

TRANSMITTAL MANIFEST

NORTHERN STATES POWER COMPANY

NUCLEAR GENERATION DEPARTMENT

MONTICELLO NUCLEAR GENERATING PLANT

Effluent and Waste Disposal Semiannual Report
for July 1, 1987 through December 31, 1987

Manifest Date: February 26, 1988

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MONTICELLO NUCLEAR GENERATING PLANT
NORTHERN STATES POWER COMPANY

Period: Jul - Dec 1987
License No. DPR-22

EFFLUENT AND WASTE DISPOSAL SEMI-ANNUAL REPORT

Supplemental Information

1. Regulatory Limits - Quarterly levels requiring reporting
to Nuclear Regulatory Commission

A. Noble Gases:

5 mrad/quarter gamma radiation
10 mrad/quarter beta radiation

B. Long Lived Iodines, Particulates, and Tritium:

7.5 mrem/quarter to any organ

C. Liquid Effluents:

1.5 mrem/quarter dose to the total body
5.0 mrem/quarter dose to any organ

2. Maximum Permissible Concentrations:

A. Noble Gases:

10 CFR Part 20, Appendix B, Table II, Column 1

B. Long Lived Iodines, Particulates, and Tritium:

10 CFR Part 20, Appendix B, Table II, Column 1

C. Liquid Effluents:

10 CFR Part 20, Appendix B, Table II, Column 2
2 E-04 uci/ml for dissolved and entrained gases

3. Average Energy:

(Not Applicable)

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Supplemental Information (continued)

4. Measurements and Approximations of Total Radioactivity:

A. Noble Gases:

Continuous gross activity monitors in Reactor Building Vent and plant stack exhaust streams. Weekly isotopic analysis of steam jet air ejector stream. Monthly analysis of storage tank contents.

B. Iodines in Gaseous Effluent:

Continuous monitoring with charcoal cartridges in Reactor Building vent and plant stack exhaust streams with weekly analysis.

C. Particulates in Gaseous Effluent:

Continuous monitoring with particulate filters in Reactor Building vent and plant stack exhaust streams with weekly analysis.

D. Tritium in Gaseous Effluent:

Continuous monitoring with silica gel cartridges in Reactor Building vent and plant stack exhaust streams with biweekly analysis.

E. Liquid Effluents:

Tank sample analyzed prior to each planned release and continuous monitoring of gross activity during planned release.

5. Batch Releases:

A. Liquid:

1. Number of Batch Releases	0	
2. Total Time Period For Batch Releases	0.0	Min
3. Maximum Time Period for a Batch Release	0.0	Min
4. Average Time Period for a Batch Release	0.0	Min
5. Minimum Time Period for a Batch Release	0.0	Min
6. Average River Flow During Releases	0.0	Cf/sec

B. Gaseous:

1. Number of Batch Releases	0	
2. Total Time Period for Batch Releases	NA	Min
3. Maximum Time Period for a Batch Release	NA	Min
4. Average Time Period for a Batch Release	NA	Min
5. Minimum Time Period for a Batch Release	NA	Min

6. Abnormal Releases:

A. Liquid:

1. Number of Releases	0	
2. Total Activity Released	0.0	Ci

B. Gaseous:

1. Number of Releases	0	
2. Total Activity Released	0.0	Ci

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Table 1A Gaseous Effluents - Summation of all Releases

	Units	1st Qtr	2nd Qtr	Pcnt Est Error

A. Noble Gases:				
1. Total Release:				
A. Elevated Release	Ci	1.02E+03	3.65E+02	
B. Building Vent Release	Ci	2.37E+02	1.66E+02	
C. Total	Ci	1.25E+03	5.31E+02	5.00E+01
2. Average Release Rate:				
A. Elevated Release	uCi/sec	1.28E+02	4.59E+01	
B. Building Vent Release	uCi/sec	2.98E+01	2.09E+01	
C. Total	uCi/sec	1.58E+02	6.69E+01	5.00E+01
3. Percent Tech Spec Qtrly Reporting Level				
Gamma Radiation		2.80E+00	4.36E+00	
Beta Radiation		1.81E+00	2.75E+00	
B. Iodines:				
1. Total I-131:				
A. Elevated Release	Ci	1.68E-02	1.47E-02	
B. Building Vent Release	Ci	3.66E-02	2.92E-02	
C. Total	Ci	5.34E-02	4.39E-02	5.00E+01
2. Average I-131 Release Rate:				
A. Elevated Release	uCi/sec	2.12E-03	1.85E-03	
B. Building Vent Release	uCi/sec	4.60E-03	3.68E-03	
C. Total	uCi/sec	6.72E-03	5.52E-03	5.00E+01
C. Long Lived Particulates and Gross Alpha Releases:				
1. Total Particulates:				
A. Elevated Release	Ci	1.45E-03	6.78E-04	
B. Building Vent Release	Ci	3.51E-03	1.75E-03	
C. Total	Ci	4.95E-03	2.43E-03	5.00E+01
2. Average Release Rate:				
A. Elevated Release	uCi/sec	1.82E-04	8.53E-05	
B. Building Vent Release	uCi/sec	4.41E-04	2.20E-04	
C. Total	uCi/sec	6.23E-04	3.05E-04	5.00E+01

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Table 1A Gaseous Effluents - Summation of All Releases (Continued)

	Units	1st qtr	2nd qtr	Pcnt Est Error

3. Gross Alpha Radioactivity:				
A. Elevated Release	Ci	1.89E-07	2.18E-07	
B. Building Vent Release	Ci	7.62E-06	1.18E-05	
C. Total	Ci	7.81E-06	1.20E-05	1.00E+02
D. Tritium:				
1. Total Release:				
A. Elevated Release	Ci	3.60E+00	1.99E+00	
B. Building Vent Release	Ci	1.88E+01	1.11E+01	
C. Total	CI	2.24E+01	1.31E+01	5.00E+01
2. Average Release Rate:				
A. Elevated Release	uCi/sec	4.53E-01	2.51E-01	
B. Building Vent Release	uCi/sec	2.37E+00	1.39E+00	
C. Total	uCi/sec	2.82E+00	1.64E+00	5.00E+01
E. Percent Tech Spec Qtrly Reporting Level for Long Lived Iodines, Particulates, and Tritium		9.71E+00	1.24E+01	

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Table 1B Gaseous Effluents - Elevated Release

Nuclides Released	Units	Continuous Mode		Batch Mode	
		1st Qtr	2nd Qtr	1st Qtr	2nd Qtr
1. Noble Gases:					
Xe133	Ci	5.46E+02	1.66E+02	0.0	0.0
Xe135	Ci	7.03E+00	2.75E+00	0.0	0.0
Kr85M	Ci	1.57E+00	6.03E-01	0.0	0.0
Kr88	Ci	4.92E+00	1.97E+00	0.0	0.0
Kr87	Ci	7.06E+00	2.97E+00	0.0	0.0
Xe138	Ci	1.05E+02	4.70E+01	0.0	0.0
Kr90	Ci	3.83E+00	1.69E+00	0.0	0.0
Xe139	Ci	1.14E+01	5.03E+00	0.0	0.0
Kr89	Ci	1.14E+02	5.02E+01	0.0	0.0
Xe137	Ci	1.49E+02	6.57E+01	0.0	0.0
Xe135M	Ci	9.00E+00	3.91E+00	0.0	0.0
Kr83M	Ci	1.33E+00	5.60E-01	0.0	0.0
Xe133M	Ci	3.58E+00	1.44E+00	0.0	0.0
Xe131M	Ci	2.45E+00	7.08E-01	0.0	0.0
Kr85	Ci	5.03E+01	1.46E+01	0.0	0.0
Total for Period	Ci	1.02E+03	3.65E+02	0.0	0.0
2. Iodines:					
I-131	Ci	1.68E-02	1.47E-02	0.0	0.0
I-133	Ci	7.08E-02	2.05E-02	0.0	0.0
I-135	Ci	7.54E-02	2.40E-02	0.0	0.0
Total	Ci	1.63E-01	5.92E-02	0.0	0.0

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Table 1B Gaseous Effluents - Elevated Release (Continued)

Nuclides Released	Units	Continuous Mode		Batch Mode	
		1st Qtr	2nd Qtr	1st Qtr	2nd Qtr
3. Particulates:					
Ce 141	Ci	2.40E-05	1.00E-05	0.0	0.0
Ba 140	Ci	1.05E-03	4.74E-04	0.0	0.0
Cs 137	Ci	1.57E-06	5.81E-05	0.0	0.0
Cs 136	Ci	0.0	1.50E-06	0.0	0.0
Cs 134	Ci	0.0	4.35E-05	0.0	0.0
Sr 90	Ci	1.75E-06	0.0	0.0	0.0
Sr 89	Ci	3.68E-04	0.0	0.0	0.0
Zn 65	Ci	0.0	1.42E-05	0.0	0.0
Co 60	Ci	0.0	5.64E-05	0.0	0.0
Co 58	Ci	0.0	5.83E-06	0.0	0.0
Mn 54	Ci	0.0	1.47E-05	0.0	0.0
Total	Ci	1.45E-03	6.78E-04	0.0	0.0

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Table 1C Gaseous Effluents - Building Vent Release

Nuclides Released	Units	Continuous Mode		Batch Mode	
		1st Qtr	2nd Qtr	1st Qtr	2nd Qtr
1. Noble Gases:					
Xe 133	Ci	8.25E-01	2.19E+01	0.0	0.0
Xe 135	Ci	3.99E+00	1.89E+00	0.0	0.0
Kr 85M	Ci	8.88E-01	4.10E-01	0.0	0.0
Kr 88	Ci	2.80E+00	1.33E+00	0.0	0.0
Kr 87	Ci	4.02E+00	2.00E+00	0.0	0.0
Xe 138	Ci	5.95E+01	3.09E+01	0.0	0.0
Kr 90	Ci	2.18E+00	1.11E+00	0.0	0.0
Xe 139	Ci	6.49E+00	3.31E+00	0.0	0.0
Kr 89	Ci	6.50E+01	3.31E+01	0.0	0.0
Xe 137	Ci	8.50E+01	4.33E+01	0.0	0.0
Xe 135M	Ci	5.12E+00	2.59E+00	0.0	0.0
Kr 83M	Ci	7.55E-01	3.74E-01	0.0	0.0
Xe 133M	Ci	2.71E-02	9.20E-02	0.0	0.0
Xe 131M	Ci	1.88E-03	2.62E-01	0.0	0.0
Kr 85	Ci	2.23E-02	2.36E+01	0.0	0.0
Total for Period	Ci	2.37E+02	1.66E+02	0.0	0.0
2. Iodines:					
I-131	Ci	3.66E-02	2.92E-02	0.0	0.0
I-133	Ci	2.60E-01	1.34E-01	0.0	0.0
I-135	Ci	2.96E-01	1.58E-01	0.0	0.0
Total	Ci	5.92E-01	3.21E-01	0.0	0.0

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Table 1C Gaseous Effluents - Building Vent Releases (Continued)

Nuclides Released	Units	Continuous Mode		Batch Mode	
		1st Qtr	2nd Qtr	1st Qtr	2nd Qtr
3. Particulates:					
Ce141	Ci	1.29E-04	7.25E-05	0.0	0.0
Ba140	Ci	2.92E-03	1.35E-03	0.0	0.0
Cs137	Ci	2.50E-05	6.12E-05	0.0	0.0
Cs134	Ci	0.0	3.49E-05	0.0	0.0
Sr90	Ci	6.50E-06	0.0	0.0	0.0
Sr89	Ci	4.21E-04	0.0	0.0	0.0
Co60	Ci	0.0	2.13E-04	0.0	0.0
Mn54	Ci	0.0	1.40E-05	0.0	0.0
Total	Ci	3.51E-03	1.75E-03	0.0	0.0

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Table 2A Liquid Effluents - Summation of All Releases

	Units	1st Qtr	2nd Qtr	Pcnt Est Error

A. Fission and Activation Products:				
1. Total Release (Except H-3, Gases, and Alpha)	Ci	0.0	0.0	0.0
2. Avg Diluted Concentration	uCi/ml	0.0	0.0	
B. Tritium:				
1. Total Release	Ci	0.0	0.0	0.0
2. Avg Diluted Concentration	uCi/ml	0.0	0.0	
C. Dissolved and Entrained Gases:				
1. Total Release	Ci	0.0	0.0	0.0
2. Avg Diluted Concentration	uCi/ml	0.0	0.0	
D. Percent Qtrly Tech Spec Reporting Level				
Whole Body Dose		0.0	0.0	
Organ Dose		0.0	0.0	
E. Gross Alpha Radioactivity:				
1. Total Release	Ci	0.0	0.0	0.0
F. Volume of Waste Released				
	Liters	0.0	0.0	0.0
G. Volume of Dilution Water Used				
	Liters	0.0	0.0	0.0

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Table 2B Liquid Effluents

Nuclides Released	Units	Continuous Mode		Batch Mode	
		1st Qtr	2nd Qtr	1st Qtr	2nd Qtr

None Released This Period

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Table 3 Solid Waste and Irradiated Fuel Shipments

A. Solid Waste Shipped Offsite For Burial or Disposal:

1. Type of Waste:

	Units	Total	Pcnt Est Error
	-----	-----	-----
A. Spent Resins, Filter Sludges, Evaporator Bottoms, Etc.	Cu Meter	1.65E+01	
	Ci	4.52E+01	5.00E+01
B. Dry Compressible Waste, Contaminated Equip, Etc.	Cu Meter	1.10E+02	
	Ci	1.18E+01	5.00E+01
C. Irradiated Components, Control Rods, Etc.	Cu Meter	0.0	
	Ci	0.0	0.0
D. Other (described below):			
DRUMS RA SOURCES	Cu Meter	4.25E-01	
	Ci	7.50E-02	5.00E+01
SOLIDIFIED OIL	Cu Meter	2.47E+00	
	Ci	4.31E-02	5.00E+01

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Table 3 Solid Waste and Irradiated Fuel Shipments (Continued)

2. Measured Major Nuclide Composition by Type of Waste:

TYPE	Nuclide	Percent
-----	-----	-----
A	Ce141	1.27E-01
	Ba140	7.17E-01
	Cs137	4.91E+01
	Cs134	2.40E+00
	Sr89	3.50E+00
	Zn65	3.06E+00
	Co60	1.47E+01
	Co58	6.00E-01
	Mn54	3.64E+00
	Cr51	1.13E+00
	I 131	1.10E+00
	Fe55	1.61E+01
B	Ce141	1.66E-01
	Ba140	1.46E-01
	Cs137	1.77E+00
	Cs136	4.32E-02
	Cs134	1.59E-02
	Sr90	1.44E-02
	Sr89	1.39E+00
	Zn65	2.31E+00
	Co60	3.60E+01
	Fe59	3.35E-01
	Co58	5.65E-01
	Mn54	1.07E+01
	Cr51	6.16E-01
	Fe55	3.14E+01
D	Cs137	1.24E+00
	Sr90	2.23E-02
	Sr89	9.48E-01
	Co60	9.59E+00
	Mn54	1.17E+00
	Fe55	1.07E+01

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Table 3 Solid Waste and Irradiated Fuel Shipments (Continued)

3. Solid Waste Disposition:

Number of Shipments	Mode	Destination
3	Truck	Chem-Nuc Inc., Barnwell, SC
7	Truck	US Ecology, Richland, WA
1	Rail	US Ecology, Richland, WA

B. Irradiated Fuel Shipments:

Number of Shipments	Mode	Destination
None		

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Table 3 Solid Waste and Irradiated Fuel Shipments (Continued)

C. Shipping Container and Solidification Method:

No.	Volume (M3)	Activity (Ci)	Type of Container Waste	Container Code	Solidification Code
(87-24)	1.63E+01	5.36E-01	B	L	
(87-24)	4.25E-01	7.50E-02	D	L	C
(87-36)	5.50E+00	1.72E+01	A	A	
(87-37)	5.50E+00	1.42E+01	A	A	
(87-30)	2.47E+00	4.31E-02	D	L	C
(87-30)	3.26E+01	1.09E+00	B	L	
(87-39)	5.50E+00	1.39E+01	A	A	
(87-40)	3.81E+01	2.17E+00	B	L	
(87-41)	1.70E+01	1.61E+00	B	L	
(87-45)	5.66E+00	6.38E+00	B	L	
(87-00)	6.09E-01	2.80E-02	B	L	

CONTAINER CODES: L - LSA
A - Type A
B - Type B
Q - Large Quantity

SOLIDIFICATION CODES: C - Cement
U - Urea Formaldehyde

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Notes:

1. Release of individual noble gas isotopes from the plant stack was determined using an isotopic analysis at the steam jet air ejector. Xe133, Xe135, Kr85M, Kr88, Kr87, and Xe138 were measured and used to characterize the mode of gas release from the fuel. Other significant noble gases were determined using known ratios, the measured total offgas holdup system delay time, and the known fraction of the offgas stream released via the gland exhauster.
2. An isotopic analysis for noble gases is normally not possible at the building vents. Individual isotopes are generally below their lower limit of detection (LLD). Therefore, for reactor building vent releases, the noble gas isotopic mixture is assumed to be the same as the mixture determined at the steam jet air ejector.
3. Information specified in Regulatory Guide 1.21 which is not applicable to the Monticello plant is indicated by 'NA'.
4. Nuclides not detected in plant effluents (those below the LLD of the analysis) are not included in the quantities reported released. LLD values are recorded and must be less than the minimum LLD values stated in the Monticello Technical Specifications.

NORTHERN STATES POWER COMPANY
MONTICELLO NUCLEAR GENERATING PLANT

OFFSITE RADIATION DOSE ASSESSMENT FOR
January 1 - December 31, 1987

An assessment of radiation dose due to releases from the Monticello Nuclear Generating Plant during 1987 was performed in accordance with the Technical Specifications. Computed doses were well below the 40 CFR Part 190 and 10 CFR 50, Appendix I standards and guidelines.

Offsite dose calculation formulas and meteorological data from the Offsite Dose Calculation Manual were used in making this assessment. Source terms were obtained from the two Effluent and Waste Disposal Semiannual Reports prepared for NRC review during the year.

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. Doses, both whole body and organ, are a small percentage of Appendix I guidelines.

Offsite Doses from Liquid Release

There were no liquid releases made from the Monticello Plant during the 1987 calendar year.

Doses to Individuals Due to Activities
Inside the Site Boundary

Occasionally sportsmen enter the Monticello site for recreational activities. In addition, an Environmental Protection Agency Field Station is located at the Monticello site (see Figure 3.8.1 or 3.8.2 of the Monticello Technical Specifications). Workers at this field station, spending an average of 40 hours/week, are the most exposed individuals. Whole body doses to these individuals have been computed using stack and vent X/Q values for the field station location. Annual computed doses were reduced by the factor 40/168 to account for the limited occupancy for workers at this location. Organ doses to workers at the EPA field station due to gaseous releases have been computed for the inhalation pathway (no other pathway exists). Doses to workers at the EPA field station due to liquid releases are not expected to be higher than those computed for individuals beyond the site boundary. Doses at the field station are reported in Table 1.

Doses to Most Exposed Member of the General Public from
Reactor Releases and Other Nearby Uranium Fuel Cycle Sources

There are no uranium fuel facilities in the vicinity of the Monticello site.

The only other source of exposure to the general public in addition to the plant gaseous and liquid releases is from direct radiation. Calculations performed in the past have shown this source to be negligible. An array of TLD monitoring locations at the site boundary has consistently indicated that plant operation in recent years has had no effect on ambient gamma radiation.

Therefore, the most exposed member of the general public will not receive a radiation dose from reactor releases and all other fuel cycle activities in excess of the sum of the liquid and gaseous whole body and organ doses reported in Table 1 for the site boundary and critical receptor, respectively. These doses are well within 40 CFR Part 190 standards of 25 mrem to the whole body or any organ (except thyroid) and 75 mrem to the thyroid every 12 months.

TABLE 1

OFFSITE RADIATION DOSE ASSESSMENT - MONTICELLO

PERIOD: JANUARY 1 through DECEMBER 31, 1987

<u>Gaseous Releases</u>		10 CFR Part 50 Appendix I Guideline per Unit per Year
Maximum Site Boundary Gamma Air Dose (mrad)	.8585	10
Maximum Site Boundary Beta Air Dose (mrad)	1.2500	20
Maximum Offsite Dose to any Organ (mrem)* Total	2.5665	15
EPA Field Station (mrem, 40 hrs/week) Whole Body	.2222	5
Organ	.5673	15
<u>Liquid Releases</u> (No releases in 1987)		
Maximum Offsite Whole Body Dose (mrem) Total	.000	3
Maximum Offsite Organ Dose (mrem) Total	.000	10

* Long-lived particulates, I-131 & tritium.

TABLE 2

OFFSITE RADIATION DOSE ASSESSMENT
 SUPPLEMENTAL INFORMATION - MONTICELLO

PERIOD: JANUARY 1 through DECEMBER 31, 1987

Gaseous Effluents

Maximum Site Boundary
 Dose Location
 (from building vents)

Sector	SSE
Distance (mi)	0.43

EPA Field Station

Sector	ESE
Distance (mi)	0.31

Maximum Offsite
 Dose Location

Sector	ESE
Distance (mi)	2.3
Pathways	Ground, Inhalation, Goat Milk

Age Group	Infant
Organ	Thyroid

Liquid Releases

Maximum Offsite Dose
 Location Downstream

Pathways	Drinking Water	Drinking Water, Fish
Age Group	Infant	Adult
Organ	Whole Body	GI-LLI
Dilution Factor (drinking water)	7.1	7.1