

NINE MILE POINT NUCLEAR STATION - UNIT 2
SEMI-ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT
JULY - DECEMBER 1998

NIAGARA MOHAWK POWER CORPORATION

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NINE MILE POINT NUCLEAR STATION - UNIT 2
SEMI-ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT

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SUPPLEMENTAL INFORMATION

Facility: Nine Mile Point Unit #2

Licensee: Niagara Mohawk Power Corporation

1. TECHNICAL SPECIFICATION LIMITS

A) FISSION AND ACTIVATION GASES

1. The dose rate limit of noble gases released in gaseous effluents from the site to areas at or beyond the site boundary shall be less than or equal to 500 mrem/year to the whole body and less than or equal to 3000 mrem/year to the skin.
2. The air dose from noble gases released in gaseous effluents from Nine Mile Point Unit 2 to areas at or beyond the site boundary shall be limited during any calendar quarter to less than or equal to 5 mrad for gamma radiation and less than or equal to 10 mrad for beta radiation, and during any calendar year to less than or equal to 10 mrad for gamma radiation and less than or equal to 20 mrad for beta radiation.

B&C) TRITIUM, IODINES AND PARTICULATES, HALF LIVES > 8 DAYS

1. The dose rate limit of Iodine-131, Iodine-133, Tritium and all radionuclides in particulate form with half-lives greater than eight days, released in gaseous effluents from the site to areas at or beyond the site boundary shall be less than or equal to 1500 mrem/year to any organ.
2. The dose to a member of the public from Iodine-131, Iodine-133, Tritium and all radionuclides in particulate form with half-lives greater than eight days in gaseous effluents released from Nine Mile Point Unit 2 to areas at or beyond the site boundary shall be limited during any calendar quarter to less than or equal to 7.5 mrem to any organ and, during any calendar year to less than or equal to 15 mrem to any organ.

D) LIQUID EFFLUENTS

1. The concentration of radioactive material released in liquid effluents to unrestricted areas shall be limited to the concentrations specified in 10 CFR Part 20, Appendix B, Table II, Column 2 for radionuclides other than dissolved or entrained noble gases. For dissolved or entrained noble gases, the concentration shall be limited to 2E-04 microcurie/ml total activity.
2. The dose or dose commitment to a member of the public from radioactive materials in liquid effluents released from Nine Mile Point Unit 2 to unrestricted areas shall be limited during any calendar quarter to less than or equal to 1.5 mrem to the whole body and to less than or equal to 5 mrem to any organ, and during any calendar year to less than or equal to 3 mrem to the whole body and to less than or equal to 10 mrem to any organ.



2. MEASUREMENTS AND APPROXIMATIONS OF TOTAL RADIOACTIVITY

Described below are the methods used to measure or approximate the total radioactivity and radionuclide composition in effluents.

A) FISSION AND ACTIVATION GASES

Noble gas effluent activity is determined by on-line gamma spectroscopic monitoring (intrinsic germanium crystal) of an isokinetic sample stream.

B) IODINES

Iodine effluent activity is determined by gamma spectroscopic analysis (at least weekly) of charcoal cartridges sampled from an isokinetic sample stream.

C) PARTICULATES

Activity released from the main stack and the combined Radwaste/Reactor Building vent is determined by gamma spectroscopic analysis (at least weekly) of particulate filters sampled from an isokinetic sample stream and composite analysis of the filters for non-gamma emitters.

D) TRITIUM

Tritium effluent activity is measured by liquid scintillation or gas proportional counting of monthly samples taken with an air sparging/water trap apparatus.

E) LIQUID EFFLUENTS

Isotopic contents of liquid effluents are determined by isotopic analysis of a representative sample of each batch and composite analysis of non-gamma emitters.

F) SOLID EFFLUENTS

Isotopic contents of waste shipments are determined by gamma spectroscopic analysis of a representative sample of each batch. Scaling factors established from primary composite sample analyses conducted off-site are applied, where appropriate, to find estimated concentrations of non-gamma emitters. For low activity trash shipments, curie content is estimated by dose rate measurement and application of appropriate scaling factors.



**ATTACHMENT 1
Summary Data**

Unit 1 <u> </u> Unit 2 <u>X</u>	Reporting Period <u>July - December 1998</u>	
Liquid Effluents:		
10CFR20, Appendix B, Table II, Column 2		
Average MPC - $\mu\text{Ci/ml}$ (Qtr. 3) = <u>1.29E - 03</u>		
Average MPC - $\mu\text{Ci/ml}$ (Qtr. 4) = <u>2.27E - 03</u>		
Average Energy (Fission and Activation gases - Mev):		
Qtr. <u>3</u>	: \dot{E}_γ	= <u>8.61E - 01</u> \dot{E}_p = <u>8.15E - 01</u>
Qtr. <u>4</u>	: \dot{E}_γ	= <u>6.28E - 01</u> \dot{E}_p = <u>1.13E + 00</u>
Liquid:		
Number of batch releases	:	<u>25</u>
Total time period for batch releases (hrs)	:	<u>7.92E + 01</u>
Maximum time period for a batch release (hrs)	:	<u>3.32E + 00</u>
Average time period for a batch release (hrs)	:	<u>3.17E + 00</u>
Minimum time period for a batch release (hrs)	:	<u>1.33E - 01</u>
Total volume of water used to dilute the liquid effluent during release period (L)	:	<u>5.96E + 08</u>
Total volume of water available to dilute the liquid effluent during reporting period (L)	:	<u>2.92E + 10</u>
Gaseous (Emergency Condenser Vent): Not Applicable for Unit 2		
Number of batch releases	:	<u>N/A</u>
Total time period for batch releases (hrs)	:	<u>N/A</u>
Maximum time period for a batch release (hrs)	:	<u>N/A</u>
Average time period for a batch release (hrs)	:	<u>N/A</u>
Minimum time period for a batch release (hrs)	:	<u>N/A</u>
Gaseous (Primary Containment Purge):		
Number of batch releases	:	<u>10</u>
Total time period for batch releases (hrs)	:	<u>1.39E + 02</u>
Maximum time period for a batch release (hrs)	:	<u>5.32E + 01</u>
Average time period for a batch release (hrs)	:	<u>1.39E + 01</u>
Minimum time period for a batch release (hrs)	:	<u>7.67E - 01</u>



1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100

ATTACHMENT 1
Summary Data

Unit 1 <input type="checkbox"/>	Unit 2 <input checked="" type="checkbox"/>	Reporting Period <u>July - December 1998</u>
Abnormal Releases: There were no abnormal releases during the reporting period.		
A. Liquids:		
Number of releases	<u>0</u>	
Total activity released	<u>N/A</u> Ci	
B. Gaseous:		
Number of releases	<u>0</u>	
Total activity released	<u>N/A</u> Ci	



ATTACHMENT 2

Unit 1 <input type="checkbox"/>		Unit 2 <input checked="" type="checkbox"/>		Reporting Period July - December 1998		
GASEOUS EFFLUENTS - SUMMATION OF ALL RELEASES, ELEVATED AND GROUND LEVEL						
				3rd	4th	EST. TOTAL
				QUARTER	QUARTER	ERROR, %
A.	<u>Fission & Activation gases</u>					
	1. Total release	Ci		<u>4.41E+00</u>	<u>2.27E+01</u>	5.00E+01
	2. Average release rate	µCi/sec		<u>5.55E-01</u>	<u>2.86E+00</u>	
B.	<u>Iodines</u>					
	1. Total iodine-131	Ci		<u>3.97E-06</u>	<u>9.98E-06</u>	3.00E+01
	2. Average release rate for period	µCi/sec		<u>5.04E-07</u>	<u>1.27E-06</u>	
C.	<u>Particulates¹</u>					
	1. Particulates with half-lives > 8 days	Ci		<u>1.21E-04</u>	<u>2.83E-04</u>	3.00E+01
	2. Average release rate for period	µCi/sec		<u>1.53E-05</u>	<u>3.62E-05</u>	
	3. Gross alpha radioactivity	Ci		<u>4.38E-05</u>	<u>2.95E-05</u>	2.50E+01
D.	<u>Tritium¹</u>					
	1. Total release	Ci		<u>1.94E+00</u>	<u>3.54E+00</u>	5.00E+01
	2. Average release rate for period	µCi/sec		<u>2.47E-01</u>	<u>4.51E-01</u>	
E.	<u>Percent of Tech. Spec. Limits</u>					
	<u>Fission and Activation Gases</u>					
	Percent of Quarterly Gamma Air Dose Limit (5 mrad)	%		<u>8.95E-03</u>	<u>3.28E-02</u>	
	Percent of Quarterly Beta Air Dose Limit (10 mrad)	%		<u>3.97E-04</u>	<u>2.83E-03</u>	
	Percent of Annual Gamma Air Dose Limit to Date (10 mrad)	%		<u>7.31E-03</u>	<u>2.37E-02</u>	
	Percent of Annual Beta Air Dose Limit to Date (20 mrad)	%		<u>2.85E-04</u>	<u>1.70E-03</u>	
	Percent of Whole Body Dose Rate Limit (500 mrem/yr)	%		<u>3.39E-04</u>	<u>1.25E-03</u>	
	Percent of Skin Dose Rate Limit (3000 mrem/yr)	%		<u>7.07E-05</u>	<u>2.76E-04</u>	
	<u>Tritium, Iodines, and Particulates¹</u>					
	<u>(with half-lives greater than 8 days)</u>					
	Percent of Quarterly Dose Limit (7.5 mrem)	%		<u>1.56E-03</u>	<u>3.82E-03</u>	
	Percent of Annual Dose Limit (15 mrem)	%		<u>1.24E-02</u>	<u>1.44E-02</u>	
	Percent of Organ Dose Rate Limit (1500 mrem/yr)	%		<u>3.15E-05</u>	<u>7.70E-05</u>	

¹ Tritium, Iron-55 and Strontium 89 and 90 results for the fourth quarter were not received from the off-site vendor at the time of this report. These numbers include estimates. Actual numbers will be provided in the next Semi-Annual Report.



ATTACHMENT 3

Unit 1 <input type="checkbox"/> Unit 2 <input checked="" type="checkbox"/>		Reporting Period <u>July - December 1998</u>	
GASEOUS EFFLUENTS - ELEVATED RELEASE			
CONTINUOUS MODE ³			
Nuclides Released		3 rd QUARTER	4 th QUARTER
1. Fission Gases¹			
Argon-41	Ci	<u>8.14E - 02</u>	<u>4.58E - 03</u>
Krypton-85	Ci	**	**
Krypton-85m	Ci	**	<u>3.46E - 02</u>
Krypton-87	Ci	**	<u>5.79E - 01</u>
Krypton-88	Ci	<u>1.47E - 01</u>	<u>1.12E + 00</u>
Xenon-127	Ci	**	**
Xenon-133	Ci	**	**
Xenon-133m	Ci	**	**
Xenon-135	Ci	**	<u>1.92E - 01</u>
Xenon-135m	Ci	<u>5.03E - 01</u>	<u>1.39E + 00</u>
Xenon-137	Ci	<u>1.17E + 00</u>	<u>1.21E + 01</u>
Xenon-138	Ci	<u>2.51E + 00</u>	<u>7.29E + 00</u>
2. Iodines¹			
Iodine-131	Ci	<u>3.97E - 06</u>	<u>9.98E - 06</u>
Iodine-133	Ci	<u>1.21E - 04</u>	<u>3.41E - 05</u>
Iodine-135	Ci	**	**
3. Particulates^{1,2}			
Strontium-89	Ci	<u>4.34E - 06</u>	<u>6.66E - 06</u>
Strontium-90	Ci	**	<u>4.60E - 07</u>
Cesium-134	Ci	**	**
Cesium-137	Ci	**	<u>3.03E - 06</u>
Cobalt-60	Ci	**	<u>7.27E - 06</u>
Cobalt-58	Ci	**	**
Manganese-54	Ci	**	<u>1.38E - 05</u>
Barium-Lanthanum-140	Ci	**	**
Antimony-125	Ci	**	**
Niobium-95	Ci	**	**
Cerium-141	Ci	**	**
Cerium-144	Ci	**	**
Iron-59	Ci	**	**
Cesium-136	Ci	**	**
Chromium-51	Ci	**	**
Zinc-65	Ci	**	**
Iron-55	Ci	<u>1.25E - 05</u>	<u>1.81E - 05</u>
Molybdenum-99	Ci	**	**
4. Tritium²			
	Ci	<u>1.46E + 00</u>	<u>2.93E + 00</u>

¹ Concentrations less than the lower limit of detection of the counting system used are indicated with a double asterisk. A lower limit of detection of 1.00E-04 μCi/ml for required noble gases, 1.00E-11 μCi/ml for required particulates, 1.00E-12 μCi/ml for required iodines, and 1.00E-06 μCi/ml for Tritium, as required by Technical Specifications, has been verified.

² Tritium, Iron-55 and Strontium 89 and 90 results for the fourth quarter were not received from the off-site vendor at the time of this report. These numbers include estimates. Actual numbers will be included in the next Semi-Annual Report.

³ Contributions from purges are included.



ATTACHMENT 4

Unit 1 Unit 2

Reporting Period July - December 1998

GASEOUS EFFLUENTS - GROUND LEVEL RELEASES

			CONTINUOUS MODE		BATCH MODE There were no batch releases during the reporting period.	
			<u>3rd</u> <u>QUARTER</u>	<u>4th</u> <u>QUARTER</u>	<u>3rd</u> <u>QUARTER</u>	<u>4th</u> <u>QUARTER</u>
1.	<u>Fission Gases</u> ¹					
	Argon-41	Ci	**	**		
	Krypton-85	Ci	**	**		
	Krypton-85m	Ci	**	**		
	Krypton-87	Ci	**	**		
	Krypton-88	Ci	**	**		
	Xenon-133	Ci	**	**		
	Xenon-133m	Ci	**	**		
	Xenon-135	Ci	**	**		
	Xenon-135m	Ci	**	**		
	Xenon-137	Ci	**	**		
	Xenon-138	Ci	**	**		
	Xenon-127	Ci	**	**		
2.	<u>Iodines</u> ¹					
	Iodine-131	Ci	**	**		
	Iodine-133	Ci	**	**		
	Iodine-135	Ci	**	**		
3.	<u>Particulates</u> ^{1,2}					
	Strontium-89	Ci	**	<u>1.00E - 05</u>		
	Strontium-90	Ci	**	<u>8.00E - 07</u>		
	Cesium-134	Ci	**	**		
	Cesium-137	Ci	**	**		
	Cobalt-60	Ci	**	<u>2.20E - 05</u>		
	Cobalt-58	Ci	**	**		
	Manganese-54	Ci	**	<u>9.95E - 05</u>		
	Barium-Lanthanum-140	Ci	**	**		
	Antimony-125	Ci	**	**		
	Niobium-95	Ci	**	**		
	Cerium-141	Ci	**	**		
	Cerium-144	Ci	**	**		
	Iron-59	Ci	**	**		
	Cesium-136	Ci	**	**		
	Chromium-51	Ci	**	**		
	Zinc-65	Ci	<u>6.57E - 05</u>	<u>3.55E - 05</u>		
	Iron-55	Ci	<u>3.80E - 05</u>	<u>6.62E - 05</u>		
	Molybdenum-99	Ci	**	**		
	Silver-110m	Ci	**	**		
4.	<u>Tritium</u> ²	Ci	<u>4.80E - 01</u>	<u>6.05E - 01</u>		

¹ Concentrations less than the lower limit of detection of the counting system used are indicated with a double asterisk. A lower limit of detection of 1.00E-04 µCi/ml for required noble gases, 1.00E-11 µCi/ml for required particulates, 1.00E-12 µCi/ml for required Iodines, and 1.00E-06 µCi/ml for Tritium, as required by Technical Specifications, has been verified.

² Tritium, Iron-55 and Strontium 89 and 90 results for the fourth quarter were not received from the off-site vendor at the time of this report. These numbers include estimates. Actual numbers will be included in the next Semi-Annual Report.



Unit 1 <input type="checkbox"/> Unit 2 <input checked="" type="checkbox"/>		Reporting Period <u>July - December 1998</u>			
LIQUID EFFLUENTS - SUMMATION OF ALL RELEASES					
		3 rd QUARTER	4 th QUARTER	EST. TOTAL ERROR, %	
A.	<u>Fission & Activation Products</u> ¹				
	1. Total release (not including Tritium, gases, alpha)	Ci	<u>3.86E - 02</u>	<u>9.56E - 03</u>	5.00E + 01
	2. Average diluted concentration during reporting period	µCi/ml	<u>2.51E - 09</u>	<u>6.93E - 10</u>	
B.	<u>Tritium</u> ¹				
	1. Total release	Ci	<u>1.47E + 00</u>	<u>1.59E + 00</u>	5.00E + 01
	2. Average diluted concentration during reporting period	µCi/ml	<u>9.53E - 08</u>	<u>1.15E - 07</u>	
C.	<u>Dissolved and Entrained Gases</u> ²				
	1. Total release	Ci	**	<u>5.19E - 05</u>	5.00E + 01
	2. Average diluted concentration during reporting period	µCi/ml	**	<u>3.76E - 12</u>	
D.	<u>Gross Alpha Radioactivity</u> ²				
	1. Total release	Ci	**	<u>4.41E - 05</u>	5.00E + 01
E.	<u>Volumes</u>				
	1. Prior to dilution	Liters	<u>1.17E + 06</u>	<u>9.92E + 05</u>	1.00E + 01
	2. Dilution water used during release period	Liters	<u>3.39E + 08</u>	<u>2.57E + 08</u>	5.00E + 01
	3. Dilution water available during reporting period	Liters	<u>1.54E + 10</u>	<u>1.38E + 10</u>	5.00E + 01
F.	<u>Percent of Technical Specification Limits</u> ^{1,2}				
	Percent of Quarterly Whole Body Dose Limit (1.5 mrem)	%	<u>4.28E - 01</u>	<u>1.15E - 01</u>	
	Percent of Quarterly Organ Dose Limit (5 mrem)	%	<u>2.73E - 01</u>	<u>1.00E - 01</u>	
	Percent of Annual Whole Body Dose Limit to Date (3 mrem)	%	<u>1.08E + 00</u>	<u>1.15E + 00</u>	
	Percent of Annual Organ Dose Limit to Date (10 mrem)	%	<u>6.80E - 01</u>	<u>7.28E - 01</u>	
	Percent of 10CFR20 Concentration Limit ³	%	<u>7.56E - 03</u>	<u>5.10E - 03</u>	
	Percent of Dissolved or Entrained Noble Gas Limit (2.00E-04 µCi/ml)	%	**	<u>1.88E - 06</u>	

¹ Tritium, Iron-55, Strontium 89 and Strontium 90 results for the fourth quarter were not received from the off-site vendor at the time of this report. These numbers include estimates. Actual numbers will be included in the next Semi-Annual Report..

² Concentrations less than the lower limit of detection of the counting system used are indicated with a double asterisk. A lower limit of detection of 5.00E-07 µCi/ml for required gamma emitting nuclides, 1.00E-05 µCi/ml for required dissolved and entrained noble gases and Tritium, 5.00E-08 µCi/ml for Sr-89/90, 1.00E-06 µCi/ml for Fe-55 and I-131, and 1.00E-07 µCi/ml for gross alpha radioactivity, as required by Technical Specifications, has been verified.

³ The percent of 10CFR20 concentration limit is based on the average concentration during the quarter.



Unit 1 Unit 2

Reporting Period July - December 1998

LIQUID EFFLUENTS RELEASED

BATCH MODE²

Nuclides Released ^{1,3}		<u>3rd</u> <u>QUARTER</u>	<u>4th</u> <u>QUARTER</u>
Strontium-89	Ci	**	<u>2.69E - 05</u>
Strontium-90	Ci	**	<u>9.44E - 06</u>
Cesium-134	Ci	**	**
Cesium-137	Ci	**	**
Iodine-131	Ci	**	**
Cobalt-58	Ci	<u>5.04E - 04</u>	<u>9.90E - 05</u>
Cobalt-60	Ci	<u>1.18E - 02</u>	<u>1.72E - 03</u>
Iron-59	Ci	<u>2.74E - 03</u>	<u>7.47E - 04</u>
Zinc-65	Ci	<u>8.43E - 03</u>	<u>1.91E - 03</u>
Manganese-54	Ci	<u>1.36E - 02</u>	<u>2.96E - 03</u>
Chromium-51	Ci	<u>1.50E - 03</u>	<u>1.35E - 03</u>
Zirconium-Niobium-95	Ci	**	<u>4.96E - 05</u>
Molybdenum-99	Ci	**	**
Technetium-99m	Ci	**	**
Barium-Lanthanum-140	Ci	**	**
Cerium-141	Ci	**	**
Tungsten-187	Ci	**	**
Arsenic-76	Ci	**	**
Iodine-133	Ci	**	**
Iron-55	Ci	**	<u>3.60E - 04</u>
Neptunium-239	Ci	**	**
Prasodymium-144	Ci	**	**
Iodine-135	Ci	**	**
Silver-110m	Ci	<u>1.77E - 05</u>	<u>3.32E - 04</u>
Dissolved or Entrained Gases	Ci	**	<u>5.19E - 05</u>
Tritium	Ci	<u>1.47E+00</u>	<u>1.59E+00</u>

¹ Concentrations less than the lower limit of detection of the counting system used are indicated with a double asterisk. A lower limit of detection of 5.00E-07 µCi/ml for required gamma emitting nuclides, 1.00E-05 µCi/ml for required dissolved and entrained noble gases and Tritium, 5.00E-08 µCi/ml for Sr-89/90, 1.00E-06 µCi/ml for Fe-55 and I-131, and 1.00E-07 µCi/ml for gross alpha radioactivity, as required by Technical Specifications, has been verified.

² No continuous mode releases occurred during the reporting period.

³ Tritium, Iron-55, Strontium 89 and Strontium 90 results for the fourth quarter were not received from the off-site vendor at the time of this report. These numbers include estimates. Actual numbers will be included in the next Semi-Annual Report..



Unit 1 Unit 2 X

Reporting Period July - December 1998

SOLID WASTE AND IRRADIATED FUEL SHIPMENTS:

A.1 TYPE	Volume (m ³)			Activity ¹ (Ci)		
	Class			Class		
	A	B	C	A	B	C
1. Spent Resin ²	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>
Filter Sludge	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>
Concentrated Waste Evaporator Bottoms	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>
Total	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>
2. Dry Compressible Waste	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>
3. Irradiated Components	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>
4. Other:						
A. Non-Compacted trash and dry non- compressible waste to vendor for processing	<u>2.82E+02</u>	<u>0</u>	<u>0</u>	<u>2.78E - 01</u>	<u>0</u>	<u>0</u>
B. Spent resin to vendor for processing	<u>6.18E+01</u>	<u>0</u>	<u>0</u>	<u>5.89E+01</u>	<u>0</u>	<u>0</u>

¹ The estimated total error is 5.00E+01%.

² There were three Unit 2 steel encased high integrity containers of waste Class A bead resin placed in interim storage at Nine Mile Point during the reporting period. The total activity was 1.64E+02 curies and the volume was 1.66E+01m³.



1952

Unit 1 <input type="checkbox"/> Unit 2 <input checked="" type="checkbox"/>		Reporting Period <u>July - December 1998</u>	
SOLID WASTE AND IRRADIATED FUEL SHIPMENTS			
A.1 TYPE	<u>Container</u>	<u>Package</u>	<u>Solidification Agent</u>
1. Spent Resin	<u>N/A</u>	<u>N/A</u>	<u>N/A</u>
Filter Sludge	<u>N/A</u>	<u>N/A</u>	<u>N/A</u>
Concentrated Waste	<u>N/A</u>	<u>N/A</u>	<u>N/A</u>
2. Dry Compressible Waste	<u>N/A</u>	<u>N/A</u>	<u>N/A</u>
3. Irradiated Components	<u>N/A</u>	<u>N/A</u>	<u>N/A</u>
4. Other:			
A. Non-Compacted trash and dry non-compressible waste.	<u>Metal Box</u>	<u>STP</u>	<u>None</u>
B. Spent Resin	<u>Poly HIC</u>	<u>Type A</u>	<u>None</u>



Unit 1 <input type="checkbox"/>	Unit 2 <input checked="" type="checkbox"/>	Reporting Period <u>July - December 1998</u>
SOLID WASTE AND IRRADIATED FUEL SHIPMENTS		
A.2 ESTIMATE OF MAJOR NUCLIDE COMPOSITION (BY TYPE OF WASTE)		
a. Spent Resins, Filter Sludges, Concentrated Waste: There were no shipments for direct burial.		
<u>Nuclide</u>	<u>Percent</u>	
b. Dry Compressible Waste: There were no shipments for direct burial.		
<u>Nuclide</u>	<u>Percent</u>	
c. Irradiated Components: There were no shipments for direct burial.		
<u>Nuclide</u>	<u>Percent</u>	
d. 1. Other: Non-compacted trash and dry non-compressible waste		
<u>Nuclide</u>	<u>Percent</u>	
Mn-54	2.34E+01	
Zn-65	2.23E+01	
Fe-59	1.77E+01	
Co-60	1.67E+01	
Cr-51	9.45E+00	
Fe-55	8.17E+00	
Co-58	1.41E+00	
Other	8.70E-01	
d. 2. Other: Spent Resin		
<u>Nuclide</u>	<u>Percent</u>	
Zn-65	5.27E+01	
Co-60	3.24E+01	
Ni-63	4.92E+00	
Fe-55	3.91E+00	
Mn-54	2.26E+00	
Ni-59	1.36E+00	
Other	2.45E+00	



Unit 1 Unit 2 Reporting Period July - December 1998**SOLID WASTE AND IRRADIATED FUEL SHIPMENTS**

A.3. SOLID WASTE DISPOSITION: There were no shipments for direct burial.

<u>Number of Shipments</u>	<u>Mode of Transportation</u>	<u>Destination</u>
<u>4</u>	<u>Truck</u>	GTS - Duratek <u>Oak Ridge, TN</u>
<u>11</u>	<u>Truck</u>	Molten Metal Technology <u>Oak Ridge, TN</u>

B. IRRADIATED FUEL SHIPMENTS (DISPOSITION): There were no shipments.

<u>Number of Shipments</u>	<u>Mode of Transportation</u>	<u>Destination</u>
<u>0</u>	<u>N/A</u>	<u>N/A</u>



Unit 1 <input type="checkbox"/>	Unit 2 <input checked="" type="checkbox"/>	Reporting Period <u>July - December 1998</u>															
SOLID WASTE AND IRRADIATED FUEL SHIPMENTS																	
<p>C. SOLID WASTE SHIPPED OFF-SITE TO VENDORS FOR PROCESSING AND SUBSEQUENT BURIAL Below is a summary of NMP-2 radwaste buried by vendor facilities during <u>July - December 1998</u>. These totals were reported separately from "10CFR61 Solid Waste Shipped for Burial" since (a) waste classification and burial is performed by the vendors, and (b) Technical Specification 6.9.1 requires reporting of "information for each class of solid waste (as defined by 10CFR61) shipped off-site during the reporting period." The data represents the actual shipments made from the off-site vendors of our radwaste that was processed and commingled prior to burial.</p>																	
<p>C.1. TYPE OF WASTE - noncompacted trash, dry non-compressible waste and spent resins processed by vendor facilities and buried at Barnwell, SC.</p>	<p>Burial Volume <u>(m³)</u></p>	<p>Activity <u>(Ci)</u></p>	<p>Est. Total <u>Error, %</u></p>														
	<u>2.64E+00</u>	<u>2.59E+00</u>	<u>5.00E+01</u>														
<p>C.2. ESTIMATE OF MAJOR NUCLIDE COMPOSITION</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;"><u>Nuclide</u></th> <th style="text-align: center;"><u>Percent</u></th> </tr> </thead> <tbody> <tr> <td>(1) Zn-65</td> <td style="text-align: center;">5.69E+01</td> </tr> <tr> <td>(2) Co-60</td> <td style="text-align: center;">3.45E+01</td> </tr> <tr> <td>(3) Fe-55</td> <td style="text-align: center;">4.10E+00</td> </tr> <tr> <td>(4) Ni-63</td> <td style="text-align: center;">1.50E+00</td> </tr> <tr> <td>(5) Mn-54</td> <td style="text-align: center;">1.20E+00</td> </tr> <tr> <td>(6) Other</td> <td style="text-align: center;">1.80E+00</td> </tr> </tbody> </table>				<u>Nuclide</u>	<u>Percent</u>	(1) Zn-65	5.69E+01	(2) Co-60	3.45E+01	(3) Fe-55	4.10E+00	(4) Ni-63	1.50E+00	(5) Mn-54	1.20E+00	(6) Other	1.80E+00
<u>Nuclide</u>	<u>Percent</u>																
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(2) Co-60	3.45E+01																
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(6) Other	1.80E+00																
<p>C.3. SOLID WASTE DISPOSITION</p> <table style="width: 100%;"> <thead> <tr> <th style="text-align: center;"><u>Number of Shipments</u></th> <th style="text-align: center;"><u>Mode of Transportation</u></th> <th style="text-align: center;"><u>Destination</u></th> </tr> </thead> <tbody> <tr> <td style="text-align: center;"><u>15</u></td> <td style="text-align: center;"><u>Truck</u></td> <td style="text-align: center;"><u>Barnwell, SC</u></td> </tr> </tbody> </table>				<u>Number of Shipments</u>	<u>Mode of Transportation</u>	<u>Destination</u>	<u>15</u>	<u>Truck</u>	<u>Barnwell, SC</u>								
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<u>15</u>	<u>Truck</u>	<u>Barnwell, SC</u>															



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Unit 1 Unit 2 Reporting Period July - December 1998**SOLID WASTE AND IRRADIATED FUEL SHIPMENTS****D. SEWAGE WASTES SHIPPED TO A TREATMENT FACILITY FOR PROCESSING AND BURIAL**

There were no shipments of sewage sludge with detectable quantities of plant-related nuclides from NMP to the treatment facility during the reporting period.



ATTACHMENT 7

Unit 1 Unit 2

Reporting Period July - December 1998

SUMMARY OF CHANGES TO THE OFF-SITE DOSE CALCULATION MANUAL

There were no changes to the Unit 2 Off-Site Dose Calculation Manual during the reporting period.



ATTACHMENT 8

Unit 1 Unit 2

Reporting Period July - December 1998

SUMMARY OF CHANGES TO THE PROCESS CONTROL PROGRAM

There were no changes to the Unit 2 Process Control Program during the reporting period.



ATTACHMENT 9

Unit 1 Unit 2

Reporting Period July - December 1998

SUMMARY OF INOPERABLE MONITORS

There were no inoperable monitors for a period greater than 30 days during the reporting period.



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**SEMI-ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT (1998)
NINE MILE POINT NUCLEAR STATION UNIT 2
DOSES TO MEMBERS OF THE PUBLIC DUE TO THEIR ACTIVITIES
INSIDE THE SITE BOUNDARY**

JANUARY - DECEMBER 1998

Doses to members of the public (as defined by the Technical Specifications) from the operation of the NMP2 facility as a result of activity inside the site boundary are based on activities at the Energy Center located approximately one quarter mile west of NMP1. This facility is open to the public and offers educational information, summer picnicking activities and fishing. Any possible doses received by a member of the public by utilizing the private road that transverses the east and west site boundaries are not considered here since it takes a matter of minutes to travel the distance.

The activity at the Energy Center that is used for the dose analysis is fishing near the shoreline adjacent to the NMP site. Dose pathways considered for this activity include direct radiation, inhalation and external ground (shoreline sediment or soil) doses. Other pathways, such as ingestion pathways, are not considered because they are either not applicable, insignificant, or are considered as part of the evaluation of the total dose to a member of the public located off-site. In addition, only releases from the NMP2 stack and vent were evaluated for the inhalation pathway.

The direct radiation pathway is evaluated in accordance with the methodology found in the Off-Site Dose Calculation Manual (ODCM). This pathway considers three components: direct radiation from the generating facilities, direct radiation from any possible overhead plume and direct radiation from plume submersion. The direct radiation pathway is evaluated by the use of high sensitivity environmental Thermoluminescent Dosimeters (TLDs). Since any significant fishing activity near the Energy Center occurs between April through December, environmental TLD data for the approximate period of April 1 - December 31, 1998 were considered. Data from environmental TLDs from the approximate area where the fishing occurs were compared to control environmental TLD locations for the same time period. The average fishing area TLD dose rate was $7.0\text{E-}03$ mRem per hour for the period. The average control TLD dose rate was $6.1\text{E-}03$ mRem per hour for the period (approximate second, third and fourth calendar quarters of the year). The average increase in dose as a result of fishing in this area at a conservative frequency of eight hours per week for thirty-nine weeks is $2.8\text{E-}01$ mRem from direct radiation for the period in question. The majority of the dose from this pathway is from the NMP1 facility because of its proximity to the fishing area. A small portion may be due to the NMP2 facility.



SEMI-ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT (1998)
NINE MILE POINT NUCLEAR STATION UNIT 2
DOSES TO MEMBERS OF THE PUBLIC DUE TO THEIR ACTIVITIES
INSIDE THE SITE BOUNDARY

JANUARY - DECEMBER 1998

The inhalation dose pathway is evaluated by utilizing the inhalation equation in the ODCM, as adapted from Regulatory Guide 1.109. The equation basically gives a total inhalation dose in mRem for the time period in question (April - December). The total dose equals the sum, for all applicable radionuclides, of the NMP2 stack and vent release concentrations, times the average NMP2 stack and vent flowrate, times the applicable five-year average calculated X/Q, times the inhalation dose factors from Regulatory Guide 1.109, Table E-7, times the Regulatory Guide 1.109 annual air intake, times the fractional portion of the year in question. In order to be slightly conservative, no radiological decay is assumed.

The 1998 calculation utilized the following information:

NMP2 Stack:

- Unit 2 average stack flowrate = $5.36E+01$ m³/sec
- X/Q value = $9.60E-07$ (annual NWN sector, historical average)
- Inhalation dose factor = Table E-7 of Regulatory Guide 1.109
- Annual air intake = 8000 m³ per year (adult)
- Fractional portion of the year = 0.0356 (312 hours)
- I-131 = $3.78E-02$ pCi/m³
- I-133 = $1.89E-01$ pCi/m³
- Fe-55 = $4.01E-02$ pCi/m³
- Sr-89 = $8.53E-02$ pCi/m³
- H-3 = $4.81E+03$ pCi/m³
- Co-60 = $5.63E-03$ pCi/m³
- Zn-65 = $2.44E-02$ pCi/m³
- Sr-90 = $3.57E-04$ pCi/m³
- Cs-137 = $2.35E-03$ pCi/m³
- Mn-54 = $1.07E-02$ pCi/m³



**SEMI-ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT (1998)
NINE MILE POINT NUCLEAR STATION UNIT 2
DOSES TO MEMBERS OF THE PUBLIC DUE TO THEIR ACTIVITIES
INSIDE THE SITE BOUNDARY**

JANUARY - DECEMBER 1998

NMP2 Vent:

- Unit 2 average vent flowrate = $1.02\text{E}+02$ m³/sec
- X/Q value = $2.8\text{E}-06$ (annual historical average)
- Inhalation dose factor = Table E-7 of Regulatory Guide 1.109
- Annual air intake = 8000 m³ per year (adult)
- Fractional portion of the year = 0.0356 (312 hours)
- Zn-65 = $3.47\text{E}-01$ pCi/m³
- H-3 = $8.35\text{E}+02$ pCi/m³
- Sr-89 = $3.33\text{E}-04$ pCi/m³
- Sr-90 = $1.39\text{E}-03$ pCi/m³
- Fe-55 = $7.48\text{E}-02$ pCi/m³
- Co-60 = $6.85\text{E}-02$ pCi/m³
- Mn-54 = $8.13\text{E}-02$ pCi/m³
- I-131 = $7.48\text{E}-02$ pCi/m³
- Fe-59 = $9.77\text{E}-03$ pCi/m³

The inhalation dose to a member of the public from NMP2 as a result of activities inside the site boundary is $3.1\text{E}-05$ mRem to the lung (maximum organ dose) and $2.2\text{E}-05$ mRem to the whole body.

The dose from standing on the shoreline while fishing is based on the methodology in the ODCM, as adapted from Regulatory Guide 1.109. During 1998, it was noted that fishing was performed from the shoreline on many occasions although waders were also utilized. In order to be conservative, it is assumed that the maximum exposed individual fished from the shoreline at all times. The use of waders, of course, would result in a dose of zero from this pathway.

The ODCM equation basically gives the total dose to the whole body and skin from the sum of all plant-related radionuclides detected in shoreline sediment samples. The plant-related radionuclide concentration is adjusted for background sample results, as applicable. The equation, therefore, yields the whole body and skin dose by multiplying the radionuclide concentration adjusted for any background data (as applicable), times a usage factor, times the sediment or soil density in grams per square meter (to a depth of one centimeter), times the applicable shore width factor, times the regulatory guide dose factor, times the fractional portion of the year over which the dose is applicable. In order to be conservative and to simplify the equation, no radiological decay is assumed since the applicable radionuclides are usually long lived.



**SEMI-ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT (1998)
NINE MILE POINT NUCLEAR STATION UNIT 2
DOSES TO MEMBERS OF THE PUBLIC DUE TO THEIR ACTIVITIES
INSIDE THE SITE BOUNDARY**

JANUARY - DECEMBER 1998

The calculation utilized the following information:

- Usage factor = 312 hours
- Density in grams per square meter = 40,000
- Shore width factor = 0.3
- Whole body and skin dose factor for each radionuclide = Regulatory Guide 1.109, Table E-6
- Fractional portion of the year = 1 (used average radionuclide concentration over total time period)
- Average Cs-137 concentration = 0.273 pCi/g

The total whole body and skin dose from standing on the shoreline to fish is 4.3E-03 mRem whole body and 5.0E-03 mRem skin dose for the period.

Doses to members of the public relative to activities inside the site boundary from aquatic pathways other than ground dose from shoreline sediment/soil are not applicable.

In summary, the total dose to a member of the public as a result of activities inside the site boundary from the direct radiation, inhalation and shoreline dose pathways is 2.8E-01 mRem to the whole body and 3.1E-05 mRem to the maximum exposed internal organ (lung). The dose to the skin of an adult is 5.0E-03 mRem. These doses are generally a result of the operation of NMP2. However, a portion of these doses for the direct radiation pathway may be attributable to the NMP1 facility.



**SEMI-ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT (1998)
NINE MILE POINT NUCLEAR STATION UNIT 2
DOSES TO MEMBERS OF THE PUBLIC DUE TO THEIR ACTIVITIES
OUTSIDE THE SITE BOUNDARY**

JANUARY - DECEMBER 1998

Radiation doses to the likely most exposed member of the public outside of the site boundary are evaluated relative to 40CFR190 requirements. The dose limits of 40CFR190 are 25 mRem (whole body or organ) per calendar year and 75 mRem (thyroid) per calendar year. The intent of 40CFR190 also requires that the effluents of NMP2, as well as other nearby uranium fuel cycle facilities, be considered. In this case, the effluents of NMP1, NMP2 and the James A. FitzPatrick (JAF) facilities must be considered.

Doses to the likely most exposed member of the public as a result of effluents from the site can be evaluated by using calculated dose modeling based on the accepted methodologies of the facilities' Off-Site Dose Calculation Manuals (ODCMs) or may, in some cases, be calculated from the analysis results of actual environmental samples. Acceptable methods of calculating doses from environmental samples are also found in the facilities' ODCMs. These methods are based on Regulatory Guide 1.109 methodology.

Dose calculations from actual environmental samples are, at times, difficult to perform for some pathways. Some pathway doses should be estimated using calculational dose modeling. These pathways include noble gas air dose, inhalation dose, etc. Other pathway doses may be calculated directly from environmental sample concentrations using Regulatory Guide 1.109 methodology.

Since the effluents from the generating facilities are low, the resultant gaseous and liquid effluent doses are anticipated to be low. In view of this, doses can be based on calculated data. Doses are not based on actual environmental data for 1998 with the exception of doses from direct radiation, fish consumption and shoreline sediment. In addition, in order to be conservative and for the sake of simplicity, it is assumed in the dose calculations that the likely most exposed member of the public is positioned in the maximum receptor location for each pathway at the same time. This approach is utilized because the doses are very low and the computations are greatly simplified.

The following pathways are considered:

1. The inhalation dose is calculated at the critical residence because of the high occupancy factor. In order to be conservative, the maximum whole body and organ dose assumes no correction for residing inside a residence.
2. The milk ingestion dose is calculated utilizing the maximum milk cow location. As noted previously, in order to be conservative and for the sake of simplicity, the likely most exposed member of the public is assumed to be at all critical receptors at one time. In this case, the member of the public at the critical residence is assumed to consume milk from the critical milk location.



7

**SEMI-ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT (1998)
NINE MILE POINT NUCLEAR STATION UNIT 2
DOSES TO MEMBERS OF THE PUBLIC DUE TO THEIR ACTIVITIES
OUTSIDE THE SITE BOUNDARY**

JANUARY - DECEMBER 1998

3. The maximum dose from the milk ingestion pathway as a result of consuming goat's milk is based on the same criteria established for item "2", above (ingestion of cow's milk).
4. The maximum dose associated from consuming meat is based on the critical meat animal. The likely most exposed member at the critical residence is assumed to consume meat from the critical meat animal location.
5. The maximum site dose associated with the consumption of vegetables is calculated from the critical vegetable garden location. As noted previously, the likely most exposed member of the public is assumed to be located at the critical residence and is assumed to consume vegetables from the critical garden location.
6. The dose, as a result of direct gamma radiation from the site, encompasses doses from direct "shine" from the generating facilities, direct radiation from any overhead gaseous plumes, plume submersion and from ground deposition. This total dose is measured by environmental TLDs. The critical location is based on the closest year-round residence from the generating facilities as well as the closest residence in the critical downwind sector in order to evaluate both direct radiation from the generating facilities and gaseous plumes as determined by the local meteorology. During 1998, the closest residence and the critical downwind residence are at the same location.

The measured average dose for 1998 at the critical residence was 53.8 mRem. The average control dose was 54.3 mRem. The average dose at the critical residence can be considered representative of the background dose since the control location dose was higher. Therefore, no dose was calculated and was assumed to be zero for this pathway.

7. The dose, as a result of fish consumption, is considered as part of the aquatic pathway. The dose for 1998 is calculated from actual results of the analysis of environmental fish samples. For the sake of being conservative, the average plant-related radionuclide concentrations were utilized from fish samples taken near the site discharge points. The only plant-related radionuclide detected in fish sampled was Cs-137. This nuclide was detected in one sample from a control location and not detected in any fish sampled from the site discharge location. Therefore, no dose was calculated and was assumed to be zero for this pathway.



7

**SEMI-ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT (1998)
NINE MILE POINT NUCLEAR STATION UNIT 2
DOSES TO MEMBERS OF THE PUBLIC DUE TO THEIR ACTIVITIES
OUTSIDE THE SITE BOUNDARY**

JANUARY - DECEMBER 1998

8. The shoreline sediment pathway is considered relative to recreational activities. The dose due to recreational activities from shoreline sediment is based on the methodology in the ODCM, as adapted from Regulatory Guide 1.109. The ODCM gives the total dose to the whole body and skin from the sum of plant-related radionuclides detected in actual shoreline sediment samples. The plant-related radionuclide concentration is adjusted for background sample results, as applicable. The total whole body and skin dose from shoreline recreational activities are $2.2E-04$ mRem whole body and $2.6E-04$ mRem skin dose for the period.

In summary, the maximum dose to the likely most exposed member of the public is $9.2E-02$ mRem to the thyroid (maximum organ dose) and $8.7E-02$ mRem to the whole body. It should be noted that the maximum organ dose and maximum whole body doses are based on the sum of the maximum doses observed for all three facilities regardless of age group. This results in some conservatism. The maximum organ and whole body doses were a result of gaseous effluents. Doses as a result of liquid effluents were secondary. The total whole body and skin dose from shoreline recreational activities are $2.2E-04$ mRem whole body and $2.6E-04$ mRem skin dose for the period. The direct radiation dose to the critical residence from the generating facilities was insignificant or zero. The dose to an individual as a result of fish consumption was also zero. These maximum total doses are a result of operations at the NMP1, NMP2 and the JAF facilities. The maximum organ dose and whole body dose are below the 40CFR190 criteria of 25 mRem per calendar year to the maximum exposed organ or the whole body, and below 75 mRem per calendar year to the thyroid.



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ATTACHMENT 12

Update of Actual Data for the Second Quarter 1998



Unit 1 <input type="checkbox"/> Unit 2 <input checked="" type="checkbox"/>		Reporting Period <u>January - June 1998</u>		
UPDATE OF RELEASE AND DOSE DATA FOR GASEOUS (ELEVATED AND GROUND LEVEL) AND LIQUID EFFLUENTS				
Update of data using actual results from the off-site vendors for Strontium, Tritium, and Iron-55 for the second quarter 1998.				
Nuclide ¹	GASEOUS 2 nd QUARTER 1998		LIQUID 2 nd QUARTER 1998	
	Activity (Ci)		Activity (Ci)	
Sr-89	**		**	
Sr-90	**		**	
H-3	<u>2.70E+00</u>		<u>5.06E+00</u>	
Fe-55	<u>9.87E - 05</u>		<u>1.99E - 03</u>	
<u>Particulates</u>	1. Particulates with half-lives >8 days	Ci	<u>1.16E - 03</u>	<u>8.59E - 02</u>
	2. Average release rate (gaseous) or diluted concentration (liquid) for reporting period	$\mu\text{Ci/sec}$ (gaseous) $\mu\text{Ci/ml}$ (liquid)	<u>1.47E - 04</u>	<u>5.69E - 09</u>
<u>Tritium</u>	1. Total release	Ci	<u>2.70E+00</u>	<u>5.06E+00</u>
	2. Average release rate for period (gaseous) or diluted concentration (liquids) for the reporting period	$\mu\text{Ci/sec}$ (gaseous) $\mu\text{Ci/ml}$ (liquid)	<u>3.43E - 01</u>	<u>3.35E - 07</u>
<u>Tritium, Iodines, and Particulates (with half-lives greater than 8 days)</u>	1. Percent of Quarterly Dose Limit ²	%	<u>1.38E - 02</u> (Quarterly)	<u>1.73E+00</u> (Quarterly)
	2. Percent of Annual Dose Limit to Date ²	%	<u>1.16E -02</u> (Annual)	<u>8.64E - 01</u> (Annual)
	3. Percent of Organ -Gaseous Dose Rate Limit (Quarterly)	%	<u>2.77E - 04</u> (Quarterly)	<u>1.09E+00</u> (Quarterly)
	-Liquid Dose Limit (Quarterly & Annual)	%	<u>N/A</u> (Annual)	<u>5.43E - 01</u> (Annual)
	4. Percent of 10CFR20 Concentration Limit ³ (Liquid)	%	<u>N/A</u>	<u>2.03E - 03</u>
5. Percent of Dissolved or Entrained Noble Gas (Liquid)	%	<u>N/A</u>	<u>4.47E - 07</u>	
<p>¹ Concentrations less than the lower limit of detection, as required by Technical Specifications are indicated with a double asterisk.</p> <p>² The dose is to the whole body for liquid effluents and to the maximally exposed organ for gaseous effluents.</p> <p>³ The percent of the 10CFR20 concentration limit is based on the average concentration during the quarter.</p>				

