

Edwin I. Hatch Nuclear Plant
Joseph M. Farley Nuclear Plant
Vogtle Electric Generating Plant
Annual Radioactive Effluent Release Reports and
Offsite Dose Calculation Manuals for 2013

Enclosure 2

Farley Annual Radioactive Effluent Release Report for 2013

SOUTHERN NUCLEAR OPERATING COMPANY
FARLEY NUCLEAR PLANT UNIT NO. ONE
LICENSE NO. NPF-2
AND
FARLEY NUCLEAR PLANT UNIT NO. TWO
LICENSE NO. NPF-8

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT
CALENDAR YEAR 2013

FARLEY NUCLEAR PLANT
ANNUAL RADIOACTIVE EFFLUENT
RELEASE REPORT

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1.0 LIQUID EFFLUENTS

This section contains applicable ODCM limits for liquid effluents as well as the quantities of radioactive liquid effluents released during 2013. These quantities are summarized on a quarterly basis and include any unplanned releases. A tabulation of the total body and organ doses which were calculated in accordance with ODCM 2.4 are presented to show conformance with the limits of ODCM 2.1.3.

1.1 Regulatory Requirements

1.1.1 Concentration Limits

Technical Specifications 5.5.4.b and 5.5.4.c state that the concentration of radioactive material released in liquid effluents to UNRESTRICTED AREAS (see ODCM Figure 10-1) shall be limited at all times to ten times the concentrations specified in 10CFR20, Appendix B, Table 2, Column 2 for radionuclides other than dissolved or entrained noble gases. For dissolved or entrained noble gases, the concentration shall be limited to 1.0E-04 uCi/ml total activity.

1.1.2 Dose Limits

Technical Specifications 5.5.4.d and 5.5.4.e state that the dose or dose commitment to a MEMBER OF THE PUBLIC from radioactive materials in liquid effluents released, from each unit, to UNRESTRICTED AREAS (see ODCM Figure 10-1) shall be limited:

- a. During any calendar quarter to less than or equal to 1.5 mrem to the total body and to less than or equal to 5 mrem to any organ, and
- b. During any calendar year to less than or equal to 3 mrem to the total body and to less than or equal to 10 mrem to any organ.

1.2 Effluent Concentration Limit (ECL)

ECL values used in determining allowable liquid radwaste release rates and concentrations, for principal gamma emitters, I-131, tritium, Sr-89, Sr-90 and Fe-55, are taken from 10CFR Part 20, Appendix B, Table 2, Column 2. A tolerance factor of up to 10 is utilized to allow flexibility in establishing practical monitor setpoints which can accommodate effluent releases at concentrations higher than the ECL values stated in 10CFR20, Appendix B, Table 2, Column 2.

For dissolved or entrained noble gases in liquid radwaste, the ECL is 1.0E-04 uCi/ml total activity.

For gross alpha in liquid radwaste, the ECL is 2.0E-09 uCi/ml.

Furthermore, for all the above radionuclides, or categories of radioactivity, the overall ECL fraction is determined in accordance with 10CFR Part 20, Appendix B.

1.3 Measurements and Approximation of Total Radioactivity

The radionuclides listed below are considered when evaluating liquid effluents:

MN-54	CS-134
FE-59	CS-137
CO-58	CE-141
CO-60	CE-144
ZN-65	MO-99
SR-89	FE-55
SR-90	H-3
I-131	

1.3.1 Total Radioactivity Determination

Batch Releases: Representative pre-release grab samples are obtained and analyzed in accordance with ODCM Table 2-3. Isotopic analyses are performed using the computerized pulse height analysis system utilizing high resolution germanium detectors. Isotopic values thus obtained are used for release rate calculations as specified in the ODCM. Only those nuclides that are detected are used in the calculations. All Strontium and Iron-55 samples are sent offsite to the Georgia Power Environmental Laboratory for analysis. Gross beta and gross alpha determinations are made using 2 pi gas flow proportional counters. Tritium determinations are made using liquid scintillation techniques. Dissolved gases are determined employing grab sampling techniques and then counting on the pulse height analyzer.

The sample analyses results are used along with the ECL values to determine the ECL fraction for the planned release. The ECL fraction is then used, with the appropriate safety factors, and the expected dilution stream flow, to calculate the maximum permissible release rate and a liquid effluent monitor setpoint. The monitor setpoint is calculated to assure that the limits of the ODCM are not exceeded. A monitor reading in excess of the calculated setpoint will result in automatic termination of the liquid radwaste discharge.

Radionuclide concentrations, safety factors, dilution stream flow rate, and liquid effluent radiation monitor calibration factors are used by the computer to generate a pre-release printout. If the release is not permissible, appropriate warnings will be displayed on the computer screen and on the printout. If the release is permissible, it is approved by a Chemistry Technician. The release permit is transferred from the Chemistry Department to the Operations Department for release. When the release is completed, the actual release data are provided to the Chemistry Department. These release data, including release rate and release duration, are input into the computer and a post-release printout is generated. This printout contains the actual release rates, radionuclide concentrations and quantities, dilution flow, and calculated doses to an individual.

Continuous Releases: Continuous releases are analogous to batch releases except that they are analyzed on a weekly composite basis in accordance with ODCM Table 2-3.

Typically achieved liquid effluent sample analyses minimum detectable concentrations are reported in Table 1-4.

1.3.2 Total Error Estimation

The maximum error associated with volume and flow measurements, based upon plant calibration practice is estimated to be + or - 10%. The average error associated with counting is estimated to be less than + or - 15%.

1.4 Liquid Effluent Release Data

Summaries of all radioactive liquid effluents released from Units 1 and 2 during 2013 are presented in accordance with Regulatory Guide 1.21 Tables 2A and 2B. Information required by Table 2A is found in this report in Tables 1-1A, 1-1B, and 1-1C; Table 2-B information is presented in Tables 1-2A, 1-2B, and 1-2C. Data is presented on a quarterly basis as required by Regulatory Guide 1.21 for all four quarters.

1.5 Radiological Impact Due to Liquid Releases

The total body and organ doses for Units 1 and 2 are provided in the following tables in order to show conformance with the limits of ODCM 2.1.3:

Unit 1 2013 Doses to a Member of the Public due to Liquid Releases:
Table 1-3A

Unit 2 2013 Doses to a Member of the Public due to Liquid Releases:
Table 1-3B

1.6 Liquid Effluents - Batch Releases

Batch release information for Units 1 and 2 is summarized in the following tables:

Unit 1 2013 Liquid Effluents - Batch Release Summary: Table 1-5A

Unit 2 2013 Liquid Effluents - Batch Release Summary: Table 1-5B

1.7 Liquid Effluents - Abnormal Releases

There were no abnormal releases during 2013.

Abnormal release information for Units 1 and 2 is summarized in the following tables:

Unit 1 2013 Liquid Effluents - Abnormal Release Summary: Table 1-6A

Unit 2 2013 Liquid Effluents - Abnormal Release Summary: Table 1-6B

Table 1-1A
Joseph M Farley Nuclear Plant
RADIOACTIVE EFFLUENT RELEASE REPORT - 2013
Liquid Effluents - Summation of All Releases
Unit: 1

Starting: 1-Jan- 2013 Ending: 31-Dec-2013

<u>Type of Effluent</u>	<u>Units</u>	<u>1ST Quarter</u>	<u>2ND Quarter</u>	<u>3RD Quarter</u>	<u>4TH Quarter</u>
A. Fission And Activation Products					
1. Total Release (not including tritium, gases, alpha)	Curies	1.47E-02	1.44E-02	1.68E-02	3.13E-02
2. Average diluted concentration during period	uCi/mL	1.35E-08	1.21E-08	1.07E-09	3.86E-08
3. Percent of Applicable Limit	%	*	*	*	*
B. Tritium					
1. Total Release	Curies	1.60E+02	1.43E+02	9.68E+01	3.94E+01
2. Average diluted Concentration during period	uCi/mL	1.47E-04	1.20E-04	6.14E-06	4.86E-05
3. Percent of Applicable Limit	%	*	*	*	*
C. Dissolved and Entrained Gases					
1. Total Release	Curies	5.50E-04	1.74E-03	1.07E-02	1.27E-03
2. Average diluted Concentration during period	uCi/mL	5.05E-10	1.46E-09	6.81E-10	1.57E-09
3. Percent of Applicable Limit	%	*	*	*	*
D: Gross Alpha Radioactivity					
1. Total Release	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00
E: Waste Vol Release (Pre-Dilution)					
	Liters	1.34E+06	1.32E+06	2.57E+07	9.79E+05
F. Volume of Dilution Water Used					
	Liters	1.09E+09	1.19E+09	1.57E+10	8.10E+08

* Applicable limits are expressed in terms of dose. See Tables 1-3A and 1-3B of this report.

Table 1-1B
Joseph M Farley Nuclear Plant
RADIOACTIVE EFFLUENT RELEASE REPORT - 2013
Liquid Effluents - Summation of All Releases
Unit: 2
Starting: 1-Jan- 2013 Ending: 31-Dec-2013

<u>Type of Effluent</u>	<u>Units</u>	<u>1ST Quarter</u>	<u>2ND Quarter</u>	<u>3RD Quarter</u>	<u>4TH Quarter</u>
A. Fission And Activation Products					
1. Total Release (not including tritium, gases, alpha)	Curies	3.43E-02	1.72E-02	2.40E-02	3.70E-02
2. Average diluted concentration during period	uCi/mL	2.14E-08	1.18E-08	1.59E-09	3.84E-08
3. Percent of Applicable Limit	%	*	*	*	*
B. Tritium					
1. Total Release	Curies	1.90E+02	9.95E+01	7.40E+01	5.96E+01
2. Average diluted Concentration during period	uCi/mL	1.18E-04	6.83E-05	4.91E-06	6.19E-05
3. Percent of Applicable Limit	%	*	*	*	*
C. Dissolved and Entrained Gases					
1. Total Release	Curies	6.89E-04	1.66E-03	8.43E-03	1.28E-03
2. Average diluted Concentration during period	uCi/mL	4.30E-10	1.14E-09	5.60E-10	1.33E-09
3. Percent of Applicable Limit	%	*	*	*	*
D: Gross Alpha Radioactivity					
1. Total Release	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00
E: Waste Vol Release (Pre-Dilution)					
	Liters	1.80E+06	1.71E+06	2.10E+07	1.17E+06
F. Volume of Dilution Water Used					
	Liters	1.60E+09	1.45E+09	1.51E+10	9.62E+08

* Applicable limits are expressed in terms of dose. See Tables 1-3A and 1-3B of this report.

Table 1-1C
Joseph M Farley Nuclear Plant
RADIOACTIVE EFFLUENT RELEASE REPORT - 2013
Liquid Effluents - Summation of All Releases
Unit: Site
Starting: 1-Jan- 2013 Ending: 31-Dec-2013

<u>Type of Effluent</u>	<u>Units</u>	<u>1ST Quarter</u>	<u>2ND Quarter</u>	<u>3RD Quarter</u>	<u>4TH Quarter</u>
A. Fission And Activation Products					
1. Total Release (not including tritium, gases, alpha)	Curies	4.90E-02	3.16E-02	4.09E-02	6.83E-02
2. Average diluted concentration during period	uCi/mL	1.82E-08	1.19E-08	1.32E-09	3.85E-08
3. Percent of Applicable Limit	%	*	*	*	*
B. Tritium					
1. Total Release	Curies	3.50E+02	2.43E+02	1.71E+02	9.90E+01
2. Average diluted Concentration during period	uCi/mL	1.30E-04	9.17E-05	5.54E-06	5.58E-05
3. Percent of Applicable Limit	%	*	*	*	*
C. Dissolved and Entrained Gases					
1. Total Release	Curies	1.24E-03	3.40E-03	1.92E-02	2.55E-03
2. Average diluted Concentration during period	uCi/mL	4.61E-10	1.28E-09	6.22E-10	1.44E-09
3. Percent of Applicable Limit	%	*	*	*	*
D: Gross Alpha Radioactivity					
1. Total Release	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00
E: Waste Vol Release (Pre-Dilution)					
	Liters	3.14E+06	3.03E+06	4.68E+07	2.15E+06
F. Volume of Dilution Water Used					
	Liters	2.69E+09	2.64E+09	3.08E+10	1.77E+09

* Applicable limits are expressed in terms of dose. See Tables 1-3A and 1-3B of this report.

Table 1-2A
Joseph M Farley Nuclear Plant
RADIOACTIVE EFFLUENT RELEASE REPORT - 2013
Liquid Effluents
Unit: 1
Starting: 1-Jan- 2013 Ending: 31-Dec-2013

Continuous Mode					
Nuclides Released	Units	1ST Quarter	2ND Quarter	3RD Quarter	4TH Quarter
Fission & Activation Products					
Sr-90	Curies	0.00E+00	0.00E+00	8.16E-05	0.00E+00
Total For Period	Curies	0.00E+00	0.00E+00	8.16E-05	0.00E+00
Tritium					
No Nuclides Found	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Dissolved And Entrained Gases					
No Nuclides Found	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Zeroes in this table indicate that no radioactivity was present at detectable levels.
 See Table 1-4 for typical minimum detectable concentrations.

Table 1-2A
Joseph M Farley Nuclear Plant
RADIOACTIVE EFFLUENT RELEASE REPORT - 2013
Liquid Effluents
Unit: 1
Starting: 1-Jan- 2013 Ending: 31-Dec-2013

Nuclides Released	Units	Batch Mode			
		1ST Quarter	2ND Quarter	3RD Quarter	4TH Quarter
Fission & Activation Products					
Y-88	Curies	0.00E+00	3.12E-07	0.00E+00	3.09E-07
Y-91	Curies	0.00E+00	0.00E+00	0.00E+00	1.46E-04
Y-94	Curies	1.79E-06	0.00E+00	0.00E+00	0.00E+00
As-76	Curies	0.00E+00	2.02E-05	0.00E+00	3.28E-06
Co-58	Curies	4.66E-04	6.59E-04	3.48E-04	2.90E-03
Co-60	Curies	4.59E-04	4.39E-04	5.54E-04	1.27E-03
Cr-51	Curies	2.24E-04	2.31E-04	4.82E-05	1.22E-03
Fe-55	Curies	3.60E-05	9.66E-05	5.10E-05	1.11E-03
Fe-59	Curies	0.00E+00	1.36E-06	0.00E+00	8.44E-06
I-130	Curies	0.00E+00	0.00E+00	0.00E+00	5.94E-07
I-131	Curies	0.00E+00	0.00E+00	0.00E+00	6.81E-07
I-132	Curies	0.00E+00	0.00E+00	0.00E+00	1.92E-06
I-133	Curies	0.00E+00	0.00E+00	2.22E-06	0.00E+00
Mn-54	Curies	4.76E-06	1.06E-06	1.03E-05	1.85E-05
Nb-95	Curies	6.23E-05	6.68E-05	6.27E-05	4.48E-04
Nb-97	Curies	0.00E+00	5.20E-06	0.00E+00	2.49E-05
Ni-56	Curies	2.10E-06	3.14E-05	3.52E-05	4.94E-05
Ni-63	Curies	3.08E-04	1.70E-04	4.16E-04	8.22E-04
Sr-85	Curies	0.00E+00	0.00E+00	5.55E-07	0.00E+00
Sr-90	Curies	8.52E-06	4.29E-06	6.04E-06	3.73E-06
Sr-92	Curies	0.00E+00	0.00E+00	0.00E+00	6.07E-07
Zn-65	Curies	2.07E-06	1.94E-06	1.16E-06	1.64E-05
Zr-95	Curies	2.95E-05	3.11E-05	2.36E-05	2.36E-04
Ce-141	Curies	1.59E-06	0.00E+00	0.00E+00	0.00E+00
Cs-137	Curies	1.85E-05	1.63E-06	1.03E-04	3.21E-05

Zeroes in this table indicate that no radioactivity was present at detectable levels. See Table 1-4 for typical minimum detectable concentrations.

Table 1-2A

**Joseph M Farley Nuclear Plant
RADIOACTIVE EFFLUENT RELEASE REPORT - 2013**

Liquid Effluents

Unit: 1

Starting: 1-Jan-2013 Ending: 31-Dec-2013

Nuclides Released	Unit	Batch Mode			
		1ST Quarter	2ND Quarter	3RD Quarter	4TH Quarter
Cs-139	Curies	0.00E+00	0.00E+00	2.95E-05	0.00E+00
Hg-203	Curies	0.00E+00	0.00E+00	0.00E+00	6.98E-07
Pr-144	Curies	0.00E+00	0.00E+00	0.00E+00	4.34E-04
Pr-146	Curies	0.00E+00	0.00E+00	0.00E+00	1.40E-06
Rh-105	Curies	1.12E-04	9.86E-05	0.00E+00	5.24E-04
Sb-122	Curies	0.00E+00	0.00E+00	0.00E+00	5.90E-07
Sb-124	Curies	1.17E-05	5.42E-06	6.12E-06	2.89E-05
Sb-125	Curies	4.11E-04	2.30E-05	1.71E-04	5.70E-04
Sn-113	Curies	0.00E+00	0.00E+00	0.00E+00	5.91E-06
Tc-99M	Curies	0.00E+00	0.00E+00	3.32E-06	0.00E+00
Te-129	Curies	0.00E+00	0.00E+00	0.00E+00	6.70E-05
Te-132	Curies	0.00E+00	0.00E+00	0.00E+00	8.98E-06
Ag-108M	Curies	0.00E+00	0.00E+00	2.73E-07	3.57E-06
Ag-110M	Curies	0.00E+00	0.00E+00	0.00E+00	2.46E-05
Sn-117M	Curies	2.80E-06	2.77E-05	4.12E-07	0.00E+00
Te-125M	Curies	1.25E-02	1.25E-02	1.49E-02	2.12E-02
Te-129M	Curies	0.00E+00	0.00E+00	0.00E+00	1.02E-04
Total For Period	Curies	1.47E-02	1.44E-02	1.67E-02	3.13E-02
Tritium					
H-3	Curies	1.60E+02	1.43E+02	9.68E+01	3.94E+01

Zeros in this table indicate that no radioactivity was present at detectable levels.
See Table 1-4 for typical minimum detectable concentrations.

Table 1-2A
Joseph M Farley Nuclear Plant
RADIOACTIVE EFFLUENT RELEASE REPORT - 2013
Liquid Effluents
Unit: 1
Starting: 1-Jan-2013 Ending: 31-Dec-2013

Nuclides Released	Unit	Batch Mode			
		1ST Quarter	2ND Quarter	3RD Quarter	4TH Quarter
Dissolved And Entrained Gases					
Ar-41	Curies	4.24E-05	2.02E-05	1.12E-06	0.00E+00
Kr-85	Curies	0.00E+00	0.00E+00	1.23E-04	0.00E+00
Kr-88	Curies	0.00E+00	0.00E+00	0.00E+00	9.45E-06
Xe-133	Curies	5.08E-04	1.68E-03	1.05E-02	1.25E-03
Xe-135	Curies	0.00E+00	3.28E-05	3.56E-05	0.00E+00
Xe-131M	Curies	0.00E+00	0.00E+00	0.00E+00	1.64E-05
Xe-133M	Curies	0.00E+00	3.51E-06	4.87E-05	0.00E+00
Total For Period	Curies	5.50E-04	1.74E-03	1.07E-02	1.27E-03

Zeros in this table indicate that no radioactivity was present at detectable levels.
 See Table 1-4 for typical minimum detectable concentrations.

Table 1-2B

**Joseph M Farley Nuclear Plant
 RADIOACTIVE EFFLUENT RELEASE REPORT - 2013
 Liquid Effluents
 Unit: 2
 Starting: 1-Jan-2013 Ending: 31-Dec-2013**

Nuclides Released	Unit	Continuous Mode			
		1ST Quarter	2ND Quarter	3RD Quarter	4TH Quarter
Fission & Activation Products					
Sr-90	Curies	0.00E+00	0.00E+00	8.86E-05	0.00E+00
Total For Period	Curies	0.00E+00	0.00E+00	8.86E-05	0.00E+00
Tritium					
No Nuclides Found	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Dissolved And Entrained Gases					
No Nuclides Found	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Zeroes in this table indicate that no radioactivity was present at detectable levels.
 See Table 1-4 for typical minimum detectable concentrations.

Table 1-2B

**Joseph M Farley Nuclear Plant
RADIOACTIVE EFFLUENT RELEASE REPORT - 2013**

Liquid Effluents

Unit: 2

Starting: 1-Jan-2013 Ending: 31-Dec-2013

Nuclides Released	Unit	Batch Mode			
		1ST Quarter	2ND Quarter	3RD Quarter	4TH Quarter
Fission & Activation Products					
Y-94	Curies	0.00E+00	0.00E+00	0.00E+00	1.32E-06
As-76	Curies	0.00E+00	1.27E-05	0.00E+00	3.41E-05
Br-82	Curies	0.00E+00	0.00E+00	3.20E-05	0.00E+00
Br-84	Curies	0.00E+00	0.00E+00	1.49E-06	0.00E+00
Co-57	Curies	0.00E+00	0.00E+00	0.00E+00	1.97E-06
Co-58	Curies	1.35E-03	4.90E-04	3.22E-04	1.83E-03
Co-60	Curies	1.24E-03	7.14E-04	5.97E-04	9.37E-04
Cr-51	Curies	5.71E-04	2.69E-04	1.27E-05	3.36E-04
Fe-55	Curies	4.84E-05	1.00E-04	2.77E-05	4.30E-04
Fe-59	Curies	0.00E+00	0.00E+00	0.00E+00	9.36E-06
I-131	Curies	1.90E-06	1.07E-06	2.83E-07	0.00E+00
I-132	Curies	4.41E-07	0.00E+00	4.29E-07	5.27E-06
I-133	Curies	2.76E-05	1.96E-05	8.98E-06	0.00E+00
Mn-54	Curies	2.47E-05	9.76E-06	1.81E-06	1.15E-05
Mn-56	Curies	0.00E+00	0.00E+00	0.00E+00	5.53E-07
Mo-99	Curies	0.00E+00	2.72E-06	0.00E+00	0.00E+00
Na-24	Curies	1.38E-04	9.07E-05	2.49E-04	0.00E+00
Nb-95	Curies	1.43E-04	9.90E-05	3.97E-05	1.13E-04
Nb-97	Curies	0.00E+00	3.67E-07	0.00E+00	8.83E-06
Ni-56	Curies	1.80E-06	2.98E-05	3.90E-05	3.55E-05
Ni-63	Curies	3.13E-04	2.33E-04	3.96E-04	3.89E-04
Sr-90	Curies	0.00E+00	0.00E+00	6.50E-06	0.00E+00
Y-91M	Curies	0.00E+00	0.00E+00	2.86E-06	0.00E+00
Zn-65	Curies	3.03E-05	2.60E-06	7.87E-06	0.00E+00
Zr-95	Curies	8.64E-05	4.06E-05	1.36E-05	4.54E-05

Zeroes in this table indicate that no radioactivity was present at detectable levels.

See Table 1-4 for typical minimum detectable concentrations. - 13 -

Table 1-2B

**Joseph M Farley Nuclear Plant
RADIOACTIVE EFFLUENT RELEASE REPORT - 2013**

Liquid Effluents

Unit: 2

Starting: 1-Jan-2013 Ending: 31-Dec-2013

Nuclides Released	Unit	Batch Mode			
		1ST Quarter	2ND Quarter	3RD Quarter	4TH Quarter
Ce-141	Curies	0.00E+00	0.00E+00	0.00E+00	9.50E-07
Ce-144	Curies	0.00E+00	2.81E-06	0.00E+00	0.00E+00
Cs-137	Curies	2.19E-06	1.35E-05	1.13E-05	1.58E-05
Eu-155	Curies	0.00E+00	0.00E+00	9.04E-07	0.00E+00
La-142	Curies	0.00E+00	0.00E+00	1.47E-06	0.00E+00
Pr-144	Curies	3.76E-05	0.00E+00	0.00E+00	8.61E-05
Pr-146	Curies	0.00E+00	0.00E+00	1.10E-06	0.00E+00
Rh-105	Curies	3.00E-04	1.16E-04	1.30E-06	1.59E-04
Sb-122	Curies	0.00E+00	0.00E+00	2.43E-05	6.11E-06
Sb-124	Curies	1.10E-05	0.00E+00	8.68E-05	7.14E-05
Sb-125	Curies	2.50E-04	9.38E-05	8.06E-05	6.79E-04
Sn-113	Curies	0.00E+00	0.00E+00	0.00E+00	2.74E-06
Tc-99M	Curies	1.87E-05	1.10E-05	1.37E-05	7.07E-07
Te-129	Curies	0.00E+00	0.00E+00	3.50E-06	1.25E-04
Te-132	Curies	0.00E+00	0.00E+00	0.00E+00	1.12E-05
Te-133	Curies	0.00E+00	0.00E+00	0.00E+00	2.16E-06
Ag-108M	Curies	0.00E+00	2.85E-07	0.00E+00	1.84E-06
Ag-110M	Curies	0.00E+00	0.00E+00	0.00E+00	1.11E-05
Sn-117M	Curies	8.22E-06	3.96E-05	1.88E-05	3.33E-06
Te-125M	Curies	2.97E-02	1.48E-02	2.19E-02	3.16E-02
Te-129M	Curies	0.00E+00	0.00E+00	0.00E+00	2.20E-05
Total For Period	Curies	3.43E-02	1.72E-02	2.39E-02	3.70E-02
Tritium					
H-3	Curies	1.90E+02	9.95E+01	7.40E+01	5.96E+01

Table 1-2B

**Joseph M Farley Nuclear Plant
 RADIOACTIVE EFFLUENT RELEASE REPORT - 2013
 Liquid Effluents
 Unit: 2
 Starting: 1-Jan-2013 Ending: 31-Dec-2013**

Nuclides Released	Unit	Batch Mode			
		1ST Quarter	2ND Quarter	3RD Quarter	4TH Quarter
Dissolved And Entrained Gases					
Ar-41	Curies	7.38E-05	2.05E-05	3.52E-06	0.00E+00
Kr-87	Curies	0.00E+00	0.00E+00	1.30E-06	0.00E+00
Kr-88	Curies	0.00E+00	1.32E-06	0.00E+00	0.00E+00
Xe-133	Curies	6.14E-04	1.60E-03	8.37E-03	1.27E-03
Xe-135	Curies	1.10E-06	3.30E-05	3.18E-05	6.52E-06
Xe-133M	Curies	0.00E+00	6.87E-06	3.25E-05	0.00E+00
Total For Period	Curies	6.89E-04	1.66E-03	8.43E-03	1.28E-03

Zeros in this table indicate that no radioactivity was present at detectable levels.
 See Table 1-4 for typical minimum detectable concentrations.

Table 1-2C
Joseph M Farley Nuclear Plant
RADIOACTIVE EFFLUENT RELEASE REPORT - 2013
Liquid Effluents
Unit: Site
Starting: 1-Jan- 2013 Ending: 31-Dec-2013

Continuous Mode

Nuclides Released	Units	1ST Quarter	2ND Quarter	3RD Quarter	4TH Quarter
Fission & Activation Products					
Sr-90	Curies	0.00E+00	0.00E+00	1.70E-04	0.00E+00
Total For Period	Curies	0.00E+00	0.00E+00	1.70E-04	0.00E+00
Tritium					
No Nuclides Found	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Dissolved And Entrained Gases					
No Nuclides Found	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Zeroes in this table indicate that no radioactivity was present at detectable levels.
See Table 1-4 for typical minimum detectable concentrations.

Table 1-2C
Joseph M Farley Nuclear Plant
RADIOACTIVE EFFLUENT RELEASE REPORT - 2013
Liquid Effluents
Unit: Site
Starting: 1-Jan- 2013 Ending: 31-Dec-2013

Nuclides Released	Units	Batch Mode			
		1ST Quarter	2ND Quarter	3RD Quarter	4TH Quarter
Fission & Activation Products					
Y-88	Curies	0.00E+00	3.12E-07	0.00E+00	3.09E-07
Y-91	Curies	0.00E+00	0.00E+00	0.00E+00	1.46E-04
Y-94	Curies	1.79E-06	0.00E+00	0.00E+00	1.32E-06
As-76	Curies	0.00E+00	3.30E-05	0.00E+00	3.74E-05
Br-82	Curies	0.00E+00	0.00E+00	3.20E-05	0.00E+00
Br-84	Curies	0.00E+00	0.00E+00	1.49E-06	0.00E+00
Co-57	Curies	0.00E+00	0.00E+00	0.00E+00	1.97E-06
Co-58	Curies	1.81E-03	1.15E-03	6.70E-04	4.73E-03
Co-60	Curies	1.70E-03	1.15E-03	1.15E-03	2.21E-03
Cr-51	Curies	7.95E-04	5.00E-04	6.09E-05	1.56E-03
Fe-55	Curies	8.44E-05	1.97E-04	7.86E-05	1.54E-03
Fe-59	Curies	0.00E+00	1.36E-06	0.00E+00	1.78E-05
I-130	Curies	0.00E+00	0.00E+00	0.00E+00	5.94E-07
I-131	Curies	1.90E-06	1.07E-06	2.83E-07	6.81E-07
I-132	Curies	4.41E-07	0.00E+00	4.29E-07	7.19E-06
I-133	Curies	2.76E-05	1.96E-05	1.12E-05	0.00E+00
Mn-54	Curies	2.95E-05	1.08E-05	1.21E-05	3.00E-05
Mn-56	Curies	0.00E+00	0.00E+00	0.00E+00	5.53E-07
Mo-99	Curies	0.00E+00	2.72E-06	0.00E+00	0.00E+00
Na-24	Curies	1.38E-04	9.07E-05	2.49E-04	0.00E+00
Nb-95	Curies	2.05E-04	1.66E-04	1.02E-04	5.61E-04
Nb-97	Curies	0.00E+00	5.56E-06	0.00E+00	3.37E-05
Ni-56	Curies	3.90E-06	6.12E-05	7.41E-05	8.48E-05
Ni-63	Curies	6.21E-04	4.03E-04	8.12E-04	1.21E-03
Sr-85	Curies	0.00E+00	0.00E+00	5.55E-07	0.00E+00

Zeros in this table indicate that no radioactivity was present at detectable levels.

See Table 1-4 for typical minimum detectable concentrations.

Table 1-2C
Joseph M Farley Nuclear Plant
RADIOACTIVE EFFLUENT RELEASE REPORT - 2013
Liquid Effluents
Unit: Site
Starting: 1-Jan- 2013 Ending: 31-Dec-2013

Nuclides Released	Units	Batch Mode			
		1ST Quarter	2ND Quarter	3RD Quarter	4TH Quarter
Sr-90	Curies	8.52E-06	4.29E-06	1.25E-05	3.73E-06
Sr-92	Curies	0.00E+00	0.00E+00	0.00E+00	6.07E-07
Y-91M	Curies	0.00E+00	0.00E+00	2.86E-06	0.00E+00
Zn-65	Curies	3.23E-05	4.54E-06	9.03E-06	1.64E-05
Zr-95	Curies	1.16E-04	7.17E-05	3.72E-05	2.81E-04
Ce-141	Curies	1.59E-06	0.00E+00	0.00E+00	9.50E-07
Ce-144	Curies	0.00E+00	2.81E-06	0.00E+00	0.00E+00
Cs-137	Curies	2.06E-05	1.51E-05	1.14E-04	4.79E-05
Cs-139	Curies	0.00E+00	0.00E+00	2.95E-05	0.00E+00
Eu-155	Curies	0.00E+00	0.00E+00	9.04E-07	0.00E+00
Hg-203	Curies	0.00E+00	0.00E+00	0.00E+00	6.98E-07
La-142	Curies	0.00E+00	0.00E+00	1.47E-06	0.00E+00
Pr-144	Curies	3.76E-05	0.00E+00	0.00E+00	5.20E-04
Pr-146	Curies	0.00E+00	0.00E+00	1.10E-06	1.40E-06
Rh-105	Curies	4.11E-04	2.15E-04	1.30E-06	6.83E-04
Sb-122	Curies	0.00E+00	0.00E+00	2.43E-05	6.70E-06
Sb-124	Curies	2.27E-05	5.42E-06	9.29E-05	1.00E-04
Sb-125	Curies	6.61E-04	1.17E-04	2.52E-04	1.25E-03
Sn-113	Curies	0.00E+00	0.00E+00	0.00E+00	8.65E-06
Tc-99M	Curies	1.87E-05	1.10E-05	1.70E-05	7.07E-07
Te-129	Curies	0.00E+00	0.00E+00	3.50E-06	1.92E-04
Te-132	Curies	0.00E+00	0.00E+00	0.00E+00	2.02E-05
Te-133	Curies	0.00E+00	0.00E+00	0.00E+00	2.16E-06
Ag-108M	Curies	0.00E+00	2.85E-07	2.73E-07	5.42E-06
Ag-110M	Curies	0.00E+00	0.00E+00	0.00E+00	3.57E-05
Sn-117M	Curies	1.10E-05	6.73E-05	1.92E-05	3.33E-06

Zeroes in this table indicate that no radioactivity was present at detectable levels.
See Table 1-4 for typical minimum detectable concentrations.

Table 1-2C

**Joseph M Farley Nuclear Plant
RADIOACTIVE EFFLUENT RELEASE REPORT - 2013**

Liquid Effluents

Unit: Site

Starting: 1-Jan-2013 Ending: 31-Dec-2013

Nuclides Released	Unit	Batch Mode			
		1ST Quarter	2ND Quarter	3RD Quarter	4TH Quarter
Te-125M	Curies	4.22E-02	2.73E-02	3.68E-02	5.28E-02
Te-129M	Curies	0.00E+00	0.00E+00	0.00E+00	1.24E-04
Total For Period	Curies	4.90E-02	3.16E-02	4.07E-02	6.83E-02
Tritium					
H-3	Curies	3.50E+02	2.43E+02	1.71E+02	9.90E+01
Dissolved And Entrained Gases					
Ar-41	Curies	1.16E-04	4.07E-05	4.64E-06	0.00E+00
Kr-85	Curies	0.00E+00	0.00E+00	1.23E-04	0.00E+00
Kr-87	Curies	0.00E+00	0.00E+00	1.30E-06	0.00E+00
Kr-88	Curies	0.00E+00	1.32E-06	0.00E+00	9.45E-06
Xe-133	Curies	1.12E-03	3.28E-03	1.89E-02	2.52E-03
Xe-135	Curies	1.10E-06	6.58E-05	6.74E-05	6.52E-06
Xe-131M	Curies	0.00E+00	0.00E+00	0.00E+00	1.64E-05
Xe-133M	Curies	0.00E+00	1.04E-05	8.12E-05	0.00E+00
Total For Period	Curies	1.24E-03	3.40E-03	1.92E-02	2.55E-03

Table 1-3A

**Joseph M Farley Nuclear Plant
RADIOACTIVE EFFLUENT RELEASE REPORT - 2013
Doses to a member of the public due to Liquid Releases
Unit: 1
Starting: 1-Jan-2013 Ending: 31-Dec-2013**

Cumulative Doses Per Quarter

Organ	ODCM Lmt	Units	1ST Qtr	% ODCM	2ND Qtr	% ODCM	3RD Qtr	% ODCM	4TH Qtr	% ODCM
Bone	5.00E+00	mRem	6.38E-03	1.28E-01	5.53E-03	1.11E-01	1.23E-02	2.46E-01	1.00E-02	2.01E-01
GI-Lli	5.00E+00	mRem	2.48E-02	4.96E-01	2.24E-02	4.49E-01	2.37E-02	4.74E-01	3.52E-02	7.04E-01
Kidney	5.00E+00	mRem	2.47E-02	4.94E-01	2.26E-02	4.51E-01	2.37E-02	4.73E-01	3.41E-02	6.82E-01
Liver	5.00E+00	mRem	4.20E-03	8.40E-02	3.57E-03	7.15E-02	3.28E-03	6.57E-02	3.90E-03	7.81E-02
Lung	5.00E+00	mRem	4.94E-03	9.87E-02	1.79E-03	3.58E-02	1.98E-03	3.96E-02	3.94E-03	7.88E-02
Thyroid	5.00E+00	mRem	3.76E-03	7.52E-02	3.20E-03	6.40E-02	2.71E-03	5.42E-02	2.96E-03	5.92E-02
Total Body	5.00E+00	mRem	2.97E-03	5.95E-02	2.41E-03	4.82E-02	3.42E-03	6.85E-02	1.85E-03	3.69E-02
Total Body	1.50E+00	mRem	2.97E-03	1.98E-01	2.41E-03	1.61E-01	3.42E-03	2.28E-01	1.85E-03	1.23E-01

Cumulative Doses per Year

Organ	ODCM Lmt	Units	Year to Ending Date	% ODCM	Receptor	Limit
Bone	1.00E+01	mRem	3.42E-02	3.42E-01	Maximum Individual Liquid	Liquid Effluent Organ Annual
GI-Lli	1.00E+01	mRem	1.06E-01	1.06E+00	Maximum Individual Liquid	Liquid Effluent Organ Annual
Kidney	1.00E+01	mRem	1.05E-01	1.05E+00	Maximum Individual Liquid	Liquid Effluent Organ Annual
Liver	1.00E+01	mRem	1.50E-02	1.50E-01	Maximum Individual Liquid	Liquid Effluent Organ Annual
Lung	1.00E+01	mRem	1.26E-02	1.26E-01	Maximum Individual Liquid	Liquid Effluent Organ Annual
Thyroid	1.00E+01	mRem	1.26E-02	1.26E-01	Maximum Individual Liquid	Liquid Effluent Organ Annual
Total Body	1.00E+01	mRem	1.07E-02	1.07E-01	Maximum Individual Liquid	Liquid Effluent Organ Annual
Total Body	3.00E+00	mRem	1.07E-02	3.55E-01	Maximum Individual Liquid	Liquid Effluent TB Annual

Table 1-3B
Joseph M Farley Nuclear Plant
RADIOACTIVE EFFLUENT RELEASE REPORT - 2013
Doses to a member of the public due to Liquid Releases
Unit: 2
Starting: 1-Jan- 2013 Ending: 31-Dec-2013

Cumulative Doses Per Quarter

Organ	ODCM Lmt	Units	1ST Qtr	% ODCM	2ND Qtr	% ODCM	3RD Qtr	% ODCM	4TH Qtr	% ODCM
Bone	5.00E+00	mRem	1.13E-02	2.26E-01	6.02E-03	1.20E-01	1.53E-02	3.06E-01	1.25E-02	2.50E-01
GI-Lli	5.00E+00	mRem	4.58E-02	9.16E-01	2.40E-02	4.79E-01	3.41E-02	6.82E-01	4.88E-02	9.77E-01
Kidney	5.00E+00	mRem	4.60E-02	9.21E-01	2.40E-02	4.81E-01	3.41E-02	6.83E-01	4.86E-02	9.73E-01
Liver	5.00E+00	mRem	6.03E-03	1.21E-01	3.24E-03	6.48E-02	3.85E-03	7.69E-02	5.13E-03	1.03E-01
Lung	5.00E+00	mRem	3.15E-03	6.30E-02	1.62E-03	3.25E-02	1.26E-03	2.51E-02	4.22E-03	8.44E-02
Thyroid	5.00E+00	mRem	5.29E-03	1.06E-01	2.82E-03	5.64E-02	3.26E-03	6.53E-02	4.21E-03	8.42E-02
Total Body	5.00E+00	mRem	3.56E-03	7.12E-02	1.94E-03	3.87E-02	3.56E-03	7.12E-02	2.37E-03	4.75E-02
Total Body	1.50E+00	mRem	3.56E-03	2.37E-01	1.94E-03	1.29E-01	3.56E-03	2.37E-01	2.37E-03	1.58E-01

Cumulative Doses per Year

Organ	ODCM Lmt	Units	Year to Ending Date	% ODCM	Receptor	Limit
Bone	1.00E+01	mRem	4.51E-02	4.51E-01	Maximum Individual Liquid	Liquid Effluent Organ Annual
GI-Lli	1.00E+01	mRem	1.53E-01	1.53E+00	Maximum Individual Liquid	Liquid Effluent Organ Annual
Kidney	1.00E+01	mRem	1.53E-01	1.53E+00	Maximum Individual Liquid	Liquid Effluent Organ Annual
Liver	1.00E+01	mRem	1.82E-02	1.82E-01	Maximum Individual Liquid	Liquid Effluent Organ Annual
Lung	1.00E+01	mRem	1.02E-02	1.02E-01	Maximum Individual Liquid	Liquid Effluent Organ Annual
Thyroid	1.00E+01	mRem	1.56E-02	1.56E-01	Maximum Individual Liquid	Liquid Effluent Organ Annual
Total Body	1.00E+01	mRem	1.14E-02	1.14E-01	Maximum Individual Liquid	Liquid Effluent Organ Annual
Total Body	3.00E+00	mRem	1.14E-02	3.81E-01	Maximum Individual Liquid	Liquid Effluent TB Annual

TABLE 1-4
Joseph M. Farley Nuclear Plant
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT - 2013
MINIMUM DETECTABLE CONCENTRATION - LIQUID SAMPLE ANALYSES

The values in this table represent a priori Minimum Detectable Concentrations (MDC) that are typically achieved in laboratory analyses of liquid radwaste samples.

Nuclide	MDC (uCi/ML)
MN-54	4.01E-08
CO-58	3.12E-08
FE-59	9.04E-08
CO-60	1.76E-08
ZN-65	1.19E-07
MO-99	2.98E-07
I-131	3.05E-08
CS-134	4.01E-08
CS-137	3.84E-08
CE-141	4.21E-08
CE-144	1.51E-07

Table 1-5A

**Joseph M Farley Nuclear Plant
 RADIOACTIVE EFFLUENT RELEASE REPORT - 2013
 Liquid Effluents - Batch Release Summary
 Unit: 1
 Starting: 1-Jan-2013 Ending: 31-Dec-2013**

Liquid Releases	Units	1ST Quarter	2ND Quarter	3RD Quarter	4TH Quarter	Year Totals
1. Number of batch releases		100	100	104	74	378
2. Total time period for Batch releases	(Minutes)	1.14E+04	1.12E+04	1.22E+04	7.94E+03	4.27E+04
3. Maximum time period for a batch release	(Minutes)	1.60E+02	1.41E+02	1.95E+02	1.61E+02	1.95E+02
4. Average time period for a batch release	(Minutes)	1.14E+02	1.12E+02	1.17E+02	1.07E+02	1.13E+02
5. Minimum time period for a batch release	(Minutes)	9.50E+01	5.00E+01	9.00E+01	2.00E+01	2.00E+01
6. Average stream flow during periods of release of liquid effluent into a flowing stream *	(CFS)	1.27E+04	9.14E+03	1.07E+04	7.83E+03	1.01E+04

*Average River Flow Rate, taken at Walter F. George Lock and Dam, located 30.7 miles above Farley Nuclear Plant.

Table 1-5B
Joseph M Farley Nuclear Plant
RADIOACTIVE EFFLUENT RELEASE REPORT - 2013
Liquid Effluents - Batch Release Summary
Unit: 2
Starting: 1-Jan- 2013 Ending: 31-Dec-2013

Liquid Releases	Units	1ST Quarter	2ND Quarter	3RD Quarter	4TH Quarter	Year Totals
1. Number of batch releases		136	129	127	88	480
2. Total time period for Batch releases	(Minutes)	1.39E+04	1.34E+04	1.28E+04	8.75E+03	4.89E+04
3. Maximum time period for a batch release	(Minutes)	1.75E+02	1.80E+02	1.35E+02	1.41E+02	1.80E+02
4. Average time period for a batch release	(Minutes)	1.02E+02	1.04E+02	1.01E+02	9.94E+01	1.02E+02
5. Minimum time period for a batch release	(Minutes)	8.70E+01	8.60E+01	8.90E+01	8.50E+01	8.50E+01
6. Average stream flow during periods of release of liquid effluent into a flowing stream *	(CFS)	1.27E+04	9.14E+03	1.07E+04	7.83E+03	1.01E+04

*Average River Flow Rate, taken at Walter F. George Lock and Dam, located 30.7 miles above Farley Nuclear Plant.

Table 1-6A
Joseph M Farley Nuclear Plant
RADIOACTIVE EFFLUENT RELEASE REPORT - 2013
Liquid Effluents - Abnormal Release Summary
Unit: 1
Starting: 1-Jan- 2013 Ending: 31-Dec-2013

iquid Releases	Units	1ST Quarter	2ND Quarter	3RD Quarter	4TH Quarter	Year Totals
1. Number of Releases		0	0	0	0	0
2. Total Time For All Releases	(Minutes)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
3. Maximum Time For A Release	(Minutes)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
4. Average Time For A Release	(Minutes)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
5. Minimum Time For A Release	(Minutes)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
6. Total activity for all releases	(Curies)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Table 1-6B
Joseph M Farley Nuclear Plant
RADIOACTIVE EFFLUENT RELEASE REPORT - 2013
Liquid Effluents - Abnormal Release Summary
Unit: 2
Starting: 1-Jan- 2013 Ending: 31-Dec-2013

iquid Releases	Units	1ST Quarter	2ND Quarter	3RD Quarter	4TH Quarter	Year Totals
1. Number of Releases		0	0	0	0	0
2. Total Time For All Releases	(Minutes)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
3. Maximum Time For A Release	(Minutes)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
4. Average Time For A Release	(Minutes)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
5. Minimum Time For A Release	(Minutes)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
6. Total activity for all releases	(Curies)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

2.0 GASEOUS EFFLUENTS

This section contains applicable ODCM limits for gaseous effluents as well as the quantities of radioactive gaseous effluents released during 2013. These quantities are summarized on a quarterly basis and include any unplanned releases. Tabulations are provided of the offsite air doses calculated in accordance with ODCM 3.4.2 to show conformance with the limits of ODCM 3.1.3, and the offsite organ doses to a member of the public calculated in accordance with ODCM 3.4.3 to show conformance with ODCM 3.1.4.

2.1 Regulatory Requirements

The requirements presented in this section are for Unit 1 and Unit 2.

2.1.1 Dose Rate Limits

The dose rates due to radioactive materials released in gaseous effluents from the site to areas at and beyond the SITE BOUNDARY shall be limited to the following:

- a. For noble gases: Less than or equal to 500 mrem/yr. to the whole body and less than or equal to 3000 mrem/yr. to the skin, and
- b. For Iodine-131, Iodine-133, tritium and for all radionuclides in particulate form with half-lives greater than 8 days: Less than or equal to 1500 mrem/yr. to any organ.

2.1.2 Air Doses Due to Noble Gases in Gaseous Releases

Technical Specifications 5.5.4.e and 5.5.4.h state that the air dose due to noble gases released in gaseous effluents, from each reactor unit, to areas at and beyond the SITE BOUNDARY (see ODCM Figure 10-1) shall be limited to the following:

- a. During any calendar quarter: Less than or equal to 5 mrad for gamma radiation and less than or equal to 10 mrad for beta radiation, and
- b. During any calendar year: Less than or equal to 10 mrad for gamma radiation and less than or equal to 20 mrad for beta radiation.

2.1.3 Doses to a Member of the Public

Technical Specifications 5.5.4.e and 5.5.4.i state that the dose to a MEMBER OF THE PUBLIC from I-131, I-133, tritium, and all radionuclides in particulate form with half-lives greater than 8 days in gaseous effluents released, from each reactor unit, to areas at and beyond the SITE BOUNDARY (see ODCM Figure 10-1) shall be limited to the following:

- a. During any calendar quarter: Less than or equal to 7.5 mrem to any organ, and
- b. During any calendar year: Less than or equal to 15 mrem to any organ.

2.2 Measurements and Approximation of Total Radioactivity

The following noble gases are considered in evaluating gaseous effluents:

KR-87	XE-133
KR-88	XE-135
XE-133M	XE-138

The following radioiodines and radioactive materials in particulate form are specifically considered in evaluating gaseous effluents:

MN-54	MO-99
FE-59	I-131
CO-58	CS-134
CO-60	CS-137
ZN-65	CE-141
SR-89	CE-144
SR-90	H-3

2.2.1 Sample collection and Analysis

Periodic grab samples from plant effluent streams are analyzed by a computerized pulse height analyzer system utilizing high resolution germanium detectors. Samples are obtained and analyzed in accordance with ODCM Table 3-3. Isotopic values thus obtained are used for release rate calculations as specified in ODCM 3.4.2 and ODCM 3.4.3. Only those nuclides which are detected are used in calculations. For radioiodines and particulates, in addition to the nuclides listed above other nuclides with half-lives greater than 8 days which are identified are also considered.

Continuous Releases: Continuous sampling is performed on the continuous release points (i.e. the Plant Vent Stack, Containment Purge when in continuous mode, and the Turbine Building Vent). Particulate material is collected by filtration. Periodically these filters are removed and analyzed on the pulse height analyzer to identify and quantify radioactive materials collected on the filters. Particulate filters are then analyzed for gross alpha and strontium as required. All gross alpha, Sr-89 and Sr-90 samples are sent offsite to the Georgia Power Environmental Laboratory for analysis.

Batch Releases: The processing of batch type releases (from Containment when in batch mode, or Waste Gas Decay Tanks) is analogous to continuous releases, except that the release is not commenced until samples have been obtained and analyzed. Containment Purge batch releases were commenced at FNP beginning in 2006 in order to take advantage of additional decay time for short lived radionuclides.

Typically achieved minimum detectable concentrations for gaseous effluent sample analyses are reported in Table 2-6.

2.2.2 Total Quantities of Radioactivity, Dose Rates, and Cumulative Doses

The methods for determining release quantities of radioactivity, dose rates, and cumulative doses follow:

2.2.2.1 Fission and Activation Gases

The released radioactivity is determined using sample analyses results collected as described in section 2.2.1 and the average release flow rates over the period represented by the collected sample.

Dose rates due to noble gases, radioiodines, tritium, and particulates are calculated (with computer assistance). The calculated dose rates are compared to the dose rate limits specified in ODCM 3.1.2 for noble gases, radioiodine, tritium, and particulates. Dose rate calculation methodology is presented in the ODCM.

Beta and gamma air doses due to noble gases are calculated for the location in the unrestricted area with the potential for the highest exposure due to gaseous releases. Air doses are calculated for each release period and cumulative totals are kept for each unit for the calendar quarter and year. Cumulative air doses are compared to the dose limits specified in ODCM 3.1.3. The current percent of the ODCM limits are shown on the printout for each release period. Air dose calculation methodology is presented in the ODCM.

2.2.2.2 Radioiodine, Tritium, and Particulate Releases

Released quantities of radioiodines are determined using the weekly samples and release flow rates for the applicable release points. Radioiodine concentrations are determined by gamma spectroscopy.

Release quantities of particulates are determined using the weekly (filter) samples and release flow rates for the applicable release points. Gamma spectroscopy is used to quantify the concentrations of principal gamma emitters.

After each quarter, the particulate filters from each applicable vent (plant vent stack and containment purge) are combined, fused, and a strontium separation is performed. Since sample flows and vent flows are almost constant over each quarterly period the filters from each vent can be dissolved together. Decay corrections are performed back to the middle of the quarterly collection period. If Sr-89 or Sr-90 is not detected, MDC's are calculated. Strontium concentrations are input into the composite file of the computer and used for release dose rate and individual dose calculations.

Tritium samples are obtained monthly from the Plant Vent Stack, the Containment Purge when in batch mode, and the Turbine Building Vent (and weekly for Containment Purge when in continuous mode) by passing the sample stream through a cold trap or by using the bubble method. The grams of water vapor/cubic meter is measured upstream of the cold trap in order to alleviate the difficulties in determining water vapor collection efficiencies. The tritium samples are analyzed onsite and the results furnished in uCi/ml of water. The tritium concentration in water is converted to the tritium concentration in air and this value is input into the composite file of the computer and used in release, dose rate, and individual dose calculations.

Dose rates due to radioiodine, tritium and particulates are calculated for a hypothetical child exposed to the inhalation pathway at the location in the unrestricted area where the potential dose rate is expected to be the highest. Dose rates are calculated, for each release point for each release period, and the dose rates from each release point is compared to the dose rate limits specified in ODCM 3.1.2, allocated for each release point as described in ODCM 3.3.2.

Doses to a Member of the Public (individual doses) due to radioiodine, tritium and particulates are calculated for the controlling receptor, which is described in the ODCM. Individual doses are calculated for each release period, and cumulative totals are kept for each unit, for the current calendar quarter and year. Cumulative individual doses are compared to the dose limits specified in ODCM 3.1.4. The current percent of ODCM limits are shown on the printout for each release period.

2.2.2.3 Gross Alpha Release

The gross alpha release is computed each month by counting the particulate filters, for each week for gross alpha activity in a proportional counter. The highest concentration calculated for any of these weeks is used for the monthly value. This value is input into the composite file of the computer and used for release calculations.

2.2.3 Total Error Estimation

The maximum errors associated with monitor readings, sample flow, vent flow, sample collection, monitor calibration and laboratory procedure are collectively estimated to be:

Fission and Activation Gases	Iodine	Particulates	Tritium
75%	60%	50%	45%

The average error associated with counting is estimated to be:

Fission and Activation Gases	Iodine	Particulates	Tritium
19%	28%	20%	8%

2.3 Gaseous Effluent Release Data

Regulatory Guide 1.21 Tables 1A, 1B and 1C are found in this report as Tables 2-1A, 2-1B, 2-1C, 2-2A, 2-2B, 2-2C, 2-3A, 2-3B, and 2-3C. Data are presented on a quarterly basis as required by Regulatory Guide 1.21.

To complete Tables 2-1A and 2-1B, the total release for each of the four categories (fission and activation gases, radioiodines, particulates and tritium) was divided by the number of seconds in the quarter to obtain a release rate in uCi/second for each category. However, the percent of the ODCM limits are not applicable because FNP has no curie limit for gaseous releases. Applicable limits are expressed in terms of dose. Noble gases are limited as specified in ODCM 3.1.2. The other three categories (tritium, radioiodines, and particulates) are limited as a group as specified in ODCM 3.1.2.

Dose rates due to noble gas releases and due to radioiodines, tritium and particulate releases were calculated as part of the pre-release and post-release permits. No limits were exceeded for this reporting period.

Gross alpha radioactivity is reported in Tables 2-1A, 2-1B and 2-1C as curies released in each quarter.

Limits for cumulative beta and gamma air doses due to noble gases are presented in Tables 2-4A and 2-4B along with the percent of ODCM limits.

Limits for cumulative doses to an individual due to radioiodines, tritium and particulates are specified in ODCM 3.1.4. Cumulative individual doses are presented in Tables 2-5A and 2-5B along with percent of ODCM limits.

2.4 Radiological Impact Due to Gaseous Releases

The air doses due to noble gases and doses to a Member of the Public due to radioiodines, tritium and particulates in gaseous effluents for Units 1 and 2 are provided in the following tables in order to show conformance with the limits of ODCM 3.1.3 and ODCM 3.1.4:

Unit 1 2013 Air Doses Due to Noble Gases in Gaseous Releases: Table 2-4A

Unit 2 2013 Air Doses Due to Noble Gases in Gaseous Releases: Table 2-4B

Unit 1 2013 Doses to a Member of the Public Due to Radioiodines, Tritium, and Particulates in Gaseous Releases: Table 2-5A

Unit 2 2013 Doses to a Member of the Public Due to Radioiodines, Tritium, and Particulates in Gaseous Releases: Table 2-5B

2.5 Gaseous Effluents - Batch Releases

Batch release information for Units 1 and 2 is summarized in the following tables:

Unit 1 2013 Gaseous Effluents - Batch Release Summary: Table 2-7A

Unit 2 2013 Gaseous Effluents - Batch Release Summary: Table 2-7B

2.6 Gaseous Effluents - Abnormal Releases

There were no abnormal releases on Unit 1 or Unit 2 during 2013.

Abnormal release information for Units 1 and 2 is summarized in the following tables:

Unit 1 2013 Gaseous Effluents - Abnormal Release Summary: Table 2-8A

Unit 2 2013 Gaseous Effluents - Abnormal Release Summary: Table 2-8B

Table 2-1A

**Joseph M Farley Nuclear Plant
RADIOACTIVE EFFLUENT RELEASE REPORT - 2013**

Gaseous Effluents - Summation Of All Releases

Unit: 1

Starting: 1-Jan-2013 Ending: 31-Dec-2013

Type of Effluent	Units	1ST Quarter	2ND Quarter	3RD Quarter	4TH Quarter
A. Fission And Activation Gases					
1. Total Release	Curies	8.54E-01	9.53E-01	1.07E+00	2.26E+00
2. Average Release rate for period	uCi/sec	1.08E-01	1.21E-01	1.35E-01	2.87E-01
3. Percent of Applicable Limit	%	*	*	*	*
B. Radioiodines					
1. Total Iodine-131	Curies	0.00E+00	0.00E+00	0.00E+00	6.25E-07
2. Average Release rate for period	uCi/sec	0.00E+00	0.00E+00	0.00E+00	7.93E-08
3. Percent of Applicable Limit	%	*	*	*	*
C. Particulates					
1. Particulates (Half-Lives > 8 Days)	Curies	0.00E+00	3.07E-09	3.33E-08	6.42E-08
2. Average Release rate for period	uCi/sec	0.00E+00	3.90E-10	4.22E-09	8.140E-09
3. Percent of Applicable Limit	%	*	*	*	*
D. Tritium					
1. Total Release	Curies	1.52E+00	1.12E+00	1.14E+00	1.73E+00
2. Average Release rate for period	uCi/sec	1.92E-01	1.43E-01	1.44E-01	2.20E-01
3. Percent of Applicable Limit	%	*	*	*	*
E. Gross Alpha					
1. Total Release	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00
2. Average Release rate for period	uCi/sec	0.00E+00	0.00E+00	0.00E+00	0.00E+00

* Applicable limits are expressed in terms of dose. See Tables 2-4A, 2-4B, 2-5A, 2-5B of this report.

Table 2-1B
Joseph M Farley Nuclear Plant
RADIOACTIVE EFFLUENT RELEASE REPORT - 2013
Gaseous Effluents - Summation Of All Releases

Unit: 2

Starting: 1-Jan- 2013 Ending: 31-Dec-2013

<u>Type of Effluent</u>	<u>Units</u>	<u>1ST Quarter</u>	<u>2ND Quarter</u>	<u>3RD Quarter</u>	<u>4TH Quarter</u>
A. Fission And Activation Gases					
1. Total Release	Curies	6.61E-01	6.03E-01	1.73E-01	3.97E-01
2. Average Release rate for period	uCi/sec	8.38E-02	7.65E-02	2.19E-02	5.03E-02
3. Percent of Applicable Limit	%	*	*	*	*
B. Radioiodines					
1. Total Iodine-131	Curies	0.00E+00	7.51E-08	0.00E+00	0.00E+00
2. Average Release rate for period	uCi/sec	0.00E+00	9.53E-09	0.00E+00	0.00E+00
3. Percent of Applicable Limit	%	*	*	*	*
C. Particulates					
1. Particulates (Half-Lives > 8 Days)	Curies	0.00E+00	0.00E+00	6.46E-09	0.00E+00
2. Average Release rate for period	uCi/sec	0.00E+00	0.00E+00	8.20E-10	0.000E+00
3. Percent of Applicable Limit	%	*	*	*	*
D. Tritium					
1. Total Release	Curies	2.39E+00	4.94E+00	2.26E+01	3.12E+00
2. Average Release rate for period	uCi/sec	3.04E-01	6.27E-01	2.87E+00	3.95E-01
3. Percent of Applicable Limit	%	*	*	*	*
E. Gross Alpha					
1. Total Release	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00
2. Average Release rate for period	uCi/sec	0.00E+00	0.00E+00	0.00E+00	0.00E+00

*Applicable limits are expressed in terms of dose. See Tables 2-4A, 2-4B, 2-5A, 2-5B of this report.

Table 2-1C

**Joseph M Farley Nuclear Plant
RADIOACTIVE EFFLUENT RELEASE REPORT - 2013
Gaseous Effluents - Summation Of All Releases
Unit: Site
Starting: 1-Jan-2013 Ending: 31-Dec-2013**

Type of Effluent	Units	1ST Quarter	2ND Quarter	3RD Quarter	4TH Quarter
A. Fission And Activation Gases					
1. Total Release	Curies	1.51E+00	1.56E+00	1.24E+00	2.66E+00
2. Average Release rate for period	uCi/sec	1.92E-01	1.97E-01	1.57E-01	3.37E-01
3. Percent of Applicable Limit	%	*	*	*	*
B. Radioiodines					
1. Total Iodine-131	Curies	0.00E+00	7.51E-08	0.00E+00	6.25E-07
2. Average Release rate for period	uCi/sec	0.00E+00	9.53E-09	0.00E+00	7.93E-08
3. Percent of Applicable Limit	%	*	*	*	*
C. Particulates					
1. Particulates (Half-Lives > 8 Days)	Curies	0.00E+00	3.07E-09	3.97E-08	6.42E-08
2. Average Release rate for period	uCi/sec	0.00E+00	3.90E-10	5.04E-09	8.140E-09
3. Percent of Applicable Limit	%	*	*	*	*
D. Tritium					
1. Total Release	Curies	3.91E+00	6.07E+00	2.37E+01	4.85E+00
2. Average Release rate for period	uCi/sec	4.96E-01	7.70E-01	3.01E+00	6.15E-01
3. Percent of Applicable Limit	%	*	*	*	*
E. Gross Alpha					
1. Total Release	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00
2. Average Release rate for period	uCi/sec	0.00E+00	0.00E+00	0.00E+00	0.00E+00

* Applicable limits are expressed in terms of dose. See Tables 2-4A, 2-4B, 2-5A, 2-5B of this report.

Table 2-2A

Joseph M Farley Nuclear Plant
RADIOACTIVE EFFLUENT RELEASE REPORT - 2013
Gaseous Effluents - Mixed Mode Level Releases
Unit: 1
Starting: 1-Jan- 2013 Ending: 31-Dec-2013

Nuclides Released	Unit	Continuous Mode			
		1ST Quarter	2ND Quarter	3RD Quarter	4TH Quarter
Fission Gases					
Ar-41	Curies	0.00E+00	0.00E+00	0.00E+00	2.00E+00
Total For Period	Curies	0.00E+00	0.00E+00	0.00E+00	2.00E+00
Iodines					
I-131	Curies	0.00E+00	0.00E+00	0.00E+00	5.85E-07
Total For Period	Curies	0.00E+00	0.00E+00	0.00E+00	5.85E-07
Particulates					
Co-60	Curies	0.00E+00	0.00E+00	0.00E+00	5.58E-08
Sr-90	Curies	0.00E+00	0.00E+00	3.33E-08	0.00E+00
Ru-103	Curies	0.00E+00	0.00E+00	0.00E+00	8.40E-09
Total For Period	Curies	0.00E+00	0.00E+00	3.33E-08	6.42E-08
Tritium					
H-3	Curies	1.33E+00	1.03E+00	1.05E+00	1.73E+00
Gross Alpha					
No Nuclides Found	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00

If Not Detected, Nuclide is Not Reported. Zeroes in this table indicate that no radioactivity was present at detectable levels. See Table 2-6 for typical minimum detectable concentrations.

Table 2-2A

**Joseph M Farley Nuclear Plant
RADIOACTIVE EFFLUENT RELEASE REPORT - 2013
Gaseous Effluents - Mixed Mode Level Releases**

Unit: 1

Starting: 1-Jan- 2013 Ending: 31-Dec-2013

Nuclides Released	Unit	Batch Mode			
		1ST Quarter	2ND Quarter	3RD Quarter	4TH Quarter
Fission Gases					
Ar-41	Curies	7.72E-01	8.33E-01	9.10E-01	1.93E-01
Kr-85M	Curies	0.00E+00	0.00E+00	2.91E-04	0.00E+00
Kr-88	Curies	0.00E+00	0.00E+00	2.52E-04	0.00E+00
Xe-131M	Curies	0.00E+00	1.24E-04	0.00E+00	3.85E-04
Xe-133M	Curies	7.88E-06	0.00E+00	2.20E-04	8.56E-05
Xe-133	Curies	7.36E-02	1.07E-01	1.43E-01	6.94E-02
Xe-135	Curies	8.44E-03	1.27E-02	1.43E-02	9.31E-06
Total For Period	Curies	8.54E-01	9.53E-01	1.07E+00	2.63E-01
Iodines					
I-131	Curies	0.00E+00	0.00E+00	0.00E+00	4.02E-08
Total For Period	Curies	0.00E+00	0.00E+00	0.00E+00	4.02E-08
Particulates					
Y-88	Curies	0.00E+00	3.07E-09	0.00E+00	0.00E+00
Total For Period	Curies	0.00E+00	3.07E-09	0.00E+00	0.00E+00
Tritium					
H-3	Curies	1.90E-01	9.13E-02	8.61E-02	4.94E-03
Gross Alpha					
No Nuclides Found	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00

If Not Detected, Nuclide is Not Reported. Zeroes in this table indicate that no radioactivity was present at detectable levels. See Table 2-6 for typical minimum detectable concentrations.

Table 2-2B

Joseph M Farley Nuclear Plant
RADIOACTIVE EFFLUENT RELEASE REPORT - 2013
Gaseous Effluents - Mixed Mode Level Releases
Unit: 2
Starting: 1-Jan- 2013 Ending: 31-Dec-2013

Nuclides Released	Unit	Continuous Mode			
		1ST Quarter	2ND Quarter	3RD Quarter	4TH Quarter
Fission Gases					
Ar-41	Curies	0.00E+00	4.43E-01	0.00E+00	0.00E+00
Total For Period	Curies	0.00E+00	4.43E-01	0.00E+00	0.00E+00
Iodines					
No Nuclides Found	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Particulates					
Sr-90	Curies	0.00E+00	0.00E+00	6.46E-09	0.00E+00
Total For Period	Curies	0.00E+00	0.00E+00	6.46E-09	0.00E+00
Tritium					
H-3	Curies	2.37E+00	4.94E+00	2.26E+01	3.09E+00
Gross Alpha					
No Nuclides Found	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00

If Not Detected, Nuclide is Not Reported. Zeroes in this table indicate that no radioactivity was present at detectable levels. See Table 2-6 for typical minimum detectable concentrations.

Table 2-2B

**Joseph M Farley Nuclear Plant
RADIOACTIVE EFFLUENT RELEASE REPORT - 2013
Gaseous Effluents - Mixed Mode Level Releases**

Unit: 2

Starting: 1-Jan- 2013 Ending: 31-Dec-2013

Nuclides Released	Unit	Batch Mode			
		1ST Quarter	2ND Quarter	3RD Quarter	4TH Quarter
Fission Gases					
Ar-41	Curies	6.61E-01	1.45E-01	1.73E-01	3.96E-01
Xe-133M	Curies	0.00E+00	1.16E-04	0.00E+00	0.00E+00
Xe-133	Curies	0.00E+00	1.29E-02	1.26E-04	4.81E-04
Xe-135	Curies	0.00E+00	2.03E-03	0.00E+00	0.00E+00
Total For Period	Curies	6.61E-01	1.60E-01	1.73E-01	3.97E-01
Iodines					
I-131	Curies	0.00E+00	7.51E-08	0.00E+00	0.00E+00
I-133	Curies	0.00E+00	2.05E-07	0.00E+00	0.00E+00
Total For Period	Curies	0.00E+00	2.80E-07	0.00E+00	0.00E+00
Particulates					
No Nuclides Found	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Tritium					
H-3	Curies	2.78E-02	3.73E-03	3.34E-02	2.53E-02
Gross Alpha					
No Nuclides Found	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00

If Not Detected, Nuclide is Not Reported. Zeroes in this table indicate that no radioactivity was present at detectable levels. See Table 2-6 for typical minimum detectable concentrations.

Table 2-2C

Joseph M Farley Nuclear Plant
RADIOACTIVE EFFLUENT RELEASE REPORT - 2013
Gaseous Effluents - Mixed Mode Level Releases
Unit: Site
Starting: 1-Jan- 2013 Ending: 31-Dec-2013

Nuclides Released	Unit	Continuous Mode			
		1ST Quarter	2ND Quarter	3RD Quarter	4TH Quarter
Fission Gases					
Ar-41	Curies	0.00E+00	4.43E-01	0.00E+00	2.00E+00
Total For Period	Curies	0.00E+00	4.43E-01	0.00E+00	2.00E+00
Iodines					
I-131	Curies	0.00E+00	0.00E+00	0.00E+00	5.85E-07
Total For Period	Curies	0.00E+00	0.00E+00	0.00E+00	5.85E-07
Particulates					
Co-60	Curies	0.00E+00	0.00E+00	0.00E+00	5.58E-08
Sr-90	Curies	0.00E+00	0.00E+00	3.97E-08	0.00E+00
Ru-103	Curies	0.00E+00	0.00E+00	0.00E+00	8.40E-09
Total For Period	Curies	0.00E+00	0.00E+00	3.97E-08	6.42E-08
Tritium					
H-3	Curies	3.69E+00	5.97E+00	2.36E+01	4.82E+00
Gross Alpha					
No Nuclides Found	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00

If Not Detected, Nuclide is Not Reported. Zeroes in this table indicate that no radioactivity was present at detectable levels. See Table 2-6 for typical minimum detectable concentrations.

Table 2-2C

Joseph M Farley Nuclear Plant
RADIOACTIVE EFFLUENT RELEASE REPORT - 2013
 Gaseous Effluents - Mixed Mode Level Releases

Unit: Site

Starting: 1-Jan- 2013 Ending: 31-Dec-2013

Nuclides Released	Unit	Batch Mode			
		1ST Quarter	2ND Quarter	3RD Quarter	4TH Quarter
Fission Gases					
Ar-41	Curies	1.43E+00	9.78E-01	1.08E+00	5.89E-01
Kr-85M	Curies	0.00E+00	0.00E+00	2.91E-04	0.00E+00
Kr-88	Curies	0.00E+00	0.00E+00	2.52E-04	0.00E+00
Xe-131M	Curies	0.00E+00	1.24E-04	0.00E+00	3.85E-04
Xe-133M	Curies	7.88E-06	1.16E-04	2.20E-04	8.56E-05
Xe-133	Curies	7.36E-02	1.20E-01	1.43E-01	6.99E-02
Xe-135	Curies	8.44E-03	1.47E-02	1.43E-02	9.31E-06
Total For Period	Curies	1.51E+00	1.11E+00	1.24E+00	6.59E-01
Iodines					
I-131	Curies	0.00E+00	7.51E-08	0.00E+00	4.02E-08
I-133	Curies	0.00E+00	2.05E-07	0.00E+00	0.00E+00
Total For Period	Curies	0.00E+00	2.80E-07	0.00E+00	4.02E-08
Particulates					
Y-88	Curies	0.00E+00	3.07E-09	0.00E+00	0.00E+00
Total For Period	Curies	0.00E+00	3.07E-09	0.00E+00	0.00E+00
Tritium					
H-3	Curies	2.18E-01	9.50E-02	1.20E-01	3.03E-02
Gross Alpha					
No Nuclides Found	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00

If Not Detected, Nuclide is Not Reported. Zeroes in this table indicate that no radioactivity was present at detectable levels. See Table 2-6 for typical minimum detectable concentrations.

Table 2-3A

**Joseph M Farley Nuclear Plant
 RADIOACTIVE EFFLUENT RELEASE REPORT - 2013
 Gaseous Effluents - Ground Level Releases
 Unit: 1
 Starting: 1-Jan-2013 Ending: 31-Dec-2013**

Nuclides Released	Unit	Continuous Mode			
		1ST Quarter	2ND Quarter	3RD Quarter	4TH Quarter
Fission Gases					
No Nuclides Found	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Iodines					
No Nuclides Found	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Particulates					
No Nuclides Found	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Tritium					
No Nuclides Found	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Gross Alpha					
No Nuclides Found	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00

If Not Detected, Nuclide is Not Reported. Zeroes in this table indicate that no radioactivity was present at detectable levels. See Table 2-6 for typical minimum detectable concentrations.

Table 2-3A

**Joseph M Farley Nuclear Plant
RADIOACTIVE EFFLUENT RELEASE REPORT - 2013
Gaseous Effluents - Ground Level Releases**

Unit: 1

Starting: 1-Jan-2013 Ending: 31-Dec-2013

Nuclides Released	Unit	Batch Mode			
		1ST Quarter	2ND Quarter	3RD Quarter	4TH Quarter
Fission Gases					
No Nuclides Found	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Iodines					
No Nuclides Found	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Particulates					
No Nuclides Found	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Tritium					
No Nuclides Found	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Gross Alpha					
No Nuclides Found	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00

If Not Detected, Nuclide is Not Reported. Zeroes in this table indicate that no radioactivity was present at detectable levels. See Table 2-6 for typical minimum detectable concentrations.

Table 2-3B

**Joseph M Farley Nuclear Plant
RADIOACTIVE EFFLUENT RELEASE REPORT - 2013**

Gaseous Effluents - Ground Level Releases

Unit: 2

Starting: 1-Jan-2013 Ending: 31-Dec-2013

Nuclides Released	Unit	Continuous Mode			
		1ST Quarter	2ND Quarter	3RD Quarter	4TH Quarter
Fission Gases					
No Nuclides Found	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Iodines					
No Nuclides Found	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Particulates					
No Nuclides Found	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Tritium					
No Nuclides Found	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Gross Alpha					
No Nuclides Found	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00

If Not Detected, Nuclide is Not Reported. Zeroes in this table indicate that no radioactivity was present at detectable levels. See Table 2-6 for typical minimum detectable concentrations.

Table 2-3B

**Joseph M Farley Nuclear Plant
RADIOACTIVE EFFLUENT RELEASE REPORT - 2013
Gaseous Effluents - Ground Level Releases**

Unit: 2

Starting: 1-Jan-2013 Ending: 31-Dec-2013

Nuclides Released	Unit	Batch Mode			
		1ST Quarter	2ND Quarter	3RD Quarter	4TH Quarter
Fission Gases					
No Nuclides Found	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Iodines					
No Nuclides Found	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Particulates					
No Nuclides Found	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Tritium					
No Nuclides Found	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Gross Alpha					
No Nuclides Found	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00

If Not Detected, Nuclide is Not Reported. Zeroes in this table indicate that no radioactivity was present at detectable levels. See Table 2-6 for typical minimum detectable concentrations.

Table 2-3C

**Joseph M Farley Nuclear Plant
RADIOACTIVE EFFLUENT RELEASE REPORT - 2013**

Gaseous Effluents - Ground Level Releases

Unit: Site

Starting: 1-Jan-2013 Ending: 31-Dec-2013

Nuclides Released	Unit	Continuous Mode			
		1ST Quarter	2ND Quarter	3RD Quarter	4TH Quarter
Fission Gases					
No Nuclides Found	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Iodines					
No Nuclides Found	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Particulates					
No Nuclides Found	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Tritium					
No Nuclides Found	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Gross Alpha					
No Nuclides Found	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00

If Not Detected, Nuclide is Not Reported. Zeroes in this table indicate that no radioactivity was present at detectable levels. See Table 2-6 for typical minimum detectable concentrations.

Table 2-3C

Joseph M Farley Nuclear Plant
RADIOACTIVE EFFLUENT RELEASE REPORT - 2013
Gaseous Effluents - Ground Level Releases
Unit: Site
Starting: 1-Jan-2013 Ending: 31-Dec-2013

Nuclides Released	Unit	Batch Mode			
		1ST Quarter	2ND Quarter	3RD Quarter	4TH Quarter
Fission Gases					
No Nuclides Found	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Iodines					
No Nuclides Found	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Particulates					
No Nuclides Found	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Tritium					
No Nuclides Found	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Gross Alpha					
No Nuclides Found	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00

If Not Detected, Nuclide is Not Reported. Zeroes in this table indicate that no radioactivity was present at detectable levels. See Table 2-6 for typical minimum detectable concentrations.

Table 2-4A

**Joseph M Farley Nuclear Plant
 RADIOACTIVE EFFLUENT RELEASE REPORT - 2013
 Air Doses Due to Gaseous Releases
 Unit: 1
 Starting: 1-Jan-2013 Ending: 31-Dec-2013**

Cumulative Doses Per Quarter

<u>Type of Radiation</u>	<u>ODCM Lmt</u>	<u>Units</u>	<u>1ST Qtr</u>	<u>% ODCM</u>	<u>2ND Qtr</u>	<u>% ODCM</u>	<u>3RD Qtr</u>	<u>% ODCM</u>	<u>4TH Qtr</u>	<u>% ODCM</u>
Gamma Air	5.00E+00	mRad	2.47E-04	4.95E-03	2.67E-04	5.35E-03	2.93E-04	5.85E-03	6.99E-04	1.40E-02
Beta Air	1.00E+01	mRad	9.01E-05	9.01E-04	9.85E-05	9.85E-04	1.09E-04	1.09E-03	2.49E-04	2.49E-03

Cumulative Doses Per Year

<u>Type of Radiation</u>	<u>ODCM Lmt</u>	<u>Units</u>	<u>Year to End Date</u>	<u>% ODCM</u>	<u>Receptor</u>	<u>Limit</u>
Gamma Air	1.00E+01	mRad	1.51E-03	1.51E-02	Site Boundary SSE Mixed Mode R	Air Dose Gamma Annual
Beta Air	2.00E+01	mRad	5.46E-04	2.73E-03	Site Boundary SSE Mixed Mode R	Air Dose Beta Annual

Table 2-4B

**Joseph M Farley Nuclear Plant
 RADIOACTIVE EFFLUENT RELEASE REPORT - 2013
 Air Doses Due to Gaseous Releases
 Unit: 2
 Starting: 1-Jan-2013 Ending: 31-Dec-2013**

Cumulative Doses Per Quarter

Type of Radiation	ODCM Lmt	Units	1ST Qtr	% ODCM	2ND Qtr	% ODCM	3RD Qtr	% ODCM	4TH Qtr	% ODCM
Gamma Air	5.00E+00	mRad	2.10E-04	4.21E-03	1.87E-04	3.75E-03	5.50E-05	1.10E-03	1.26E-04	2.52E-03
Beta Air	1.00E+01	mRad	7.42E-05	7.42E-04	6.67E-05	6.67E-04	1.94E-05	1.94E-04	4.45E-05	4.45E-04

Cumulative Doses Per Year

Type of Radiation	ODCM Lmt	Units	Year to End Date	% ODCM	Receptor	Limit
Gamma Air	1.00E+01	mRad	5.79E-04	5.79E-03	Site Boundary SSE Mixed Mode R	Air Dose Gamma Annual
Beta Air	2.00E+01	mRad	2.05E-04	1.02E-03	Site Boundary SSE Mixed Mode R	Air Dose Beta Annual

Table 2-5A

**Joseph M Farley Nuclear Plant
RADIOACTIVE EFFLUENT RELEASE REPORT - 2013**

Doses To A Member Of The Public Due To Radioiodines, Tritium, and Particulates in Gaseous Releases

Unit: 1

Starting: 1-Jan-2013 Ending: 31-Dec-2013

Cumulative Doses Per Quarter

<u>Organ</u>	<u>ODCM Lmt</u>	<u>Units</u>	<u>1ST Qtr</u>	<u>% ODCM</u>	<u>2ND Qtr</u>	<u>% ODCM</u>	<u>3RD Qtr</u>	<u>% ODCM</u>	<u>4TH Qtr</u>	<u>% ODCM</u>
Bone	7.50E+00	mRem	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.39E-05	1.86E-04	4.38E-07	5.83E-06
GI-Lli	7.50E+00	mRem	2.07E-04	2.76E-03	1.54E-04	2.05E-03	1.56E-04	2.08E-03	1.57E-04	2.09E-03
Kidney	7.50E+00	mRem	2.07E-04	2.76E-03	1.54E-04	2.05E-03	1.55E-04	2.07E-03	1.57E-04	2.09E-03
Liver	7.50E+00	mRem	2.07E-04	2.76E-03	1.54E-04	2.05E-03	1.55E-04	2.07E-03	1.57E-04	2.09E-03
Lung	7.50E+00	mRem	2.07E-04	2.76E-03	1.54E-04	2.05E-03	1.55E-04	2.07E-03	1.57E-04	2.09E-03
Thyroid	7.50E+00	mRem	2.07E-04	2.76E-03	1.54E-04	2.05E-03	1.55E-04	2.07E-03	1.68E-04	2.24E-03
Total Body	7.50E+00	mRem	2.07E-04	2.76E-03	1.54E-04	2.05E-03	1.59E-04	2.12E-03	1.57E-04	2.09E-03

Cumulative Doses per Year

<u>Organ</u>	<u>ODCM Lmt</u>	<u>Units</u>	<u>Year to Ending Date</u>	<u>% ODCM</u>	<u>Receptor</u>	<u>Limit</u>
Bone	1.500E+01	mRem	1.437E-05	9.583E-05	Gas Controlling Receptor	Iodine/Part Dose Annual
GI-Lli	1.500E+01	mRem	6.740E-04	4.493E-03	Gas Controlling Receptor	Iodine/Part Dose Annual
Kidney	1.500E+01	mRem	6.738E-04	4.492E-03	Gas Controlling Receptor	Iodine/Part Dose Annual
Liver	1.500E+01	mRem	6.738E-04	4.492E-03	Gas Controlling Receptor	Iodine/Part Dose Annual
Lung	1.500E+01	mRem	6.737E-04	4.492E-03	Gas Controlling Receptor	Iodine/Part Dose Annual
Thyroid	1.500E+01	mRem	6.850E-04	4.567E-03	Gas Controlling Receptor	Iodine/Part Dose Annual
Total Body	1.500E+01	mRem	6.773E-04	4.515E-03	Gas Controlling Receptor	Iodine/Part Dose Annual

Table 2-5B

**Joseph M Farley Nuclear Plant
RADIOACTIVE EFFLUENT RELEASE REPORT - 2013**

Doses To A Member Of The Public Due To Radioiodines, Tritium, and Particulates in Gaseous Releases

Unit: 2

Starting: 1-Jan-2013 Ending: 31-Dec-2013

Cumulative Doses Per Quarter

<u>Organ</u>	<u>ODCM Lmt</u>	<u>Units</u>	<u>1ST Qtr</u>	<u>% ODCM</u>	<u>2ND Qtr</u>	<u>% ODCM</u>	<u>3RD Qtr</u>	<u>% ODCM</u>	<u>4TH Qtr</u>	<u>% ODCM</u>
Bone	7.50E+00	mRem	0.00E+00	0.00E+00	5.01E-09	6.68E-08	2.71E-06	3.61E-05	0.00E+00	0.00E+00
GI-Lli	7.50E+00	mRem	3.27E-04	4.36E-03	6.37E-04	8.50E-03	3.09E-03	4.12E-02	4.26E-04	5.68E-03
Kidney	7.50E+00	mRem	3.27E-04	4.36E-03	6.37E-04	8.50E-03	3.09E-03	4.12E-02	4.26E-04	5.68E-03
Liver	7.50E+00	mRem	3.27E-04	4.36E-03	6.37E-04	8.50E-03	3.09E-03	4.12E-02	4.26E-04	5.68E-03
Lung	7.50E+00	mRem	3.27E-04	4.36E-03	6.37E-04	8.50E-03	3.09E-03	4.12E-02	4.26E-04	5.68E-03
Thyroid	7.50E+00	mRem	3.27E-04	4.36E-03	6.39E-04	8.52E-03	3.09E-03	4.12E-02	4.26E-04	5.68E-03
Total Body	7.50E+00	mRem	3.27E-04	4.36E-03	6.37E-04	8.50E-03	3.09E-03	4.12E-02	4.26E-04	5.68E-03

Cumulative Doses per Year

<u>Organ</u>	<u>ODCM Lmt</u>	<u>Units</u>	<u>Year to Ending Date</u>	<u>% ODCM</u>	<u>Receptor</u>	<u>Limit</u>
Bone	1.500E+01	mRem	2.713E-06	1.808E-05	Gas Controlling Receptor	Iodine/Part Dose Annual
GI-Lli	1.500E+01	mRem	4.483E-03	2.988E-02	Gas Controlling Receptor	Iodine/Part Dose Annual
Kidney	1.500E+01	mRem	4.482E-03	2.988E-02	Gas Controlling Receptor	Iodine/Part Dose Annual
Liver	1.500E+01	mRem	4.482E-03	2.988E-02	Gas Controlling Receptor	Iodine/Part Dose Annual
Lung	1.500E+01	mRem	4.482E-03	2.988E-02	Gas Controlling Receptor	Iodine/Part Dose Annual
Thyroid	1.500E+01	mRem	4.484E-03	2.989E-02	Gas Controlling Receptor	Iodine/Part Dose Annual
Total Body	1.500E+01	mRem	4.483E-03	2.989E-02	Gas Controlling Receptor	Iodine/Part Dose Annual

TABLE 2-6
Joseph M. Farley Nuclear Plant
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT - 2013
MINIMUM DETECTABLE CONCENTRATIONS - GASEOUS EFFLUENT ANALYSES

The values in this table represent a priori Minimum Detectable Concentrations (MDC) that are typically achieved in laboratory analyses of gaseous radwaste samples.

<u>Nuclide</u>	<u>MDC (uCi/ML)</u>	<u>Nuclide</u>	<u>MDC (uCi/ML)</u>
MN-54	4.17E-14	KR-87	4.64E-08
CO-58	7.65E-14	KR-88	7.46E-08
FE-59	2.53E-14	XE-133	4.71E-08
CO-60	6.01E-14	XE-133M	1.42E-07
ZN-65	2.40E-13	XE-135	1.58E-08
MO-99	4.46E-13	XE-138	1.21E-07
CS-134	5.17E-14	I-131	5.95E-14
CS-137	6.95E-15	I-133	8.96E-14
CE-141	4.28E-14		
CE-144	1.64E-13		

Table 2-7A
Joseph M Farley Nuclear Plant
RADIOACTIVE EFFLUENT RELEASE REPORT - 2013
Gaseous Effluents - Batch Release Summary
Unit: 1
Starting: 1-Jan- 2013 Ending: 31-Dec-2013

Gaseous Releases	Units	1ST Quarter	2ND Quarter	3RD Quarter	4TH Quarter	Year Totals
1. Number of batch releases		165	181	179	46	571
2. Total time period for batch releases	(Minutes)	8.39E+03	1.41E+04	1.93E+04	7.92E+03	4.97E+04
3. Maximum time period for a batch release	(Minutes)	3.18E+02	1.13E+03	9.08E+02	8.69E+02	1.13E+03
4. Average time period for a batch release	(Minutes)	5.08E+01	7.79E+01	1.08E+02	1.72E+02	8.71E+01
5. Minimum time period for a batch release	(Minutes)	1.00E+00	2.00E+00	4.00E+00	5.00E+00	1.00E+00

Table 2-7B
Joseph M Farley Nuclear Plant
RADIOACTIVE EFFLUENT RELEASE REPORT - 2013
Gaseous Effluents - Batch Release Summary
Unit: 2
Starting: 1-Jan- 2013 Ending: 31-Dec-2013

Gaseous Releases	Units	1ST Quarter	2ND Quarter	3RD Quarter	4TH Quarter	Year Totals
1. Number of batch releases		134	57	45	64	300
2. Total time period for batch releases	(Minutes)	8.57E+03	8.07E+03	3.89E+03	5.25E+03	2.58E+04
3. Maximum time period for a batch release	(Minutes)	3.61E+02	5.49E+02	7.40E+02	1.59E+03	1.59E+03
4. Average time period for a batch release	(Minutes)	6.39E+01	1.42E+02	8.65E+01	8.21E+01	8.60E+01
5. Minimum time period for a batch release	(Minutes)	6.00E+00	3.00E+00	4.00E+00	5.00E+00	3.00E+00

Table 2-8A
Joseph M Farley Nuclear Plant
RADIOACTIVE EFFLUENT RELEASE REPORT - 2013
Gaseous Effluents - Abnormal Release Summary
Unit: 1
Starting: 1-Jan- 2013 Ending: 31-Dec-2013

Gaseous Releases	Units	1ST Quarter	2ND Quarter	3RD Quarter	4TH Quarter	Year Totals
1. Number of Releases		0	0	0	0	0
2. Total Time For All Releases	(Minutes)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
3. Maximum Time For A Release	(Minutes)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
4. Average Time For A Release	(Minutes)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
5. Minimum Time For A Release	(Minutes)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
6. Total activity for all releases	(Curies)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Table 2-8B

Joseph M Farley Nuclear Plant
RADIOACTIVE EFFLUENT RELEASE REPORT - 2013
Gaseous Effluents - Abnormal Release Summary
Unit: 2
Starting: 1-Jan-2013 Ending: 31-Dec-2013

<u>Gaseous Releases</u>	<u>Units</u>	<u>1ST Quarter</u>	<u>2ND Quarter</u>	<u>3RD Quarter</u>	<u>4TH Quarter</u>	<u>Year Totals</u>
1. Number of Releases	:	0	0	0	0	0
2. Total Time For All Releases	(Minutes):	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
3. Maximum Time For A Release	(Minutes):	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
4. Average Time For A Release	(Minutes):	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
5. Minimum Time For A Release	(Minutes):	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
6. Total activity for all releases	(Curies) :	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

3.0 SOLID WASTE

3.1 Regulatory Requirements

3.1.1 Solid Radioactive Waste System

FNP-0-M-30 step B.3.1 states that the radwaste solidification system shall be OPERABLE and used, as applicable in accordance with a PROCESS CONTROL PROGRAM, for the SOLIDIFICATION and packaging of radioactive wastes to ensure meeting the requirements of 10 CFR Part 20 and 10 CFR Part 71 prior to shipment of radioactive wastes from the site.

3.1.2 Reporting Requirements

FNP-0-M-30 step B.5.1 states that the Annual Radioactive Effluent Release Report, submitted in accordance with Technical Specifications 5.6.2 and 5.6.3, shall include a summary of the quantities of solid radwaste released from the units as outlined in Regulatory Guide 1.21, "Measuring, Evaluating, and Reporting Radioactive Material in Liquid and Gaseous Effluents and Solid Waste," Revision 2, June 2009, with data summarized on an annual basis following the format of Table A-3 thereof.

3.2 Solid Waste Data

Regulatory Guide 1.21 Revision 2 Table A-3 is found in the report as Table 3-1.

TABLE 3-1
Joseph M. Farley Nuclear Plant
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT – 2013
SOLID RADIOACTIVE WASTE SHIPPED FOR PROCESSING OR DISPOSAL
Starting 01-Jan-2013 Ending 31-Dec-2013

Resins, Filters, and Evaporator Bottoms Waste Class	Volume		Curies Shipped
	ft ³	m ³	
A	1.83E+02	5.20E+00	6.61E+00
B	1.00E+02	2.83E+00	3.01E+02
C	5.66E+01	1.60E+00	3.33E+01
ALL	3.40E+02	9.63E+00	3.41E+02

Major Nuclides for the Above Table:

Waste Class A	Ni-63 33.334%	Co-60 23.665%	Sb-125 16.003%	Fe-55 11.577%
	C-14 11.047%	H-3 1.647%		
Waste Class B	Co-60 42.952%	Fe-55 31.759%	Ni-63 18.839%	Zn-65 2.970%
	Mn-54 1.959%			
Waste Class C	Co-60 26.817%	Fe-55 21.119%	H-3 16.116%	Co-58 8.436%
	C-14 8.183%	Ni-63 6.098%	Zr-95 3.626%	Sb-125 2.267%
	Cr-51 1.703%	Nb-95 1.347%		
ALL	Co-60 41.002%	Fe-55 30.336%	Ni-63 17.875%	Zn-65 2.724%
	Mn-54 1.808%	H-3 1.622%	Co-58 1.342%	C-14 1.120%

Dry Active Waste Waste Class	Volume		Curies Shipped
	ft ³	m ³	
A	1.92E+04	5.44E+02	4.47E-01
B	0.00E+00	0.00E+00	0.00E+00
C	0.00E+00	0.00E+00	0.00E+00
ALL	1.92E+04	5.44E+02	4.47E-01

Major Nuclides for the Above Table:

Waste Class A	H-3 22.080%	Fe-55 19.509%	Co-60 11.574%	Nb-95 11.422%
	Zr-95 10.009%	Ni-63 8.271%	Co-58 6.873%	C-14 3.436%
	Cr-51 2.399%	Sb-125 1.767%		
Waste Class B	N/A			
Waste Class C	N/A			
ALL	H-3 22.080%	Fe-55 19.509%	Co-60 11.574%	Nb-95 11.422%
	Zr-95 10.009%	Ni-63 8.271%	Co-58 6.873%	C-14 3.436%
	Cr-51 2.399%	Sb-125 1.767%		

Irradiated Components Waste Class	Volume		Curies Shipped
	ft ³	m ³	
A	0.00E+00	0.00E+00	0.00E+00
B	0.00E+00	0.00E+00	0.00E+00
C	0.00E+00	0.00E+00	0.00E+00
ALL	0.00E+00	0.00E+00	0.00E+00

Major Nuclides for the Above Table:

Waste Class A	N/A
Waste Class B	N/A
Waste Class C	N/A
ALL	N/A

TABLE 3-1
Joseph M. Farley Nuclear Plant
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT – 2013
SOLID RADIOACTIVE WASTE SHIPPED FOR PROCESSING OR DISPOSAL
Starting 01-Jan-2013 Ending 31-Dec-2013
(Continued)

Other Waste	Volume		Curies Shipped
	ft ³	m ³	
Waste Class			
A	0.00E+00	0.00E+00	0.00E+00
B	0.00E+00	0.00E+00	0.00E+00
C	0.00E+00	0.00E+00	0.00E+00
ALL	0.00E+00	0.00E+00	0.00E+00

Major Nuclides for the Above Table:

Waste Class A N/A
Waste Class B N/A
Waste Class C N/A
ALL N/A

Sum of All Low-Level Waste Shipped from Site	Volume		Curies Shipped
	ft ³	m ³	
Waste Class			
A	1.94+04	5.49E+02	7.06E+00
B	1.00E+02	2.83E+00	3.01E+02
C	5.66E+01	1.60E+00	3.33E+01
ALL	1.95+04	5.53E+02	3.42E+02

Major Nuclides for the Above Table:

Waste Class A	Ni-63 31.747%	Co-60 22.899%	Sb-125 15.102%	Fe-55 12.079%
	C-14 10.565%	H-3 2.941%	Co-58 1.326%	
Waste Class B	Co-60 42.952%	Fe-55 31.759%	Ni-63 18.839%	Zn-65 2.970%
	Mn-54 1.959%			
Waste Class C	Co-60 26.817%	Fe-55 21.199%	H-3 16.116%	Co-58 8.436%
	C-14 8.183%	Ni-63 6.098%	Zr-95 3.626%	Sb-125 2.267%
	Nb-95 1.347%	Cr-51 1.703%		
ALL	Co-60 40.963%	Fe-55 30.321%	Ni-63 17.862%	Zn-65 2.721%
	Mn-54 1.806%	H-3 1.649%	Co-58 1.349%	C-14 1.123%

4.0 DOSES TO MEMBERS OF THE PUBLIC INSIDE THE SITE BOUNDARY

4.1 Regulatory Requirements

Current FNP effluent controls as established by ODCM 6.1 do not require assessment of the radiation doses from radioactive liquid and gaseous effluents to MEMBERS OF THE PUBLIC due to their activities inside the SITE BOUNDARY (ODCM Figure 10-1).

4.2 Demonstration of Compliance

However, this assessment has been performed for 2013 using the methods described in ODCM 6.2 and is included in this section as Table 4-1.

Table 4-1

Joseph M Farley Nuclear Plant

RADIOACTIVE EFFLUENT RELEASE REPORT - 2013

Doses to a Member of the Public Due to Activities Inside the Site Boundary

Unit: Site

Starting: 1-Jan-2013 Ending: 31-Dec-2013

Location Name: Visitor Center
Distance (kilometers): 3.06E-01
Sector: N
Occupancy Factor: 1.37E-03
Age Group: Child

Ground Level Release	Noble Gas	X/Q (sec/m3): 1.04E-04	
Ground Level Release	Particulate and Radioiodine	X/Q (sec/m3): 1.04E-04	D/Q (m-2): 4.80E-07
Mixed Mode Release	Noble Gas	X/Q (sec/m3): 8.80E-06	
Mixed Mode Release	Particulate and Radioiodine	X/Q (sec/m3): 8.80E-06	D/Q (m-2): 6.20E-08

	Units	1ST Quarter	2ND Quarter	3RD Quarter	4TH Quarter	Year
Bone	mRem	0.00E+00	7.52E-12	1.54E-09	3.27E-09	4.82E-09
Liver	mRem	1.68E-06	2.48E-06	1.02E-05	1.83E-06	1.62E-05
Total Body	mRem	1.68E-06	2.48E-06	1.02E-05	1.83E-06	1.62E-05
Thyroid	mRem	1.68E-06	2.48E-06	1.02E-05	1.83E-06	1.62E-05
Kidney	mRem	1.68E-06	2.48E-06	1.02E-05	1.83E-06	1.62E-05
Lung	mRem	1.68E-06	2.48E-06	1.02E-05	1.83E-06	1.62E-05
GI-Lli	mRem	1.68E-06	2.48E-06	1.02E-05	1.83E-06	1.62E-05
NG Total Body	mRem	4.86E-06	4.83E-06	3.69E-06	8.75E-06	2.21E-05
Whole Body Dose	mRem	6.53E-06	7.31E-06	1.39E-05	1.06E-05	3.83E-05

Table 4-1

Joseph M Farley Nuclear Plant
RADIOACTIVE EFFLUENT RELEASE REPORT - 2013
Doses to a Member of the Public Due to Activities Inside the Site Boundary
Unit: Site
Starting: 1-Jan-2013 Ending: 31-Dec-2013

Location Name: Service Water Pond
Distance (kilometers): 9.66E-01
Sector: N
Occupancy Factor: 7.57E-03
Age Group: Child

Ground Level Release	Noble Gas	X/Q (sec/m3): 4.74E-05	
Ground Level Release	Particulate and Radioiodine	X/Q (sec/m3): 4.74E-05	D/Q (m-2): 1.31E-07
Mixed Mode Release	Noble Gas	X/Q (sec/m3): 9.75E-07	
Mixed Mode Release	Particulate and Radioiodine	X/Q (sec/m3): 9.75E-07	D/Q (m-2): 2.78E-08

	<u>Units</u>	<u>1ST Quarter</u>	<u>2ND Quarter</u>	<u>3RD Quarter</u>	<u>4TH Quarter</u>	<u>Year</u>
Bone	mRem	0.00E+00	1.36E-11	9.41E-10	8.09E-09	9.04E-09
Liver	mRem	1.03E-06	1.52E-06	6.23E-06	1.13E-06	9.90E-06
Total Body	mRem	1.03E-06	1.52E-06	6.23E-06	1.13E-06	9.90E-06
Thyroid	mRem	1.03E-06	1.52E-06	6.23E-06	1.13E-06	9.91E-06
Kidney	mRem	1.03E-06	1.52E-06	6.23E-06	1.13E-06	9.90E-06
Lung	mRem	1.03E-06	1.52E-06	6.23E-06	1.13E-06	9.90E-06
GI-Lli	mRem	1.03E-06	1.52E-06	6.23E-06	1.13E-06	9.90E-06
NG Total Body	mRem	2.97E-06	2.95E-06	2.26E-06	5.36E-06	1.35E-05
Whole Body Dose	mRem	4.00E-06	4.47E-06	8.49E-06	6.49E-06	2.34E-05

Table 4-1

Joseph M Farley Nuclear Plant
RADIOACTIVE EFFLUENT RELEASE REPORT - 2013
Doses to a Member of the Public Due to Activities Inside the Site Boundary
Unit: Site
Starting: 1-Jan-2013 Ending: 31-Dec-2013

Location Name: River Water Discharge - Air
Distance (kilometers): 1.64E+00
Sector: N
Occupancy Factor: 1.14E-02
Age Group: Child

Ground Level Release	Noble Gas	X/Q (sec/m3): 1.63E-05	
Ground Level Release	Particulate and Radioiodine	X/Q (sec/m3): 1.63E-05	D/Q (m-2): 4.55E-08
Mixed Mode Release	Noble Gas	X/Q (sec/m3): 7.05E-07	
Mixed Mode Release	Particulate and Radioiodine	X/Q (sec/m3): 7.05E-07	D/Q (m-2): 1.39E-08

	<u>Units</u>	<u>1ST Quarter</u>	<u>2ND Quarter</u>	<u>3RD Quarter</u>	<u>4TH Quarter</u>	<u>Year</u>
Bone	mRem	0.00E+00	1.08E-11	1.02E-09	6.09E-09	7.13E-09
Liver	mRem	1.12E-06	1.65E-06	6.79E-06	1.22E-06	1.08E-05
Total Body	mRem	1.12E-06	1.65E-06	6.79E-06	1.22E-06	1.08E-05
Thyroid	mRem	1.12E-06	1.65E-06	6.79E-06	1.23E-06	1.08E-05
Kidney	mRem	1.12E-06	1.65E-06	6.79E-06	1.22E-06	1.08E-05
Lung	mRem	1.12E-06	1.65E-06	6.79E-06	1.22E-06	1.08E-05
GI-Li	mRem	1.12E-06	1.65E-06	6.79E-06	1.22E-06	1.08E-05
NG Total Body	mRem	3.24E-06	3.22E-06	2.46E-06	5.83E-06	1.47E-05
Whole Body Dose	mRem	4.35E-06	4.87E-06	9.24E-06	7.06E-06	2.55E-05

5.0 TOTAL DOSE FROM URANIUM FUEL CYCLE (40CFR190)

5.1 Regulatory Requirements

Technical Specification 5.5.4.j states that the dose or dose commitment to any MEMBER OF THE PUBLIC over a calendar year, due to releases of radioactivity and to radiation from uranium fuel cycle sources, shall be limited to less than or equal to 25 mrem to the total body or to any organ, except the thyroid, which shall be limited to less than or equal to 75 mrem (as stated in ODCM 5.1).

With the calculated doses from the release of radioactive materials in liquid or gaseous effluents exceeding twice the limits of ODCM 2.1.3, 3.1.3, or 3.1.4, calculations shall be made according to ODCM 5.2 methods to determine whether the above (ODCM 5.1) limits have been exceeded (as stated in ODCM 5.1.2).

5.2 Demonstration of Compliance

Since none of the ODCM 2.1.3, 3.1.3, or 3.1.4 limits were exceeded during 2013, no calculations were required.

6.0 METEOROLOGICAL DATA

Meteorological data are retained onsite; these data are available to the NRC upon request. The meteorological data include annual summaries of hourly measurements of wind speed, wind direction and atmospheric stability in the form of joint frequency distribution tables.

7.0 PROGRAM DEVIATIONS

7.1 Inoperable Liquid or Gaseous Effluent Monitoring Instrumentation

7.1.1 Regulatory Requirements

ODCM 7.2.2.6 states in part that the Annual Radioactive Effluent Release Report (the report) shall include deviations from the liquid and gaseous effluent monitoring instrumentation operability requirements included in Sections 2.1.1 and 3.1.1 of the ODCM. The report must also include an explanation as to why the inoperability was not corrected in a timely manner.

7.1.2 Description of Deviations

There were two deviations during 2013. The Unit 1 Service Water dilution flow recorder was inoperable for greater than thirty days due to an emergent design change, as documented in Condition Report 593309. Also the Unit 1 liquid effluent radiation monitor, RE-18, was inoperable for greater than thirty days due to an isolation valve which would not fully close, as documented in Condition Report 714825.

7.2 Effluent Sample Analysis Exceeding Minimum Detectable Concentration (MDC)

7.2.1 Regulatory Requirements

ODCM 7.2.2.6 states in part that the report shall include deviations from the MDC requirements included in ODCM Tables 2-3 and 3-3.

7.2.2 Description of Deviations

There was one deviation during 2013. Unit 1 Plant Vent Stack continuous iodine and particulate samples were not obtained for a week due to a loss of system power. The samples from the weeks prior to and following this period were used to estimate the release. Details of this event can be found in Condition Report 654381.

7.3 Incorrect Compositing of Liquid or Gaseous Effluent Samples

7.3.1 Regulatory Requirements

ODCM 7.2.2.6 states in part that the report shall include deviations from composite sampling requirements included in ODCM Tables 2-3 and 3-3.

7.3.2 Description of Deviations

There were no deviations during 2013.

8.0 CHANGES TO THE PLANT FARLEY ODCM

8.1 Regulatory Requirements

Pursuant to Technical Specification 5.5.1.c and ODCM 7.2.2.5, licensee initiated changes to the ODCM shall be submitted to the Nuclear Regulatory Commission as a part of or concurrent with the Annual Radioactive Effluent Release Report for the period in which any changes were made. Included are changes to the radiological environmental monitoring program sampling locations or dose calculation locations or pathways, including any changes made pursuant to ODCM 4.1.2.2.2 (land use census).

8.2 Description of Changes

There were no changes to the ODCM during 2013.

9.0 MAJOR CHANGES TO LIQUID, GASEOUS, OR SOLID RADWASTE TREATMENT SYSTEMS

9.1 Regulatory Requirements

ODCM 7.2.2.7 states in part that, as required by ODCM 2.1.5 and 3.1.6, licensee initiated MAJOR CHANGES TO RADIOACTIVE WASTE TREATMENT SYSTEMS (liquid and gaseous) shall be reported to the Nuclear Regulatory Commission in the Annual Radioactive Effluents Release Report covering the period in which the change was reviewed and accepted for implementation.

Process Control Program (PCP) B.5.1.2 states that licensee initiated major changes to the solid radioactive waste treatment system shall be reported to the Nuclear Regulatory Commission in the Annual Radioactive Effluent Release Report for the period in which the change was implemented. The discussion of each change shall include the information specified in PCP B.4.1.

9.2 Description of Major Changes

There were no changes to the Process Control Program during 2013.

10.0 SERVICE WATER DILUTION BIAS

In March, 2013, the Unit 2 Service Water dilution flow recorder was determined to be biased high by a factor of about 1.43 based on ultrasonic flow detection. Details of this determination can be found in Condition Report 600325 and Technical Evaluation 601127. Calculations of Curies released were not impacted by this bias since dilution is not a parameter in those calculations. The calculation of liquid concentrations and doses up to this point in 2013, however, were biased low by a factor of 1.43. Based on an application of the 1.43 correction factor to a random number of liquid releases over the previous five years, no 10CFR20 concentration limits were exceeded as a result of the bias. Since FNP's liquid doses have always been a small fraction of the ODCM limit (less than two percent of the ODCM limit for this year's report), the bias would not have resulted in any liquid dose limits being exceeded or approached. Details of this assessment are included in Technical Evaluation 600968.

Farley Nuclear Plant
Appendix A

CARBON-14

Carbon-14 (C-14) is a naturally-occurring radionuclide with a 5730 year half life. Nuclear weapons testing in the 1950s and 1960s significantly increased the amount of C-14 in the atmosphere. Nuclear power plants also produce C-14, but the amount is infinitesimal compared to what has been distributed in the environment due to weapons testing and what is produced by natural cosmic ray interactions.

As nuclear plants have improved gaseous waste processing systems and improved fuel performance, the percentages of “principal radionuclides” in gaseous effluents have changed, and C-14 has become a larger percentage. “Principal radionuclides” are determined based on public dose contribution or the amount of activity discharged compared to other radionuclides of the same effluent type. In Revision 2 (June 2009) of Regulatory Guide 1.21 (RG 1.21), “Measuring, Evaluating, and Reporting Radioactive Material in Liquid and Gaseous Effluents and Solid Waste,” the NRC recommended re-evaluating “principal radionuclides” and reporting C-14 as appropriate. In 2010 Radioactive Effluent Release Reports, virtually all U. S. nuclear power plants started reporting C-14 amounts released and resulting doses to the maximally exposed member of the public.

Because C-14 is considered a hard-to-detect radionuclide which must be chemically separated from the effluent stream before it can be measured, RG 1.21 provides the option of calculating the C-14 source term based on power generation. The Electric Power Research Institute (EPRI) developed an accepted methodology for calculating C-14, and published the results in Technical Report 1021106 (December 2010), “Estimation of Carbon-14 in Nuclear Power Plant Gaseous Effluents.” Evaluation of C-14 in radioactive liquid effluents is not required because the quantity and dose contribution has been determined to be insignificant.

At Plant Farley, the annual quantity of C-14 released in gaseous effluents was estimated to be 9.28 Curies (per unit). Approximately 30% of the C-14 released is in the form of $^{14}\text{CO}_2$ and is incorporated into plants through photosynthesis. Ingestion dose results from this pathway. The remaining 70% is estimated to be organic. Both the organic and inorganic forms of C-14 contribute to inhalation dose. A child is the maximally exposed individual, and bone dose is the highest organ dose. Using the dose calculation methodology from the Farley ODCM, the resulting bone dose to a child located at the controlling receptor location would be 4.11E-01 mrem in a year which is 2.74% of the regulatory limit of 15 mrem per year (per unit) to any organ due to gaseous effluents. The resulting total body dose to a child located at the controlling receptor location would be 8.21E-02 mrem in a year which is 0.54% of the regulatory limit of 15 mrem per year (per unit) total body dose due to gaseous effluents.