**0.11 m^3/sec**				
Tc-99	1,699,473	2.81E-14	1.77E-14	2.99E-14	4.77E-08	2.82E-06	3.12E-05
Th-230	1,699,473	7.78E-19	5.54E-19	1.06E-18	1.32E-12	6.55E-11	3.89E-05
Th-231	1,699,473	3.60E-16	2.27E-16	3.83E-16	6.11E-10	1.15E-15	4.00E-08
U-234	1,699,473	1.74E-14	1.24E-14	2.38E-14	2.96E-08	4.74E-06	3.48E-01
U-235	1,699,473	2.93E-16	2.09E-16	4.00E-16	4.97E-10	2.30E-04	4.88E-03
U-238	1,699,473	3.36E-19	2.39E-19	4.60E-19	5.71E-13	1.70E-06	5.60E-06
						Total:	**3.53E-01**
Stack 701 Bldg. 307		**162.79 m^3/min**	**2.71 m^3/sec**				
Tc-99	23,207,851	2.66E-14	2.43E-14	3.74E-14	6.17E-07	3.65E-05	2.96E-05
Th-230	23,207,851	1.19E-19	6.51E-19	1.44E-18	2.76E-12	1.37E-10	5.95E-06
Th-231	23,207,851	3.41E-16	3.11E-16	4.79E-16	7.91E-09	1.49E-14	3.79E-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
July 1, 2003 to December 31, 2003

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		**162.79 m^3/min**	**2.71 m^3/sec**				
U-234	23,207,851	2.66E-15	1.45E-14	3.21E-14	6.17E-08	9.89E-06	5.32E-02
U-235	23,207,851	4.47E-17	2.45E-16	5.41E-16	1.04E-09	4.81E-04	7.46E-04
U-238	23,207,851	5.14E-20	2.81E-19	6.21E-19	1.19E-12	3.56E-06	8.56E-07
						Total:	**5.39E-02**
Stack 702 Bldg. 307		**164.66 m^3/min**	**2.74 m^3/sec**				
Tc-99	23,474,284	2.52E-14	2.41E-14	3.76E-14	5.91E-07	3.50E-05	2.80E-05
Th-230	23,474,284	1.27E-19	6.60E-19	1.44E-18	2.97E-12	1.47E-10	6.33E-06
Th-231	23,474,284	3.23E-16	3.08E-16	4.81E-16	7.57E-09	1.42E-14	3.58E-08
U-234	23,474,284	2.83E-15	1.47E-14	3.22E-14	6.64E-08	1.06E-05	5.66E-02
U-235	23,474,284	4.76E-17	2.48E-16	5.42E-16	1.12E-09	5.17E-04	7.93E-04
U-238	23,474,284	5.46E-20	2.85E-19	6.23E-19	1.28E-12	3.83E-06	9.11E-07
						Total:	**5.74E-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.

B. M. Moore to Mr. Luis Reyes (NRC)
February 27, 2004

21G-04-0036
GOV-01-55
ACF-04-0053

Attachment C
To Letter Dated February 27, 2004
B. M. Moore to Mr. Luis A. Reyes (NRC)

Report of Gaseous Effluent Dose and Activity Concentrations
for the Maximally Exposed
Off-Site Individual for the Release Period
July – December 2003

(Three Pages to Follow)

B. M. Moore to Mr. Luis Reyes (NRC)
February 27, 2004

21G-04-0036
GOV-01-55
ACF-04-0053

Report of Potential Gaseous Effluent Dose to the Maximally Exposed Offsite Individual and on the Maximum Radionuclide Concentrations for the Period: July through December 2003

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. CAP88-PC accommodates up to six stacks and considers stacks to be co-located (i.e., at the same physical location on the site). NFS operated sixteen (16) radiological stacks during the 2nd half of 2003. Based on effluent types and stack physical characteristics, releases from these stacks were grouped into four effective stacks for modeling purposes. To accommodate the co-location limitation of the model, the four 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 taken to be 150 meters for all sectors and is conservative. 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; this size is consistent with assumptions used in EPA Federal Guidance Report 11.

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 a table 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 below 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 500 meters North Northeast from the center of the plant site. The TEDE to the MEI was estimated to be 0.0060 mrem for gaseous effluents released during the 2nd half of 2003. The highest organ committed dose equivalent (CDE) to the MEI was estimated to be 0.046 mrem to the lungs. These MEI doses are well below SNM-124 license action levels and applicable regulatory limits/ALARA constraints.

Table 2 summarizes the maximum radioactive air concentrations at or beyond the site boundary, as determined by CAP88-PC, for radionuclides released. The total sum of fractions based on maximum values 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 on out. 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 1. Organ Doses and Total Effective Dose Equivalent at the MEI Location

Organ	Committed Dose Equivalent (mrem per 2nd half of 2003)
Gonads	2.7E-05
Breast	3.0E-05
Red Bone Marrow	4.7E-04
Lungs	4.6E-02
Thyroid	1.7E-04
Endosteal Tissue (Bone Surfaces)	7.3E-03
Remainder Organs	7.2E-04
Total Effective Dose Equivalent	**6.0E-03 mrem**
Location of MEI:	500 meters North Northeast

Notes: Dose results are from the CAP88-PC "Synopsis Report". CAP88-PC uses organ dose weighting factors equal to those in 10 CFR Part 20.1003 to compute the effective dose equivalent.

Table 2. Maximum Predicted Air Concentrations for Receptors at or Beyond the Site Boundary

Nuclide	Maximum Concentration (uCi/mL)	Concentration Location		10 CFR 20, App. B, Table 2, Col. 1 Value (uCi/mL)	Ratio of Maximum Concentration to 10 CFR 20 Value
		Sector	Dist. (m)		
Tc-99	1.0E-17	NNE	550	9.E-10	1.1E-08
Pb-212	3.3E-19	NNE	250	5.E-11	6.6E-09
Ac-227	5.0E-23	NNE	250	1.E-15	5.0E-08
Th-230	4.5E-22	NNE	500	2.E-14	2.3E-08
Th-231	1.3E-19	NNE	500	9.E-09	1.4E-11
U-232	3.3E-22	NNE	250	1.E-14	3.3E-08
U-233	3.2E-22	NNE	250	5.E-14	6.4E-09
U-234	1.0E-17	NNE	500	5.E-14	2.0E-04
U-235	1.7E-19	NNE	500	6.E-14	2.8E-06
U-236	1.4E-20	NNE	300	6.E-14	2.3E-07
U-238	3.3E-21	NNE	250	6.E-14	5.5E-08
Pu-241	6.5E-20	NNE	250	8.E-13	8.1E-08
				Sum of Fractions:	**2.0E-04**

Notes: The maximum concentration values were extracted from the CAP88-PC computer code's "Concentration" output report generated for this semiannual period.