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MAY 08 2017

L-PI-17-018
TS 5.5.1.c
TS 5.6.3

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555

Prairie Island Nuclear Generating Plant, Units 1 and 2
Docket Nos. 50-282 and 50-306
Renewed Operating License Nos. DPR-42 and DPR-60

2016 Annual Radioactive Effluent Report and Offsite Dose Calculation Manual

Pursuant to the applicable Prairie Island Nuclear Generating Plant (PINGP) Technical Specifications (TS), Appendix A to Renewed Operating Licenses DPR-42 and DPR-60, and the requirements of the Offsite Dose Calculation Manual (ODCM), Northern States Power Company, a Minnesota corporation, doing business as Xcel Energy (hereafter "NSPM"), submits the 2016 Annual Radioactive Effluent Report which is comprised of the following:

Enclosure 1 contains the Off-Site Radiation Dose Assessment for the period January 1, 2016, through December 31, 2016, in accordance with ODCM sections 8.1.1c, d, e, f, g, h, i, j, k, m and n.

Enclosure 2 contains the Annual Radioactive Effluent Report, Supplemental Information, for the period January 1, 2016, through December 31, 2016, in accordance with TS 5.6.3 and ODCM section 8.1.1b.

Enclosure 3 contains a complete and legible copy of the entire ODCM revision 30, issued on 2/27/2016, in accordance with ODCM section 8.1.1l.

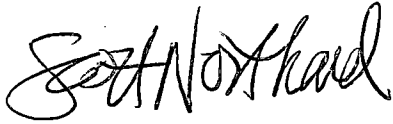
Enclosure 4 contains a complete and legible copy of the entire ODCM revision 31, issued on 10/13/2016, in accordance with ODCM section 8.1.1l.

On May 4, 2016, PINGP identified a potential issue regarding the operability of the Waste Gas Holdup System Gas (Oxygen) Monitors listed in ODCM Table 3.2. This issue has been entered into the PINGP Corrective Action Program for evaluation. Evaluation identified errata data for 2014 and 2015 Annual Radioactive Effluent Reports, in the form of omission of reporting of operability, in accordance with ODCM section 8.1.1h. The errata data is reported with this submittal and in accordance with ODCM section 8.7 guidance for reporting of errata data.

IE48
A009
NRR

Summary of Commitments

This letter makes no new commitments and no revisions to existing commitments.

A handwritten signature in black ink, appearing to read "Scott Northard". The signature is written in a cursive, flowing style.

Scott Northard
Vice President, Prairie Island Nuclear Generating Plant
Northern States Power Company – Minnesota

Enclosures (4)

cc: Regional Administrator, USNRC, Region III
Project Manager, Prairie Island Nuclear Generating Plant, USNRC; NRR
NRC Resident Inspector – Prairie Island Nuclear Generating Plant
Department of Health, State of Minnesota
PI Dakota Community Environmental Coordinator

ENCLOSURE 1

OFF-SITE RADIATION DOSE ASSESSMENT

January 1, 2016 – December 31, 2016

7 pages to follow

PRAIRIE ISLAND NUCLEAR GENERATING PLANT
OFF-SITE RADIATION DOSE ASSESSMENT FOR

January 1, 2016 - December 31, 2016

An Assessment of the radiation dose due to releases from Prairie Island Nuclear Generating Plant during 2016 was performed, in accordance with the Offsite Dose Calculation Manual, and as required by Technical Specifications. Computed doses were well below the 40 CFR Part 190 Standards and 10 CFR Part 50 Appendix I Guidelines.

Off-site dose calculation formulas and historical meteorological data were used in making this assessment. Source terms were obtained from the Annual Radioactive Effluent and Waste Disposal Report and prepared for NRC review, for the year of 2016.

OFFSITE DOSES FROM GASEOUS RELEASE:

Computed doses due to gaseous releases are reported in Table 1. Critical receptor location and pathways for organ doses are reported in Table 2. Gaseous release doses are a small percentage of Appendix I Guidelines.

OFFSITE DOSES FROM LIQUID RELEASE:

Computed doses due to liquid releases are reported in Table 1. Critical receptor information is reported in Table 2. Liquid release doses, both whole body and organ, are a small percentage of Appendix I Guidelines.

DOSES TO INDIVIDUALS DUE TO ACTIVITIES INSIDE THE SITE BOUNDARY:

Occasionally sportsmen enter the Prairie Island Site Boundary for recreational activities. These individuals are not expected to spend more than a few hours per year within the site boundary. Commercial and recreational river traffic exists through this area.

For purposes of estimating the dose, due to recreational and river water transportation activities within the site boundary, it is assumed that the limiting dose within the site boundary would be received by an individual who spends a total of seven days per year on the river just off-shore from the plant buildings (ESE at 0.2 miles). The gamma dose from noble gas releases and the whole body and organ doses from the inhalation pathway due to Iodine 131, Iodine-133, tritium, long-lived particulates and Carbon-14 were calculated for this location and occupancy time. These doses are reported in Table 1.

Critical Receptor location and pathways for organ doses are reported in Table 2.

ABNORMAL RELEASES

There were no (0) abnormal releases for 2016.

40 CFR 190 COMPLIANCE

REMP environmental TLD results for 2016 were reviewed per ANSI/HPS N13.37-2014 methodology for determining any plant effect above ambient gamma radiation measurements. All measurements are considered to be within the range of variations in natural background radiation.

Neutron sky shine dose from the ISFSI was evaluated. The maximum sky shine dose was determined to be 0.71 mrem, to the nearest resident, at 724 meters from the ISFSI. Neutron sky shine dose is greater than the effluent dose to the Critical Receptor, therefore, 40 CFR190 compliance was evaluated to the location of the maximum neutron sky shine dose.

The 40CFR190 evaluation location was determined to be 0.7 miles west of the plant.

Dose due to gaseous effluents were calculated to the 40 CFR 190 evaluation location.

| | |
|---|----------------|
| Gamma Direct Radiation Dose: | 0.00E+00 MREM |
| Neutron sky shine Dose: | 7.10E-01 MREM |
| Gamma Air Dose: | 2.08E-12 MREM |
| Beta Air Dose: | 1.37E-11 MREM |
| Iodine, particulate, H-3 and C-14 Dose: | 1.04E-02 MREM* |

*Calculated values identical for Whole Body, Thyroid and Maximum "Other" Organs

40CFR190 DOSE EVALUATION:

| | 40CFR190 LIMIT (MREM) | 40CFR190 DOSE (MREM) |
|-------------------------------------|--------------------------|-------------------------|
| WHOLE BODY | 25 | 7.20E-01 |
| THYROID | 75 | 7.20E-01 |
| OTHER ORGANS (TEEN – WHOLE BODY) | 25 | 7.20E-01 |

SAMPLING, ANALYSIS AND LLD REQUIREMENTS

The lower limit of detection (LLD) requirements, as specified in ODCM Table 2.1 and 3.1 were met for 2016. The minimum sampling frequency requirements, as specified in ODCM Table 2.1 and 3.1 were met for 2016.

MONITORING INSTRUMENTATION

For 2016, there was one (1) occurrence, when less than the minimum required radioactive liquid and/or gaseous effluent monitoring instrumentation channels were operable, as required by ODCM Tables 2.2 and 3.2.

From 1/24/16 to 4/14/16, less than the minimum channels required for Explosive Gas Monitoring Instrumentation were available, as specified in H4, Offsite Dose Calculation Manual.

Special Report L-16-058 was submitted to NRC on July 22, 2016. An apparent cause evaluation was initiated.

The apparent cause evaluation found that a lack of clarity between the ODCM, Administrative Work Instructions and Operations Procedures was the cause.

Actions were initiated to clarify requirements.

DOSES TO INDIVIDUALS DUE TO EFFLUENT RELEASES FROM THE INDEPENDENT SPENT FUEL STORAGE FACILITY (ISFSI):

Zero (0) fuel casks were loaded and placed in the storage facility during the 2016 calendar year. The total number of casks in the ISFSI, as of 12/31/16, was forty (40). There were no (0) releases of radioactive effluents from the ISFSI.

CURRENT OFFSITE DOSE CALCULATIONS MANUAL (ODCM) REVISION:

The Offsite Dose Calculation Manual was revised two (2) times in 2016. Revision 30 is dated February 27, 2016. Revision 31 is dated October 13, 2016. Both revisions are submitted with this report.

CRITICAL RECEPTOR

Based on the Annual Land Use Census, the critical receptor did change. The critical receptor is defined as The Suter Residence, at 0.6 miles, in the SSE sector.

2016 is evaluated using the Critical Receptor identification of the Glazier Residence, at 0.6 miles in the NNW sector.

2017 will be evaluated using the newly identified Critical Receptor identification of the Suter Residence, at 0.6 miles in the SSE direction.

ERRATA DATA:

For 2014, there was one (1) occurrence, when less than the minimum required radioactive liquid and/or gaseous effluent monitoring instrumentation channels were operable, as required by ODCM Tables 2.2 and 3.2.

For 2015, there was one (1) occurrence, when less than the minimum required radioactive liquid and/or gaseous effluent monitoring instrumentation channels were operable, as required by ODCM Tables 2.2 and 3.2.

These out of service periods were incorrectly omitted from their respective annual reports.

From 9/25/14 to 10/26/14 and from 7/12/15 to 8/18/15, less than the minimum channels required for Explosive Gas Monitoring Instrumentation were available, as specified in H4, Offsite Dose Calculation Manual.

Special Report L-16-058 was submitted to NRC on July 22, 2016. An apparent cause evaluation was initiated.

The apparent cause evaluation found that a lack of clarity between the ODCM, Administrative Work Instructions and Operations Procedures was the cause.

Actions were initiated to clarify requirements.

ERRATA DATA:

The volume for the geometry employed in the evaluation of noble gas samples was inaccurate. This value is canned in the software and the inaccuracy went undetected for an extended period of time.

The inaccuracy would have generated results with a conservatively high bias. No underreporting occurred.

Inaccurate reporting of dose equated to significantly less than 1% of the applicable 10 CFR 50 Appendix I design objectives and significantly less than 1% of the EPA public dose criterion. Over reporting did NOT impede Prairie Island's ability to adequately assess the information supplied.

Corrective actions have been implemented.

INDUSTRY INITIATIVE ON GROUND WATER PROTECTION:

There was zero (0) events for inclusion in the Annual Effluent Report, as part of the NEI Ground Water Initiative.

**LOW LEVEL WASTE DISPOSAL ANNUAL REPORT
SOLID WASTE AND IRRADIATED COMPONENTS SHIPMENTS
PERIOD: 1/1/16 TO 12/31/16
LICENSE NUMBER: DPR-42/60**

**SOLID WASTE SHIPPED OFFSITE FOR BURIAL OR DISPOSAL
(NOT IRRADIATED FUEL):**

| Resins, Filters and Evaporator Bottoms | Volume | | Curies Shipped |
|---|---|----------|----------------|
| | FT3 | M3 | Curies |
| Waste Class | | | |
| A | 2.91E+02 | 8.25E+00 | 1.93E-01 |
| B | 4.37E+02 | 1.24E+01 | 2.00E+02 |
| C | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| ALL | 7.29E+02 | 2.06E+01 | 2.00E+02 |
| Major Nuclides | H-3, Mn-54, Fe-55, Co-57, Co-58, Co-60, Ni-63, Sb-125, Cs-137 | | |

| Dry Active Waste | Volume | | Curies Shipped |
|------------------|--|----------|----------------|
| | FT3 | M3 | Curies |
| Waste Class | | | |
| A | 2.82E+04 | 7.97E+02 | 2.76E-01 |
| B | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| C | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| ALL | 2.82E+04 | 7.97E+02 | 2.76E-01 |
| Major Nuclides | Fe-55, Co-58, Co-60, Ni-63, Zr-95, Nb-95 | | |

| Irradiated Components | Volume | | Curies Shipped |
|-----------------------|----------|----------|----------------|
| | FT3 | M3 | Curies |
| 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 | | | |

| Other Waste | Volume | | Curies Shipped |
|----------------|----------|----------|----------------|
| | FT3 | M3 | Curies |
| 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 | | | |

| Sum of All Low Level Waste Shipped from Site | Volume | | Curies Shipped |
|---|---|----------|----------------|
| | FT3 | M3 | Curies |
| Waste Class | | | |
| A | 2.85E+04 | 8.06E+02 | 4.68E-01 |
| B | 4.37E+02 | 1.24E+01 | 2.00E+02 |
| C | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| ALL | 2.89E+04 | 8.18E+02 | 2.00E+02 |
| Major Nuclides | Mn-54, Fe-55, Co-58, Co-60, Ni-63, Zr-95, Nb-95, Sb-125, Cs-137 | | |

PROCESS CONTROL PROGRAM

The Process Control Program for Solidification/Dewatering of Radioactive Waste from Liquid Systems (D 59) was not revised in 2016. Current manual revision is 11. The revision date is October 23, 2014. Revision 11 was submitted with the 2014 report.

Table 1

OFF-SITE RADIATION DOSE ASSESSMENT - PRAIRIE ISLAND

PERIOD: JANUARY 2016 through DECEMBER 2016

10 CFR Part 50
Appendix I Guidelines
(2-unit site per year)

Gaseous Releases

| | | |
|---|--------------------------|----|
| Maximum Site Boundary Gamma Air Dose (mrad) | 2.48E-05 | 20 |
| Maximum Site Boundary Beta Air Dose (mrad) | 1.65E-04 | 40 |
| Maximum Off-site Dose to any Organ (mrem)* Organ: | 8.03E-02 Child - bone | 30 |
| Offshore Location Gamma Dose (mrad) | 4.97E-07 | 20 |
| Total Body (mrem) | 4.15E-07 | 10 |
| Maximum Off-site Dose to any Organ (mrem)* Organ: | 6.90E-03 Teen - Lung | 30 |

Liquid Releases

| | | |
|---|----------------------------|----|
| Maximum Off-site Dose Total Body (mrem) | 1.64E-03 | 6 |
| Maximum Off-site Dose to any Organ (mrem) Organ | 2.13E-03 Adult - Gi-LLi | 20 |

* Long-Lived Particulate, I-131, I-133, Tritium and C-14

Table 2

**OFF-SITE RADIATION DOSE ASSESSMENT – PRAIRIE ISLAND
SUPPLEMENTAL INFORMATION**

January 1, 2016 – December 31, 2016

Gaseous Releases

**Maximum Site Boundary
Dose Location
(From Building Vents)**

| | |
|-------------------------|-------------|
| Sector | W |
| Distance (miles) | 0.36 |

**Offshore Location
Within Site Boundary**

| | |
|-------------------------|-------------------|
| Sector | ESE |
| Distance (miles) | 0.2 |
| Pathway | Inhalation |

Maximum Off-site

| | |
|-------------------------|---|
| Sector | NNW |
| Distance (miles) | 0.60 |
| Pathways | Ground, Inhalation Vegetable |
| Age Group | Child |

Liquid Releases

**Maximum Off-site Dose
Location Downstream**

| | |
|----------------|-------------|
| Pathway | Fish |
|----------------|-------------|

ENCLOSURE 2

**ANNUAL RADIOACTIVE EFFLUENT REPORT
SUPPLEMENTAL INFORMATION**

January 1, 2016 – December 31, 2016

8 pages to follow

ANNUAL RADIOACTIVE EFFLUENT REPORT

01-JAN-16 THROUGH 31-DEC-16

SUPPLEMENTAL INFORMATION

Facility: Prairie Island Nuclear Generating Plant

Licensee: Northern States Power Company

License Numbers: DPR-42 & 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 |
| for the year | 6.0 mrem to the total body 20.0 mrem to any organ |

2. Gaseous Effluents:

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

| | |
|------------------------|---|
| noble gases | ≤ 500 mrem/year total body ≤ 3000 mrem/year skin |
| I-131, I-133, H-3, LLP | ≤ 1500 mrem/year to any organ |

- b. The dose due to radioactive gaseous effluents released from the site shall be limited to:

| | |
|------------------------|--|
| noble gases | ≤ 10 mrad/quarter gamma ≤ 20 mrad/quarter beta ≤ 20 mrad/year gamma ≤ 40 mrad/year beta |
| I-131, I-133, H-3, LLP | ≤ 15 mrem/quarter to any organ ≤ 30 mrem/year to any organ |

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: 31
Revision date : October 13, 2016

Prairie Island Nuclear Generating Station
2016 Annual Release Summary

Batch Release Summary

| Liquid Releases | Qtr 1 | Qtr 2 | Qtr 3 | Qtr 4 | Year |
|--|--------|--------|--------|--------|--------|
| Number of Releases: | 21 | 21 | 35 | 48 | 125 |
| Total Time for All Releases (Minutes): | 1607.0 | 1624.0 | 2516.0 | 4156.0 | 9903.0 |
| Maximum Time for All Releases (Minutes): | 117.0 | 103.0 | 89.0 | 140.0 | 140.0 |
| Average Time for All Releases (Minutes): | 76.5 | 77.3 | 71.9 | 86.6 | 79.2 |
| Minimum Time for All Releases (Minutes): | 50.0 | 62.0 | 61.0 | 63.0 | 50.0 |

| Gaseous Releases | Qtr 1 | Qtr 2 | Qtr 3 | Qtr 4 | Year |
|--|---------|--------|-------|---------|----------|
| Number of Releases: | 65 | 5 | 1 | 18 | 89 |
| Total Time for All Releases (Minutes): | 90055.0 | 1070.0 | 60.0 | 21472.0 | 112657.0 |
| Maximum Time for All Releases (Minutes): | 1440.0 | 300.0 | 60.0 | 1660.0 | 1660.0 |
| Average Time for All Releases (Minutes): | 1385.5 | 214.0 | 60.0 | 1192.9 | 1265.8 |
| Minimum Time for All Releases (Minutes): | 71.0 | 71.0 | 60.0 | 220.0 | 60.0 |

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

Prairie Island Nuclear Generating Station
2016 Annual Release Summary

Gaseous Effluents-Summation of All Releases

| Type of Effluent | Units | Qtr 1 | Qtr 2 | Qtr 3 | Qtr 4 | Est. Total Error, % |
|---|---------|----------|----------|----------|----------|------------------------|
| A. Fission & Activation Gases | | | | | | |
| 1. Total Release | Curies | 9.42E-04 | 5.00E-04 | 3.88E-02 | 0.00E+00 | 2.50E+01 |
| 2. Average Release Rate for Period | µCi/sec | 1.20E-04 | 6.35E-05 | 4.89E-03 | 0.00E+00 | |
| 3. Percent of Applicable Limit | % | 2.65E-05 | 1.39E-05 | 7.87E-04 | 0.00E+00 | |
| B. Iodines | | | | | | |
| 1. Total Iodine-131 | Curies | 0.00E+00 | 0.00E+00 | 0.00E+00 | 2.09E-07 | 2.50E+01 |
| 2. Average Release Rate for Period | µCi/sec | 0.00E+00 | 0.00E+00 | 0.00E+00 | 2.62E-08 | |
| 3. Percent of Applicable Limit | % | 0.00E+00 | 0.00E+00 | 0.00E+00 | 2.09E-05 | |
| C. Particulates | | | | | | |
| 1. Total Particulates (Half-lives > 8 days) | Curies | 0.00E+00 | 0.00E+00 | 0.00E+00 | 2.42E-06 | 2.50E+01 |
| 2. Average Release Rate for Period | µCi/sec | 0.00E+00 | 0.00E+00 | 0.00E+00 | 3.04E-07 | |
| 3. Percent of Applicable Limit | % | 0.00E+00 | 0.00E+00 | 0.00E+00 | 2.46E-05 | |
| 4. Gross Alpha Activity | Curies | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 2.50E+01 |
| D. Tritium | | | | | | |
| 1. Total Release | Curies | 5.13E+00 | 5.51E+00 | 6.99E+00 | 1.09E+01 | 2.50E+01 |
| 2. Average Release Rate for Period | µCi/sec | 6.52E-01 | 7.01E-01 | 8.79E-01 | 1.37E+00 | |
| 3. Percent of Applicable Limit | % | 3.64E-02 | 3.83E-02 | 4.86E-02 | 7.70E-02 | |
| E. Carbon-14 | | | | | | |
| 1. Total Release | Curies | 2.02E+00 | 2.89E+00 | 2.93E+00 | 2.32E+00 | 2.50E+01 |

Prairie Island Nuclear Generating Station
2016 Annual Release Summary

Gaseous Effluents - Ground Level Releases

| Nuclides Released | Units | Continuous Mode | | | | Batch Mode | | | |
|---------------------------------|--------|-----------------|----------|----------|----------|------------|----------|----------|----------|
| | | Qtr 1 | Qtr 2 | Qtr 3 | Qtr 4 | Qtr 1 | Qtr 2 | Qtr 3 | Qtr 4 |
| 1. Fission and Activation Gases | | | | | | | | | |
| Kr-85 | Curies | 0.00E+00 | 0.00E+00 | 1.43E-02 | 0.00E+00 | 9.42E-04 | 4.89E-04 | 9.80E-04 | 0.00E+00 |
| Xe-133 | Curies | 0.00E+00 | 0.00E+00 | 2.36E-02 | 0.00E+00 | 0.00E+00 | 1.07E-05 | 0.00E+00 | 0.00E+00 |
| Total for Period | Curies | 0.00E+00 | 0.00E+00 | 3.79E-02 | 0.00E+00 | 9.42E-04 | 5.00E-04 | 9.80E-04 | 0.00E+00 |
| 2. Iodines | | | | | | | | | |
| I-131 | Curies | 0.00E+00 | 0.00E+00 | 0.00E+00 | 2.09E-07 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Total for Period | Curies | 0.00E+00 | 0.00E+00 | 0.00E+00 | 2.09E-07 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| 3. Particulates | | | | | | | | | |
| Cd-109 | Curies | 0.00E+00 | 0.00E+00 | 0.00E+00 | 4.93E-07 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Co-58 | Curies | 0.00E+00 | 0.00E+00 | 0.00E+00 | 1.34E-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 | 3.27E-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 | 1.72E-07 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Mn-54 | Curies | 0.00E+00 | 0.00E+00 | 0.00E+00 | 2.50E-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 | 3.59E-08 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Zr-95 | Curies | 0.00E+00 | 0.00E+00 | 0.00E+00 | 2.32E-08 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| Total for Period | Curies | 0.00E+00 | 0.00E+00 | 0.00E+00 | 2.42E-06 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| 4. Tritium | | | | | | | | | |
| H-3 | Curies | 5.09E+00 | 5.51E+00 | 6.99E+00 | 1.09E+01 | 3.36E-02 | 1.09E-04 | 1.10E-03 | 4.90E-02 |
| 5. Carbon-14 | | | | | | | | | |
| C-14 | Curies | 2.02E+00 | 2.89E+00 | 2.93E+00 | 2.32E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |

Prairie Island Nuclear Generating Station
2016 Annual Release Summary

Liquid Effluents - Summation of All Releases

| Type of Effluent | Units | Qtr 1 | Qtr 2 | Qtr 3 | Qtr 4 | Est. Total Error, % |
|--|---------|----------|----------|----------|----------|---------------------|
| A. Fission & Activation Products | | | | | | |
| 1. Total Release (not including Tritium, Gases, and Alpha) | Curies | 7.09E-03 | 2.41E-03 | 1.43E-03 | 7.34E-03 | 2.50E+01 |
| 2. Average Diluted Concentration During Period | µCi/ml | 7.29E-11 | 3.05E-11 | 1.94E-11 | 7.73E-11 | |
| 3. Percent of Applicable Limit | % | 1.42E-01 | 4.82E-02 | 2.87E-02 | 1.47E-01 | |
| B. Tritium | | | | | | |
| 1. Total Release | Curies | 1.02E+02 | 1.20E+02 | 1.06E+02 | 6.85E+01 | 2.50E+01 |
| 2. Average Diluted Concentration During Period | µCi/ml | 1.05E-06 | 1.52E-06 | 1.44E-06 | 7.21E-07 | |
| 3. Percent of Applicable Limit | % | 1.05E-02 | 1.52E-02 | 1.44E-02 | 7.21E-03 | |
| C. Dissolved and Entrained Gases | | | | | | |
| 1. Total Release | Curies | 0.00E+00 | 5.95E-05 | 4.34E-05 | 3.41E-05 | 2.50E+01 |
| 2. Average Diluted Concentration During Period | µCi/sec | 0.00E+00 | 7.52E-13 | 5.88E-13 | 3.59E-13 | |
| 3. Percent of Applicable Limit | % | 0.00E+00 | 3.76E-07 | 2.94E-07 | 1.79E-07 | |
| D. Gross Alpha Radioactivity | | | | | | |
| 1. Total Release | Curies | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 2.50E+01 |
| E. Waste Volume Released (Pre-Dilution) | | | | | | |
| F. Volume of Dilution Water Used | Liters | 5.67E+07 | 4.03E+07 | 5.94E+08 | 5.38E+07 | 2.50E+01 |
| | Liters | 9.72E+10 | 7.90E+10 | 7.32E+10 | 9.49E+10 | 2.50E+01 |

Prairie Island Nuclear Generating Station
2016 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 | 1.20E-04 | 9.39E-05 | 2.61E-05 | 2.73E-05 |
| Ar-41 | Curies | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 7.62E-07 | 0.00E+00 | 0.00E+00 |
| As-76 | Curies | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 1.47E-06 |
| Co-57 | Curies | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 6.35E-06 |
| Co-58 | Curies | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 3.41E-04 | 2.67E-04 | 4.95E-05 | 3.05E-03 |
| Co-60 | Curies | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 6.41E-04 | 2.33E-04 | 2.83E-04 | 3.38E-04 |
| Cr-51 | Curies | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 1.60E-05 | 7.95E-06 | 0.00E+00 | 5.40E-05 |
| Fe-55 | Curies | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 3.88E-03 | 1.44E-03 | 9.49E-04 | 1.49E-03 |
| Fe-59 | Curies | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 2.14E-06 | 5.50E-06 | 0.00E+00 | 0.00E+00 |
| H-3 | Curies | 1.45E-01 | 1.60E-01 | 2.99E+00 | 1.46E-01 | 1.02E+02 | 1.20E+02 | 1.03E+02 | 6.83E+01 |
| Mn-54 | Curies | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 1.26E-05 | 1.47E-05 | 2.90E-05 | 2.06E-05 |
| Nb-95 | Curies | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 3.49E-06 | 3.76E-05 | 0.00E+00 | 4.04E-06 |
| Nb-97 | Curies | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 6.87E-06 | 6.48E-06 | 1.37E-05 | 1.09E-05 |
| Ni-63 | Curies | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 1.97E-03 | 1.22E-04 | 0.00E+00 | 7.35E-04 |
| Sb-124 | Curies | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 6.45E-07 | 0.00E+00 | 1.65E-06 |
| Sb-125 | Curies | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 6.30E-05 | 1.23E-04 | 8.15E-05 | 1.55E-03 |
| Sn-113 | Curies | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 1.71E-06 | 3.32E-05 | 0.00E+00 | 2.01E-06 |
| Sr-92 | Curies | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 1.32E-06 | 1.11E-06 | 1.65E-06 |
| Te-123M | Curies | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 3.24E-06 | 0.00E+00 | 1.46E-06 | 4.73E-05 |
| W-187 | Curies | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 2.50E-05 | 4.64E-06 | 0.00E+00 | 0.00E+00 |
| Xe-127 | Curies | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 2.95E-06 |
| Xe-133 | Curies | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 5.48E-05 | 4.28E-05 | 2.99E-05 |
| Xe-135 | Curies | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 3.88E-06 | 5.17E-07 | 1.27E-06 |
| Zr-95 | Curies | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 2.32E-06 | 1.77E-05 | 0.00E+00 | 0.00E+00 |
| Total for Period | Curies | 1.45E-01 | 1.60E-01 | 2.99E+00 | 1.46E-01 | 1.02E+02 | 1.20E+02 | 1.03E+02 | 6.83E+01 |

Prairie Island Nuclear Generating Station
2016 Annual Dose Summary

Gaseous Effluents

| | Parameter | Location | Dose | Dose Limit | % of Limit |
|-------|------------------------|-------------|----------|------------|------------|
| Qtr 1 | Gamma Air Dose (mrad) | 0.58 km W | 4.67E-08 | 1.00E+01 | 0.00 |
| | Beta Air Dose (mrad) | 0.58 km W | 5.30E-06 | 2.00E+01 | 0.00 |
| | Total Body Dose (mrem) | 0.58 km W | 4.37E-08 | 5.00E+00 | 0.00 |
| | Skin Dose (mrem) | 0.58 km W | 3.69E-06 | 1.50E+01 | 0.00 |
| | Max Organ Dose (mrem) | 0.97 km NNW | 5.76E-03 | 1.50E+01 | 0.04 |
| | Child - Liver | | | | |
| Qtr 2 | Gamma Air Dose (mrad) | 0.58 km W | 3.51E-08 | 1.00E+01 | 0.00 |
| | Beta Air Dose (mrad) | 0.58 km W | 2.78E-06 | 2.00E+01 | 0.00 |
| | Total Body Dose (mrem) | 0.58 km W | 3.18E-08 | 5.00E+00 | 0.00 |
| | Skin Dose (mrem) | 0.58 km W | 1.94E-06 | 1.50E+01 | 0.00 |
| | Max Organ Dose (mrem) | 0.97 km NNW | 3.20E-02 | 1.50E+01 | 0.21 |
| | Child - Bone | | | | |
| Qtr 3 | Gamma Air Dose (mrad) | 0.58 km W | 2.47E-05 | 1.00E+01 | 0.00 |
| | Beta Air Dose (mrad) | 0.58 km W | 1.57E-04 | 2.00E+01 | 0.00 |
| | Total Body Dose (mrem) | 0.58 km W | 2.07E-05 | 5.00E+00 | 0.00 |
| | Skin Dose (mrem) | 0.58 km W | 1.07E-04 | 1.50E+01 | 0.00 |
| | Max Organ Dose (mrem) | 0.97 km NNW | 4.83E-02 | 1.50E+01 | 0.32 |
| | 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 | 1.22E-02 | 1.50E+01 | 0.08 |
| | Child - Thyroid | | | | |
| Year | Gamma Air Dose (mrad) | 0.58 km W | 2.48E-05 | 2.00E+01 | 0.00 |
| | Beta Air Dose (mrad) | 0.58 km W | 1.65E-04 | 4.00E+01 | 0.00 |
| | Total Body Dose (mrem) | 0.58 km W | 2.08E-05 | 1.00E+01 | 0.00 |
| | Skin Dose (mrem) | 0.58 km W | 1.13E-04 | 3.00E+01 | 0.00 |
| | Max Organ Dose (mrem) | 0.97 km NNW | 8.03E-02 | 3.00E+01 | 0.27 |
| | Child - Bone | | | | |

Liquid Effluents

| | Parameter | Max Receptor | Dose | Dose Limit | % of Limit |
|-------|------------------------|--------------------|----------|------------|------------|
| Qtr 1 | Max Organ Dose (mrem) | Adult - Bone | 1.21E-03 | 1.00E+01 | 0.01 |
| | Total Body Dose (mrem) | Adult - Total Body | 4.64E-04 | 3.00E+00 | 0.02 |
| Qtr 2 | Max Organ Dose (mrem) | Adult - Gi-LLi | 9.17E-04 | 1.00E+01 | 0.01 |
| | Total Body Dose (mrem) | Adult - Total Body | 6.15E-04 | 3.00E+00 | 0.02 |
| Qtr 3 | Max Organ Dose (mrem) | Adult - Gi-LLi | 2.49E-04 | 1.00E+01 | 0.00 |
| | Total Body Dose (mrem) | Adult - Total Body | 2.34E-04 | 3.00E+00 | 0.01 |
| Qtr 4 | Max Organ Dose (mrem) | Adult - Bone | 5.23E-04 | 1.00E+01 | 0.01 |
| | Total Body Dose (mrem) | Adult - Total Body | 3.23E-04 | 3.00E+00 | 0.01 |
| Year | Max Organ Dose (mrem) | Adult - Gi-LLi | 2.13E-03 | 2.00E+01 | 0.01 |
| | Total Body Dose (mrem) | Adult - Total Body | 1.64E-03 | 6.00E+00 | 0.03 |