

TRANSMITTAL MANIFEST  
 NORTHERN STATES POWER COMPANY  
 NUCLEAR GENERATION DEPARTMENT  
MONTICELLO NUCLEAR GENERATING PLANT

Effluent and Waste Disposal Semiannual Report  
for July 1, 1991 through December 31, 1991

MANIFEST DATE: FEBRUARY 27, 1992

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NORTHERN STATES POWER COMPANY  
MONTICELLO NUCLEAR GENERATING PLANT  
License No. DPR-22

EFFLUENT AND WASTE DISPOSAL SEMIANNUAL REPORT  
Period : Jul - Dec 1991

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 dose 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  
2.0 E-4 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 exhaust streams.

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 weekly 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	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. Average River Flow During Release	NA	cF/sec

B. Gaseous :

1. Number of Batch Releases	2	
2. Total Time Period for Batch Releases	4630.0	min
3. Maximum Time Period for a Batch Release	4030.0	min
4. Average Time Period for a Batch Release	2315.0	min
5. Minimum Time Period for a Batch Release	600.0	min

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## Supplemental Information (continued)

## 6. Abnormal Releases

## A. Liquid :

1. Number of Releases	0	
2. Total Activity Released	NA	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	3rd Qtr	4th Qtr	Est. Total Error, %
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## A. Fission &amp; Activation gases

1. Total Release	Ci	5.25E+02	4.63E+02	2.00E+01
2. Average Release Rate	uci/sec	6.60E+01	5.83E+01	
3. Percent Tech Spec Qtrly Reporting Level				
Gamma Radiation	%	1.26E+00	6.83E-01	
Beta Radiation	%	4.18E-01	1.50E-01	

## B. Iodines

1. Total I-131 Release	Ci	1.17E-02	7.03E-03	1.00E+01
2. Average I-131 Release Rate	uci/sec	1.47E-03	8.84E-04	

## C. Particulates

1. Total Particulates	Ci	1.68E-03	9.78E-04	3.00E+01
2. Average Release Rate	uci/sec	2.11E-04	1.23E-04	
3. Gross Alpha Radioactivity	Ci	6.49E-06	4.11E-06	

## D. Tritium

1. Total Release	Ci	1.46E+01	1.97E+01	1.00E+01
2. Average Release Rate	uci/sec	1.83E+00	2.47E+00	

## E. Percent Qtrly Tech Spec Reporting Levels

1. Iodines, Particulates, and Tritium	%	2.97E+00	1.99E+00	
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Table 1B Gaseous Effluents - Elevated Releases

Nuclides Released	Unit	Continuous Mode		Batch Mode	
		3rd Qtr	4th Qtr	3rd Qtr	4th Qtr
<b>1. Fission Gases</b>					
KR-85M	Ci	5.70E+00	5.98E+00	0.00E+00	0.00E+00
KR-87	Ci	9.22E+00	6.68E+00	0.00E+00	0.00E+00
KR-88	Ci	1.36E+01	2.77E+00	0.00E+00	0.00E+00
KR-89	Ci	8.05E+00	2.26E+00	0.00E+00	0.00E+00
XE-133	Ci	1.20E+02	9.57E+01	4.76E-03	0.00E+00
XE-133M	Ci	2.25E+00	2.64E+00	0.00E+00	0.00E+00
XE-135	Ci	5.36E+01	6.36E+01	4.24E-03	0.00E+00
XE-135M	Ci	2.35E+01	2.38E+01	0.00E+00	0.00E+00
XE-137	Ci	1.25E+02	1.29E+02	0.00E+00	0.00E+00
XE-138	Ci	6.58E+01	6.58E+01	0.00E+00	0.00E+00
AR-41	Ci	1.97E-01	0.00E+00	3.50E-03	0.00E+00
Total for Period	Ci	4.27E+02	3.98E+02	1.25E-02	0.00E+00

**2. Iodines**

I-131	Ci	3.35E-03	8.30E-04	0.00E+00	0.00E+00
I-133	Ci	2.04E-02	3.48E-03	0.00E+00	0.00E+00
I-135	Ci	2.78E-02	4.71E-03	0.00E+00	0.00E+00
Total for Period	Ci	5.15E-02	9.02E-03	0.00E+00	0.00E+00

**3. Particulates**

CR-51	Ci	2.13E-06	0.00E+00	0.00E+00	0.00E+00
MN-54	Ci	1.13E-06	1.72E-07	0.00E+00	0.00E+00
CO-60	Ci	8.19E-06	2.53E-06	1.82E-08	0.00E+00
ZN-65	Ci	1.49E-06	4.84E-07	0.00E+00	0.00E+00
ZR-95	Ci	2.28E-07	0.00E+00	0.00E+00	0.00E+00
CS-137	Ci	1.75E-05	9.84E-06	0.00E+00	0.00E+00
BA-140	Ci	3.28E-04	3.97E-04	0.00E+00	0.00E+00
SR-89	Ci	6.08E-04	0.00E+00	0.00E+00	0.00E+00
SR-90	Ci	5.78E-07	0.00E+00	0.00E+00	0.00E+00
Total for Period	Ci	9.67E-04	4.10E-04	1.82E-08	0.00E+00

Analysis of Sr-89 & 90 for the 4th Qtr was not completed in time for this report, results will be included with the next semiannual report.

EFFLUENT AND WASTE DISPOSAL SEMIANNUAL REPORT  
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Table 1C Gaseous Effluents - Building Vent Releases

Nuclides Released	Unit	Continuous Mode		Batch Mode	
		3rd Qtr	4th Qtr	3rd Qtr	4th Qtr
1. Fission Gases					
KR-88	Ci	4.57E-01	2.74E+00	0.00E+00	0.00E+00
KR-89	Ci	1.14E+01	0.00E+00	0.00E+00	0.00E+00
XE-133	Ci	1.12E+01	1.85E-01	0.00E+00	3.14E-03
XE-135	Ci	4.20E+01	2.07E+01	0.00E+00	3.43E-03
XE-135M	Ci	3.23E+01	4.04E+01	0.00E+00	0.00E+00
XE-138	Ci	0.00E+00	1.14E+00	0.00E+00	0.00E+00
Total for Period	Ci	9.73E+01	6.51E+01	0.00E+00	6.57E-03

## 2. Iodines

I-131	Ci	8.35E-03	6.20E-03	0.00E+00	0.00E+00
I-133	Ci	7.32E-02	5.24E-02	0.00E+00	0.00E+00
I-135	Ci	9.45E-02	8.84E-02	0.00E+00	0.00E+00
Total for Period	Ci	1.70E-01	1.47E-01	0.00E+00	0.00E+00

## 3. Particulates

MN-54	Ci	1.48E-05	7.10E-06	0.00E+00	0.00E+00
CO-60	Ci	2.58E-04	1.12E-04	0.00E+00	0.00E+00
Zn-65	Ci	4.48E-05	1.03E-04	0.00E+00	0.00E+00
CS-137	Ci	4.31E-05	9.59E-06	0.00E+00	0.00E+00
BA-140	Ci	3.14E-04	3.14E-04	0.00E+00	0.00E+00
CE-141	Ci	3.06E-05	2.34E-05	0.00E+00	0.00E+00
Sr-89	Ci	3.84E-06	0.00E+00	0.00E+00	0.00E+00
Total for Period	Ci	7.08E-04	5.69E-04	0.00E+00	0.00E+00

Analysis of Sr-89 & 90 for the 4th Qtr was not completed in time for this report, results will be included with the next semiannual report.

EFFLUENT AND WASTE DISPOSAL SEMIANNUAL REPORT  
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Table 2A Liquid Effluents - Summation of all Releases

	Units	3rd Qtr	4th Qtr	Est. Total Error, %
<b>A. Fission &amp; Activation products</b>				
1. Total Release (not including tritium, gases, alpha)	Ci	0.00E+00	0.00E+00	0.00E+00
2. Avg Diluted Concentration	uci/ml	0.00E+00	0.00E+00	
<b>B. Tritium</b>				
1. Total Release	Ci	0.00E+00	0.00E+00	0.00E+00
2. Avg Diluted Concentration	uci/ml	0.00E+00	0.00E+00	
<b>C. Dissolved and Entrained Gases</b>				
1. Total Release	Ci	0.00E+00	0.00E+00	0.00E+00
2. Avg Diluted Concentration	uci/ml	0.00E+00	0.00E+00	
<b>D. Percent Qtrly Tech Spec Reporting Level</b>				
1. Whole Body Dose	%	0.00E+00	0.00E+00	
2. Organ Dose	%	0.00E+00	0.00E+00	
<b>E. Gross Alpha Radioactivity</b>				
1. Total Release	Ci	0.00E+00	0.00E+00	0.00E+00
<b>F. Volume of Waste Released</b>				
	Liters	0.00E+00	0.00E+00	0.00E+00
<b>F. Volume of Dilution Water Used</b>				
	Liters	0.00E+00	0.00E+00	0.00E+00

Table 2B Liquid Effluents

Nuclides Released	Unit	Continuous Mode		Batch Mode	
		3rd Qtr	4th Qtr	3rd Qtr	4th 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 (not irradiated fuel)

1. Type of Waste	Units	6-month Period	Est. Total Error, %
a. Spent resins, filter sludges, evaporator bottoms, etc.	Cu. Meter	7.34E+01	3.70E+01
	Ci	9.95E+02	
b. Dry compressible waste, contaminated equipment, etc.	Cu. Meter	6.82E+01	3.50E+01
	Ci	4.26E+01	
c. Irradiated components, control rods, etc.	Cu. Meter	0.00E+00	0.00E+01
	Ci	0.00E+00	
d. Other (describe)	Cu. Meter	0.00E+00	0.00E+01
	Ci	0.00E+00	

2. Estimate of major nuclide composition (by type of waste)	Nuclide	Percent
A	Cr-51	2.08E-01
	Mn-54	5.60E+00
	Fe-55	2.94E+01
	H-3	1.21E-02
	Co-58	5.24E-01
	Fe-59	1.89E-01
	Co-60	3.07E+01
	Ni-63	1.52E-01
	Zn-65	2.98E+01
	Sr-89	3.18E-01
	Sr-90	3.42E-02
	Tc-99	6.81E-05
	I-131	4.17E-01
	Cs-134	7.51E-02
	I-129	1.34E-04
	Cs-137	2.13E+00
	Ba-140	1.72E-01
	La-140	5.24E-02
	Ce-141	2.69E-02
	Pu-238	2.56E-04
	Pu-239	1.36E-04
	Am-241	3.22E-04
	Pu-241	1.53E-02
	Cm-242	2.56E-04
	Pu-242	1.77E-08
	Cm-243	7.05E-04
	C-14	2.48E-01
B	Mn-54	4.13E+00
	Fe-55	2.40E+01
	H-3	6.60E+00
	Co-58	1.04E-01
	Co-60	4.26E+01
	Ni-63	2.41E-01
	Zn-65	1.68E+01
	Sr-89	9.20E-01
	Sr-90	1.93E-01
	Tc-99	1.12E-05
	Cs-134	1.87E-01
I-129	1.91E-04	

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Table 3 Solid Waste and Irradiated Fuel Shipments

## 3. Solid waste disposal

Number of Shipments	Mode of Transportation	Destination
7	Truck	Chem-Nuc Inc., Barnwell, SC.
5	Truck	US Ecology, Richland, WA.
3	Railway	US Ecology, Richland, WA.
24	Truck	US Ecology, Beatty, NV.

## B. Irradiated Fuel Shipments

## 1. Disposition

Number of Shipments	Mode of Transportation	Destination
None This Period		

## C. Shipping Container and Solidification Method

No.	Volume M3	Activity Ci	Type of Waste	Container Code	Solidification Code
91-63	5.81E+00	7.54E+01	A	A	D
91-66	2.00E+01	1.51E+00	A	L	D
91-69	5.83E+00	5.42E+01	A	A	D
91-74	5.83E+00	5.88E+01	A	A	D
91-75	5.83E+00	4.53E+01	A	A	D
91-76	3.41E+00	3.05E+02	A	A	D
91-77	3.41E+00	2.39E+02	A	A	D
91-79	5.83E+00	9.26E+01	A	A	D
91-81	5.83E+00	6.60E+01	A	A	D
91-84	5.83E+00	3.92E+01	A	A	D
91-88	5.83E+00	1.76E+01	A	A	D
91-90	3.81E+01	1.67E+00	B	L	N
91-91	5.84E+00	3.45E+01	B	A	N
91-92	9.09E+00	3.80E-01	B	L	N
9120a	1.03E+00	1.46E-02	B	L	N
9120b	3.40E-02	2.86E-02	B	L	N
9120c	5.66E-03	1.03E-03	B	L	N
9120d	9.63E-02	1.11E-02	B	L	N
9120e	1.42E-02	3.13E-04	B	L	N
9130a	1.74E+00	4.01E-02	B	L	N
9130b	3.13E+00	8.70E-02	B	L	N
9130c	6.03E-01	1.35E-02	B	L	N
9130d	3.40E-02	8.99E-02	B	L	N
9130e	5.95E-01	1.69E-02	B	L	N
9147a	5.01E-01	1.82E-02	B	L	N
9147b	8.21E-01	3.18E-02	B	L	N
9147c	9.06E-01	4.41E-02	B	L	N
9147d	4.30E-01	2.30E-02	B	L	N

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## C. Shipping Container and Solidification Method (Cont.)

No.	Volume M3	Activity Ci	Type of Waste	Container Code	Solidification Code
9147e	4.53E-01	2.22E-02	B	L	N
9147f	1.13E-01	2.09E-01	B	L	N
9157a	4.76E-01	1.06E-02	B	L	N
9157b	9.74E-01	3.13E-02	B	L	N
9157c	3.60E-01	1.40E-02	B	L	N
9157d	5.58E-01	1.43E-02	B	L	N
9157e	5.07E-01	1.77E-02	B	L	N
9157f	6.80E-02	1.43E+00	B	L	N
9157g	3.85E-01	9.31E-03	B	L	N
9178a	9.63E-01	8.56E-03	B	L	N
9178b	4.33E-01	3.87E+00	B	L	N

## Container Codes :

L - LSA  
A - Type A  
B - Type B  
Q - Large Quantity

## Solidification Codes :

C - Cement  
U - Urea Formaldehyde  
D - Dewatering  
N - Not Applicable

NORTHERN STATES POWER COMPANY  
MONTICELLO NUCLEAR GENERATING PLANT  
OFF-SITE RADIATION DOSE ASSESSMENT FOR  
January 1- December 31, 1991

An assessment of radiation dose due to release from the Monticello Nuclear Generating Plant during 1991 was performed in accordance with the 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 meteorological data from the Off-site 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 of 1991.

Off-site 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.

Off-site Doses from Liquid Release

There were no liquid releases made from the Monticello Plant during the 1991 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 and Figure 3.8.2 of 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 of 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 inhalation pathway (no other pathway exists). Doses at this location were reported in Table 1.

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

There are no other uranium fuel facilities in the vicinity of the Monticello site. The only other artificial source of exposure to the general public in addition to the plant effluent releases is from direct radiation of the reactor and the steam turbines. MNGP started a hydrogen water chemistry (HWC) program in February 1989. Prior to the installation of HWC, a study was conducted to determine the direct and skyshine radiation contribution from HWC.

This study determined the maximum exposed member of the public from direct and skyshine radiation to be a residence located 0.6 mile from the reactor at the SW sector. Using conservative assumption, calculations indicated a maximum annual dose of 4 mrem to this residence. However, a review of TLD results from 1987, 1988, 1989, 1990, and 1991 revealed no noticeable increase in direct and skyshine radiation as a result of the HWC program installed in early 1989.

A calculation of the total annual dose to this residence from all existing pathways of radioactive effluents were performed by running GASPAR computer codes. Adding the 4 mrem/year to this calculation results in a maximum whole body dose of 4.083 mrem/year.

Therefore, the most exposed member of the general public will not receive an annual radiation dose from reactor effluent releases and all other fuel cycle activities in excess of 40 CFR Part 190 standards of 25 mrem to the whole body, 75 mrem to the thyroid, and 25 mrem to any other organ.

TABLE 1

## OFF-SITE RADIATION DOSE ASSESSMENT - MONTICELLO

PERIOD: JANUARY 1 through DECEMBER 31, 199110 CFR Part 50 Appendix I  
Guidelines per unit per yearGaseous Releases

Maximum Site Boundary Gamma Air Dose (mrad)	0.177	10
Maximum Site Boundary Beta Air Dose (mrad)	0.126	20
Maximum Off-site Dose to Any Organ (mrem)* Total	0.261	15
EPA Field Station (mrem, 40 hours/week)		
Whole Body	0.105	5
Organ	0.167	15

Liquid Releases

Maximum Off-site Dose Whole Body (mrem)	0.0	3
Maximum Off-site Dose Organ, Total	0.0	10

\* Long-lived Particulates, I-131, and H-3

TABLE 2

OFF-SITE RADIATION DOSE ASSESSMENT - MONTICELLO  
SUPPLEMENTAL INFORMATION

PERIOD: JANUARY 1 through DECEMBER 31, 1991

Gaseous Releases

Maximum Site Boundary  
Dose Location  
(from building vents)

Sector	NNW
Distance (miles)	0.4

EPA Field Station

Sector	ESE
Distance (miles)	0.3

Maximum Off-site  
Dose Location

Sector	ESE
Distance (miles)	2.5
Pathways	Plume, Ground, Inhalation, Cow Milk

Age Group	Infant
Organ	Thyroid

Liquid Releases

Maximum Off-site Dose  
Location Downstream

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