

ENCLOSURE 2

ANNUAL RADIOACTIVE EFFLUENT REPORT  
SUPPLEMENTAL INFORMATION

January 1, 2013 – December 31, 2013

**8 pages to follow**

## ANNUAL RADIOACTIVE EFFLUENT REPORT

01-JAN-13 THROUGH 31-DEC-13

## SUPPLEMENTAL INFORMATION

Facility: Prairie Island Nuclear Generating Plant

Licensee: Northern States Power Company

License Numbers: DPR-42 &amp; DPR-60

A. Regulatory Limits

## 1. Liquid Effluents:

- a. The dose or dose commitment to an individual from radioactive materials in liquid effluents released from the site shall be limited to:

for the quarter	3.0 mrem to the total body 10.0 mrem to any organ
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for the year	6.0 mrem to the total body 20.0 mrem to any organ
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## 2. Gaseous Effluents:

- a. The dose rate due to radioactive materials released in gaseous effluents from the site shall be limited to:

noble gases	$\leq 500$ mrem/year total body $\leq 3000$ mrem/year skin
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I-131, I-133, H-3, LLP	$\leq 1500$ mrem/year to any organ
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- b. The dose due to radioactive gaseous effluents released from the site shall be limited to:

noble gases	$\leq 10$ mrad/quarter gamma $\leq 20$ mrad/quarter beta $\leq 20$ mrad/year gamma $\leq 40$ mrad/year beta
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I-131, I-133, H-3, LLP	$\leq 15$ mrem/quarter to any organ $\leq 30$ mrem/year to any organ
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B. Effluent Concentration

1. Fission and activation gases in gaseous releases:

10 CFR 20, Appendix B, Table 2, Column 1

2. Iodine and particulates with half lives greater than 8 days in gaseous releases:

10 CFR 20, Appendix B, Table 2, Column 1

3. Liquid effluents for radionuclides other than dissolved or entrained gases:

10 CFR 20, Appendix B, Table 2, Column 2

4. Liquid effluent dissolved and entrained gases:

2.0E-04 uCi/ml Total Activity

C. Average Energy

Not applicable to Prairie Island regulatory limits.

D. Measurements and approximations of total activity

1. Fission and activation gases in gaseous releases:	Total Nuclide	Gem Gem	±25%
2. Iodines in gaseous releases:	Total Nuclide	Gem Gem	±25%
3. Particulates in gaseous releases:	Total Nuclide	Gem Gem	±25%
4. Liquid effluents	Total Nuclide	Gem Gem	±25%

E. Manual Revisions

1. Offsite Dose Calculations Manual:

Latest Revision number: 28

Revision date : November 27, 2013

Prairie Island Nuclear Generating Station  
PI 2013 Annual Release Summary

Batch Release Summary

Liquid Releases	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Year
Number of Releases:	17	27	42	40	126
Total Time for All Releases (Minutes):	1319.0	2140.0	4085.3	4290.0	11834.3
Maximum Time for All Releases (Minutes):	109.0	108.0	174.0	1285.0	1285.0
Average Time for All Releases (Minutes):	77.6	79.3	97.3	107.3	93.9
Minimum Time for All Releases (Minutes):	67.0	59.0	63.0	35.0	35.0

Gaseous Releases	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Year
Number of Releases:	5	4	9	22	37
Total Time for All Releases (Minutes):	126320.0	131040.0	137000.0	155332.0	549692.0
Maximum Time for All Releases (Minutes):	120960.0	40320.0	41760.0	43200.0	131040.0
Average Time for All Releases (Minutes):	25264.0	32760.0	15222.2	7060.5	14856.5
Minimum Time for All Releases (Minutes):	1302.0	10080.0	192.0	417.0	192.0

Abnormal Release Summary

Liquid Releases

Number of Abnormal Releases:	0
Total Activity for Abnormal Releases:	0.00E+00 Curies

Gaseous Releases

Number of Abnormal Releases:	10
Total Activity for Abnormal Releases:	4.33E-01 Curies

Prairie Island Nuclear Generating Station  
PI 2013 Annual Release Summary

Gaseous Effluents-Summation of All Releases

Type of Effluent	Units	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Est. Total Error, %
<b>A. Fission &amp; Activation Gases</b>						
1. Total Release	Curies	9.71E-06	0.00E+00	0.00E+00	0.00E+00	2.50E+01
2. Average Release Rate for Period	µCi/sec	1.25E-06	0.00E+00	0.00E+00	0.00E+00	
3. Percent of Applicable Limit	%	1.47E-07	0.00E+00	0.00E+00	0.00E+00	
<b>B. Iodines</b>						
1. Total Iodine-131	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.50E+01
2. Average Release Rate for Period	µCi/sec	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
3. Percent of Applicable Limit	%	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
<b>C. Particulates</b>						
1. Total Particulates (Half-lives > 8 days)	Curies	1.70E-07	0.00E+00	2.82E-08	2.25E-06	2.50E+01
2. Average Release Rate for Period	µCi/sec	2.19E-08	0.00E+00	3.54E-09	2.83E-07	
3. Percent of Applicable Limit	%	4.61E-07	0.00E+00	3.23E-07	1.16E-04	
4. Gross Alpha Activity	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.50E+01
<b>D. Tritium</b>						
1. Total Release	Curies	3.92E+00	4.45E+00	4.09E+00	6.44E+00	2.50E+01
2. Average Release Rate for Period	µCi/sec	5.04E-01	5.66E-01	5.15E-01	8.11E-01	
3. Percent of Applicable Limit	%	3.28E-02	3.46E-02	3.32E-02	5.01E-02	
<b>E. Carbon-14</b>						
1. Total Release	Curies	2.79E+00	2.80E+00	2.42E+00	1.47E+00	2.50E+01

Prairie Island Nuclear Generating Station  
PI 2013 Annual Release Summary

Gaseous Effluents - Ground Level Releases

		Continuous Mode				Batch Mode			
Nuclides Released	Units	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Qtr 1	Qtr 2	Qtr 3	Qtr 4
C. Fission and Activation Gases									
Xe-133	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.71E-06	0.00E+00	0.00E+00	0.00E+00
Total for Period	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.71E-06	0.00E+00	0.00E+00	0.00E+00
C. Iodines									
Total for Period	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
C. Particulates									
Cd-109	Curies	0.00E+00	0.00E+00	0.00E+00	1.83E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Co-58	Curies	1.70E-07	0.00E+00	2.82E-08	1.62E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Co-60	Curies	0.00E+00	0.00E+00	0.00E+00	3.82E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cr-51	Curies	0.00E+00	0.00E+00	0.00E+00	1.29E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cs-137	Curies	0.00E+00	0.00E+00	0.00E+00	1.37E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Mn-54	Curies	0.00E+00	0.00E+00	0.00E+00	3.48E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nb-95	Curies	0.00E+00	0.00E+00	0.00E+00	6.42E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total for Period	Curies	1.70E-07	0.00E+00	2.82E-08	2.25E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00
4. Tritium									
H-3	Curies	3.75E+00	4.37E+00	3.96E+00	6.35E+00	1.74E-01	8.40E-02	1.36E-01	9.64E-02
5. Carbon-14									
C-14	Curies	2.79E+00	2.80E+00	2.42E+00	1.47E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Prairie Island Nuclear Generating Station  
PI 2013 Annual Release Summary

Liquid Effluents - Summation of All Releases

Type of Effluent	Units	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Est. Total Error, %
<b>A. Fission &amp; Activation Products</b>						
1. Total Release (not including Tritium, Gases, and Alpha)	Curies	2.69E-03	2.96E-03	6.08E-03	5.23E-03	2.50E+01
2. Average Diluted Concentration During Period	µCi/ml	3.95E-11	3.10E-11	5.63E-11	7.06E-11	
3. Percent of Applicable Limit	%	5.39E-02	5.91E-02	1.22E-01	1.05E-01	
<b>B. Tritium</b>						
1. Total Release	Curies	6.29E+01	6.60E+01	1.40E+02	9.75E+01	2.50E+01
2. Average Diluted Concentration During Period	µCi/ml	9.22E-07	6.92E-07	1.30E-06	1.32E-06	
3. Percent of Applicable Limit	%	9.22E-02	6.92E-02	1.30E-01	1.32E-01	
<b>C. Dissolved and Entrained Gases</b>						
1. Total Release	Curies	0.00E+00	1.05E-04	1.46E-04	7.50E-05	2.50E+01
2. Average Diluted Concentration During Period	µCi/ses	0.00E+00	1.11E-12	1.36E-12	1.01E-12	
3. Percent of Applicable Limit	%	0.00E+00	5.53E-07	6.78E-07	5.06E-07	
<b>D. Gross Alpha Radioactivity</b>						
1. Total Release	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.50E+01
<b>E. Waste Volume Released (Pre-Dilution)</b>						
F. Volume of Dilution Water Used	Liters	6.82E+10	9.54E+10	1.08E+11	7.41E+10	2.50E+01

Prairie Island Nuclear Generating Station  
PI 2013 Annual Release Summary

Liquid Effluents

Nuclides Released	Units	Continuous Mode				Batch Mode			
		Qtr 1	Qtr 2	Qtr 3	Qtr 4	Qtr 1	Qtr 2	Qtr 3	Qtr 4
Ag-110m	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.44E-06	7.13E-05	1.67E-05	1.47E-04
Ar-41	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.98E-06	0.00E+00
Co-57	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.76E-06	3.82E-06	6.35E-07	1.01E-06
Co-58	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.26E-03	6.11E-04	8.11E-05	1.65E-03
Co-60	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.28E-05	4.80E-04	7.23E-05	1.77E-04
Cr-51	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.62E-05	0.00E+00	2.57E-04
Cs-137	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.94E-06
Fe-55	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.05E-03	7.52E-04	2.00E-03	1.71E-03
Fe-59	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.41E-06	1.23E-05	0.00E+00	8.33E-05
H-3	Curies	5.78E-01	8.60E-01	1.07E+00	1.08E-01	6.23E+01	6.51E+01	1.39E+02	9.74E+01
La-140	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.80E-07
Mn-54	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.16E-06	6.65E-05	8.17E-06	3.12E-06
Nb-95	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.60E-05	2.02E-04	4.00E-06	1.57E-05
Nb-97	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.12E-06	7.77E-07	3.88E-06	4.10E-06
Ni-63	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.47E-04	5.25E-04	3.88E-03	1.05E-03
Sb-125	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.73E-06	2.74E-05	9.29E-06	1.85E-05
Sn-113	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.75E-06	2.28E-05	0.00E+00	1.96E-07
Sr-92	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.07E-06	0.00E+00	0.00E+00	0.00E+00
Te-123M	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.50E-06	0.00E+00	1.03E-04
Xe-133	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.05E-04	1.35E-04	7.50E-05
Xe-135	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.05E-06	0.00E+00
Zr-95	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.35E-05	1.13E-04	1.39E-06	1.00E-05
<b>Total for Period</b>	<b>Curies</b>	<b>5.78E-01</b>	<b>8.60E-01</b>	<b>1.07E+00</b>	<b>1.08E-01</b>	<b>6.23E+01</b>	<b>6.51E+01</b>	<b>1.39E+02</b>	<b>9.74E+01</b>



**Prairie Island Nuclear Generating Station  
2013 Annual Dose Summary**

Gaseous Effluents

	Parameter	Location	Dose	Dose Limit	% of Limit
Qtr 1	Gamma Air Dose (mrad)	0.58 km W	9.89E-09	1.00E+01	0.00
	Beta Air Dose (mrad)	0.58 km W	2.94E-08	2.00E+01	0.00
	Total Body Dose (mrem)	0.58 km W	8.24E-09	5.00E+00	0.00
	Skin Dose (mrem)	0.58 km W	1.95E-08	1.50E+01	0.00
	Max Organ Dose (mrem)	0.97 km NNW	4.92E-03	1.50E+01	0.03
	Child - Lung				
Qtr 2	Gamma Air Dose (mrad)	0.58 km W	0.00E+00	1.00E+01	0.00
	Beta Air Dose (mrad)	0.58 km W	0.00E+00	2.00E+01	0.00
	Total Body Dose (mrem)	0.58 km W	0.00E+00	5.00E+00	0.00
	Skin Dose (mrem)	0.58 km W	0.00E+00	1.50E+01	0.00
	Max Organ Dose (mrem)	0.97 km NNW	3.04E-02	1.50E+01	0.20
	Child - Bone				
Qtr 3	Gamma Air Dose (mrad)	0.58 km W	0.00E+00	1.00E+01	0.00
	Beta Air Dose (mrad)	0.58 km W	0.00E+00	2.00E+01	0.00
	Total Body Dose (mrem)	0.58 km W	0.00E+00	5.00E+00	0.00
	Skin Dose (mrem)	0.58 km W	0.00E+00	1.50E+01	0.00
	Max Organ Dose (mrem)	0.97 km NNW	3.99E-02	1.50E+01	0.27
	Child - Bone				
Qtr 4	Gamma Air Dose (mrad)	0.58 km W	0.00E+00	1.00E+01	0.00
	Beta Air Dose (mrad)	0.58 km W	0.00E+00	2.00E+01	0.00
	Total Body Dose (mrem)	0.58 km W	0.00E+00	5.00E+00	0.00
	Skin Dose (mrem)	0.58 km W	0.00E+00	1.50E+01	0.00
	Max Organ Dose (mrem)	0.97 km NNW	7.53E-03	1.50E+01	0.05
	Child - Lung				
Year	Gamma Air Dose (mrad)	0.58 km W	9.89E-09	2.00E+01	0.00
	Beta Air Dose (mrad)	0.58 km W	2.94E-08	4.00E+01	0.00
	Total Body Dose (mrem)	0.58 km W	8.24E-09	1.00E+01	0.00
	Skin Dose (mrem)	0.58 km W	1.95E-08	3.00E+01	0.00
	Max Organ Dose (mrem)	0.97 km NNW	7.03E-02	3.00E+01	0.23
	Child - Bone				

Liquid Effluents

	Parameter	Max Receptor	Dose	Dose Limit	% of Limit
Qtr 1	Max Organ Dose (mrem)	Adult - Gi-LLi	2.64E-04	1.00E+01	0.00
	Total Body Dose (mrem)	Adult - Total Body	2.16E-04	3.00E+00	0.01
Qtr 2	Max Organ Dose (mrem)	Adult - Gi-LLi	7.55E-04	1.00E+01	0.01
	Total Body Dose (mrem)	Adult - Total Body	4.63E-04	3.00E+00	0.02
Qtr 3	Max Organ Dose (mrem)	Adult - Bone	1.74E-03	1.00E+01	0.02
	Total Body Dose (mrem)	Adult - Total Body	3.83E-04	3.00E+00	0.01
Qtr 4	Max Organ Dose (mrem)	Adult - Bone	9.96E-04	1.00E+01	0.01
	Total Body Dose (mrem)	Adult - Total Body	5.98E-04	3.00E+00	0.02
Year	Max Organ Dose (mrem)	Adult - Bone	3.30E-03	2.00E+01	0.02
	Total Body Dose (mrem)	Adult - Total Body	1.66E-03	6.00E+00	0.03