

**ENCLOSURE 1**

**RADIOACTIVE EFFLUENT RELEASE REPORT FOR  
JANUARY 1 – DECEMBER 31, 2009**

**22 pages follow**

NUCLEAR MANAGEMENT COMPANY  
MONTICELLO NUCLEAR GENERATING PLANT  
License No. DPR-22

RADIOACTIVE EFFLUENT RELEASE REPORT  
Period : Jan - Dec 2009

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)

RADIOACTIVE EFFLUENT RELEASE REPORT  
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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 :

Monthly grab samples from Reactor Building Vent and Plant Stack exhaust streams.

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	1	
2. Total Time Period for Batch Releases	345.0	min
3. Maximum Time Period for a Batch Release	345.0	min
4. Average Time Period for a Batch Release	345.0	min
5. Minimum Time Period for a Batch Release	345.0	min
6. Average Dilution Flow During Release	544.0	cf/sec

B. Gaseous :

1. Number of Batch Releases	2	
2. Total Time Period for Batch Releases	1922.0	min
3. Maximum Time Period for a Batch Release	1540.0	min
4. Average Time Period for a Batch Release	961.0	min
5. Minimum Time Period for a Batch Release	382.0	min

RADIOACTIVE EFFLUENT RELEASE REPORT  
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## Supplemental Information (continued)

## 6. Abnormal Releases

## A. Liquid :

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

## B. Gaseous :

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

RADIOACTIVE EFFLUENT RELEASE REPORT  
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Table 1A Gaseous Effluents - Summation of all Releases

	Units	1st Qtr	2nd Qtr	Est. Total Error, %
<b>A. Fission &amp; Activation gases</b>				
1. Total Release	Ci	4.35E+02	3.07E+02	2.00E+01
2. Average Release Rate	uci/sec	5.60E+01	3.90E+01	
3. Percent Tech Spec Qtrly Reporting Level				
Gamma Radiation	%	1.88E-01	1.59E-01	
Beta Radiation	%	4.56E-02	4.41E-02	
<b>B. Iodines</b>				
1. Total I-131 Release	Ci	6.40E-03	1.83E-03	1.00E+01
2. Average I-131 Release Rate	uci/sec	8.23E-04	2.33E-04	
<b>C. Particulates</b>				
1. Total Particulates	Ci	5.72E-04	4.90E-04	3.00E+01
2. Average Release Rate	uci/sec	7.35E-05	6.23E-05	
3. Gross Alpha Radioactivity	Ci	1.05E-06	5.24E-07	
<b>D. Tritium</b>				
1. Total Release	Ci	4.37E+00	2.02E+00	1.00E+01
2. Average Release Rate	uci/sec	5.62E-01	2.57E-01	
<b>E. Percent Qtrly Tech Spec Reporting Levels</b>				
1. Iodines, Particulates, and Tritium	%	8.63E-01	2.30E-01	

RADIOACTIVE EFFLUENT RELEASE REPORT  
Period : Jan - Dec 2009

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	3.88E+02	3.73E+02	2.00E+01
2. Average Release Rate	uci/sec	4.88E+01	4.69E+01	
3. Percent Tech Spec Qtrly Reporting Level				
Gamma Radiation	%	2.12E-01	2.02E-01	
Beta Radiation	%	5.60E-02	5.38E-02	

## B. Iodines

1. Total I-131 Release	Ci	2.45E-03	2.81E-03	1.00E+01
2. Average I-131 Release Rate	uci/sec	3.08E-04	3.53E-04	

## C. Particulates

1. Total Particulates	Ci	7.18E-04	7.22E-04	3.00E+01
2. Average Release Rate	uci/sec	9.03E-05	9.09E-05	
3. Gross Alpha Radioactivity	Ci	4.97E-07	3.70E-07	

## D. Tritium

1. Total Release	Ci	4.62E+00	4.10E+00	1.00E+01
2. Average Release Rate	uci/sec	5.81E-01	5.16E-01	

## E. Percent Qtrly Tech Spec Reporting Levels

1. Iodines, Particulates, and Tritium	%	2.65E-01	3.35E-01	
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RADIOACTIVE EFFLUENT RELEASE REPORT  
Period : Jan - Dec 2009

Table 1B Gaseous Effluents - Elevated Releases

Nuclides Released	Unit	Continuous Mode		Batch Mode	
		1st Qtr	2nd Qtr	1st Qtr	2nd Qtr
1. Fission Gases					
KR-85M	Ci	6.85E-01	4.80E+00	0.00E+00	0.00E+00
KR-87	Ci	4.29E+00	5.32E+00	0.00E+00	0.00E+00
KR-88	Ci	2.86E+00	1.05E+01	0.00E+00	0.00E+00
KR-89	Ci	4.43E+01	3.84E+01	0.00E+00	0.00E+00
XE-133	Ci	1.40E+02	5.39E+01	2.61E-02	0.00E+00
XE-133M	Ci	4.33E+00	1.62E+00	0.00E+00	0.00E+00
XE-135	Ci	1.78E+01	3.51E+01	3.57E-02	3.13E-04
XE-135M	Ci	2.06E+01	1.44E+01	0.00E+00	0.00E+00
XE-137	Ci	1.28E+02	9.44E+01	0.00E+00	0.00E+00
XE-138	Ci	6.08E+01	4.19E+01	0.00E+00	0.00E+00
AR-41	Ci	0.00E+00	0.00E+00	5.60E-03	7.05E-03
Total for Period	Ci	4.23E+02	3.00E+02	6.74E-02	7.36E-03
2. Iodines					
I-131	Ci	3.06E-03	1.07E-03	0.00E+00	0.00E+00
I-133	Ci	2.11E-02	8.25E-03	3.55E-08	3.39E-08
I-135	Ci	2.98E-02	1.18E-02	0.00E+00	0.00E+00
Total for Period	Ci	5.41E-02	2.11E-02	3.55E-08	3.39E-08
3. Particulates					
MN-54	Ci	8.52E-09	2.13E-08	0.00E+00	0.00E+00
CO-60	Ci	1.47E-06	2.93E-06	8.48E-08	1.11E-08
ZN-65	Ci	8.38E-08	0.00E+00	0.00E+00	0.00E+00
CS-137	Ci	7.10E-07	2.29E-06	0.00E+00	0.00E+00
BA-140	Ci	1.79E-04	1.84E-04	0.00E+00	0.00E+00
CE-141	Ci	8.59E-08	7.22E-08	0.00E+00	0.00E+00
CE-144	Ci	0.00E+00	2.20E-07	0.00E+00	0.00E+00
SR-89	Ci	4.62E-05	9.48E-05	0.00E+00	0.00E+00
SR-90	Ci	4.18E-07	2.75E-07	0.00E+00	0.00E+00
Total for Period	Ci	2.28E-04	2.85E-04	8.48E-08	1.11E-08

RADIOACTIVE EFFLUENT RELEASE REPORT  
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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
1. Fission Gases					
KR-85M	Ci	1.26E+00	5.59E-01	0.00E+00	0.00E+00
KR-87	Ci	4.92E+00	3.22E+00	0.00E+00	0.00E+00
KR-88	Ci	4.16E+00	2.14E+00	0.00E+00	0.00E+00
KR-89	Ci	5.78E+01	6.45E+01	0.00E+00	0.00E+00
XE-133	Ci	4.03E+01	4.90E+01	0.00E+00	0.00E+00
XE-133M	Ci	9.52E-01	1.10E+00	0.00E+00	0.00E+00
XE-135	Ci	1.43E+01	1.10E+01	0.00E+00	0.00E+00
XE-135M	Ci	3.02E+01	2.64E+01	0.00E+00	0.00E+00
XE-137	Ci	1.54E+02	1.47E+02	0.00E+00	0.00E+00
XE-138	Ci	7.17E+01	5.97E+01	0.00E+00	0.00E+00
Total for Period	Ci	3.80E+02	3.65E+02	0.00E+00	0.00E+00
2. Iodines					
I-131	Ci	1.77E-03	1.95E-03	0.00E+00	0.00E+00
I-133	Ci	1.14E-02	1.40E-02	0.00E+00	0.00E+00
I-135	Ci	1.62E-02	2.23E-02	0.00E+00	0.00E+00
Total for Period	Ci	2.94E-02	3.82E-02	0.00E+00	0.00E+00
3. Particulates					
CO-60	Ci	1.73E-06	6.24E-07	0.00E+00	0.00E+00
ZN-65	Ci	0.00E+00	1.28E-07	0.00E+00	0.00E+00
CS-137	Ci	8.51E-07	9.09E-07	0.00E+00	0.00E+00
BA-140	Ci	2.91E-04	2.57E-04	0.00E+00	0.00E+00
CE-141	Ci	7.14E-07	0.00E+00	0.00E+00	0.00E+00
SR-89	Ci	1.26E-04	7.48E-05	0.00E+00	0.00E+00
SR-90	Ci	6.69E-07	5.10E-07	0.00E+00	0.00E+00
Total for Period	Ci	4.21E-04	3.34E-04	0.00E+00	0.00E+00



RADIOACTIVE EFFLUENT RELEASE REPORT  
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Table 1C Gaseous Effluents - Building Vent Releases

Nuclides Released	Unit	Continuous Mode		Batch Mode	
		1st Qtr	2nd Qtr	1st Qtr	2nd Qtr
1. Fission Gases					
XE-133	Ci	1.77E+00	0.00E+00	0.00E+00	0.00E+00
XE-135	Ci	3.83E+00	5.37E+00	0.00E+00	0.00E+00
XE-135M	Ci	6.52E+00	1.03E+00	0.00E+00	0.00E+00
Total for Period	Ci	1.21E+01	6.40E+00	0.00E+00	0.00E+00
2. Iodines					
I-131	Ci	3.33E-03	7.66E-04	0.00E+00	0.00E+00
I-133	Ci	1.48E-02	2.24E-03	0.00E+00	0.00E+00
I-135	Ci	2.33E-02	1.29E-03	0.00E+00	0.00E+00
Total for Period	Ci	4.14E-02	4.30E-03	0.00E+00	0.00E+00
3. Particulates					
CR-51	Ci	5.38E-06	0.00E+00	0.00E+00	0.00E+00
MN-54	Ci	3.47E-06	1.94E-06	0.00E+00	0.00E+00
CO-58	Ci	2.72E-06	0.00E+00	0.00E+00	0.00E+00
CO-60	Ci	5.34E-05	1.23E-04	0.00E+00	0.00E+00
CS-137	Ci	2.14E-05	8.66E-06	0.00E+00	0.00E+00
BA-140	Ci	2.14E-04	4.01E-05	0.00E+00	0.00E+00
CE-141	Ci	2.70E-06	0.00E+00	0.00E+00	0.00E+00
SR-89	Ci	4.16E-05	3.13E-05	0.00E+00	0.00E+00
Total for Period	Ci	3.44E-04	2.05E-04	0.00E+00	0.00E+00

RADIOACTIVE EFFLUENT RELEASE REPORT  
Period : Jan - Dec 2009

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					
XE-133	Ci	1.45E+00	1.40E+00	0.00E+00	0.00E+00
XE-135	Ci	3.89E+00	3.30E+00	0.00E+00	0.00E+00
XE-135M	Ci	2.79E+00	2.94E+00	0.00E+00	0.00E+00
Total for Period	Ci	8.13E+00	7.64E+00	0.00E+00	0.00E+00
2. Iodines					
I-131	Ci	6.76E-04	8.60E-04	0.00E+00	0.00E+00
I-133	Ci	5.58E-03	7.93E-03	0.00E+00	0.00E+00
I-135	Ci	7.98E-03	1.51E-02	0.00E+00	0.00E+00
Total for Period	Ci	1.42E-02	2.39E-02	0.00E+00	0.00E+00
3. Particulates					
CO-60	Ci	9.57E-05	1.07E-04	0.00E+00	0.00E+00
CS-137	Ci	5.65E-05	1.61E-04	0.00E+00	0.00E+00
BA-140	Ci	8.35E-05	7.67E-05	0.00E+00	0.00E+00
SR-89	Ci	6.10E-05	4.30E-05	0.00E+00	0.00E+00
Total for Period	Ci	2.97E-04	3.88E-04	0.00E+00	0.00E+00

RADIOACTIVE EFFLUENT RELEASE REPORT  
Period : Jan - Dec 2009

Table 2A Liquid Effluents - Summation of all Releases

	Units	1st Qtr	2nd Qtr	Est. Total Error, %
A. Fission & Activation products				
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. Tritium				
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	
C. Dissolved and Entrained Gases				
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	
D. Percent Qtrly Tech Spec Reporting Level				
1. Whole Body Dose	%	0.00E+00	0.00E+00	
2. Organ Dose	%	0.00E+00	0.00E+00	
E. Gross Alpha Radioactivity				
1. Total Release	Ci	0.00E+00	0.00E+00	0.00E+00
F. Volume of Waste Released				
	Liters	0.00E+00	0.00E+00	0.00E+00
G. Volume of Dilution Water Used				
	Liters	0.00E+00	0.00E+00	0.00E+00

Table 2B Liquid Effluents

Nuclides Released	Unit	Continuous Mode		Batch Mode	
		1st Qtr	2nd Qtr	1st Qtr	2nd Qtr
Tritium	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00

RADIOACTIVE EFFLUENT RELEASE REPORT  
Period : Jan - Dec 2009

Table 2A Liquid Effluents - Summation of all Releases

	Units	3rd Qtr	4th Qtr	Est. Total Error, %
A. Fission & Activation products				
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. Tritium				
1. Total Release	Ci	0.00E+00	1.21E-05	5.00E+01
2. Avg Diluted Concentration	uci/ml	0.00E+00	7.59E-10	
C. Dissolved and Entrained Gases				
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	
D. Percent Qtrly Tech Spec Reporting Level				
1. Whole Body Dose	%	0.00E+00	2.14E-08	
2. Organ Dose	%	0.00E+00	6.42E-09	
E. Gross Alpha Radioactivity				
1. Total Release	Ci	0.00E+00	0.00E+00	0.00E+00
F. Volume of Waste Released				
	Liters	0.00E+00	5.68E+03	5.00E+01
G. Volume of Dilution Water Used				
	Liters	0.00E+00	1.59E+07	5.00E+01

Table 2B Liquid Effluents

Nuclides Released	Unit	Continuous Mode		Batch Mode	
		3rd Qtr	4th Qtr	3rd Qtr	4th Qtr
Tritium	Ci	0.00E+00	0.00E+00	0.00E+00	1.21E-05

RADIOACTIVE EFFLUENT RELEASE REPORT  
Period : Jan - Dec 2009

Table 3 Solid Waste and Irradiated Fuel Shipments

\* S E E A T T A C H E D R E P O R T S \*

# NRC Regulatory Guide 1.21 Reports

Report Date : 3/5/2010

Solid Waste Shipped Offsite for Disposal and Estimates of Major Nuclides by Waste Class and Stream  
 During Period From 01/01/2009 to 12/31/2009 Percent Cutoff: 0

Waste Stream : Resins, Filters, and Evap Bottoms  
 PRD-NA 215 2007/2009mixdat

Waste Class	Volume		Curies Shipped	% Error (Ci)
	Ft <sup>3</sup>	M <sup>3</sup>		
A	7.46E+02	2.11E+01	1.07E+02	+/- 25%
B	0.00E+00	0.00E+00	0.00E+00	+/- 25%
C	0.00E+00	0.00E+00	0.00E+00	+/- 25%
All	7.46E+02	2.11E+01	1.07E+02	+/- 25%

Waste Stream : Dry Active Waste  
 DAW-U-NA DAW-U-NA Asbestos CHROMATED RAGS  
 Paint Chips / Rags

Waste Class	Volume		Curies Shipped	%Error (Ci)
	Ft <sup>3</sup>	M <sup>3</sup>		
A	2.41E+04	6.82E+02	2.67E-01	+/-25%
B	0.00E+00	0.00E+00	0.00E+00	+/-25%
C	0.00E+00	0.00E+00	0.00E+00	+/-25%
All	2.41E+04	6.82E+02	2.67E-01	+/-25%

Waste Stream : Irradiated Components

Waste Class	Volume		Curies Shipped	% Error (Ci)
	Ft <sup>3</sup>	M <sup>3</sup>		
A	0.00E+00	0.00E+00	0.00E+00	+/-25%
B	0.00E+00	0.00E+00	0.00E+00	+/-25%
C	0.00E+00	0.00E+00	0.00E+00	+/-25%
All	0.00E+00	0.00E+00	0.00E+00	+/-25%

# NRC Regulatory Guide 1.21 Reports

Report Date : 3/5/2010

Solid Waste Shipped Offsite for Disposal and Estimates of Major Nuclides by Waste Class and Stream  
 During Period From 01/01/2009 to 12/31/2009 Percent Cutoff: 0

Waste Stream : Other Waste  
 Combined Packages HP Turbine Rotor Scrap Steel van

Waste Class	Volume		Curies Shipped	% Error (Ci)
	Ft <sup>3</sup>	M <sup>3</sup>		
A	3.38E+03	9.57E+01	1.21E+01	+/-25%
B	0.00E+00	0.00E+00	0.00E+00	+/-25%
C	0.00E+00	0.00E+00	0.00E+00	+/-25%
All	3.38E+03	9.57E+01	1.21E+01	+/-25%

Waste Stream : Sum of All 4 Categories  
 Combined Packages DAW-U-NA DAW-U-NA PRD-NA 215  
 Asbestos CHROMATED RAGS Paint Chips / Rags HP Turbine Rotor  
 2007/2009mixdat Scrap Steel van

Waste Class	Volume		Curies Shipped	% Error (Ci)
	Ft <sup>3</sup>	M <sup>3</sup>		
A	2.82E+04	7.99E+02	1.19E+02	+/-25%
B	0.00E+00	0.00E+00	0.00E+00	+/-25%
C	0.00E+00	0.00E+00	0.00E+00	+/-25%
All	2.82E+04	7.99E+02	1.19E+02	+/-25%

-Combined Waste Type Shipment, Major Volume Waste Type Shown

# NRC Regulatory Guide 1.21 Reports

Report Date : 3/5/2010

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Solid Waste Shipped Offsite for Disposal and Estimates of Major Nuclides by Waste Class and Stream  
During Period From 01/01/2009 to 12/31/2009

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Number of Shipments	Mode of Transportation	Destination
1	Hittman Transport	Energy Solutions Bear Creek
1	Xcel Energy Trucking	EnergySolutions, LLC. (Bulk)
5	Hittman Transport	EnergySolutions, LLC. (Containerized)
1	Xcel Energy Trucking	Perma-Fix of Florida
7	Southern Pines Trucking Inc	Studsvik Processing Facility Memphis
7	Studsvik Logistics	Studsvik Processing Facility Memphis
8	Xcel Energy Trucking	Studsvik Processing Facility Memphis



# NRC Regulatory Guide 1.21 Reports

Report Date : 3/5/2010

Solid Waste Shipped Offsite for Disposal and Estimates of Major Nuclides by Waste Class and Stream  
 During Period From 01/01/2009 to 12/31/2009 Percent Cutoff: 0

Resins, Filters, and Evap Bottom		
Waste Class A		
Nuclide Name	Percent Abundance	Curies
H-3	0.190%	2.03E-01
C-14	0.316%	3.37E-01
K-40	0.024%	2.58E-02
Cr-51	0.013%	1.38E-02
Mn-54	2.874%	3.07E+00
Fe-55	40.803%	4.36E+01
Fe-59	0.006%	5.90E-03
Co-57	0.001%	1.30E-03
Co-58	0.279%	2.98E-01
Co-60	37.745%	4.03E+01
Ni-63	1.411%	1.51E+00
Zn-65	3.379%	3.61E+00
Sr-89	0.249%	2.66E-01
Sr-90	0.081%	8.66E-02
Nb-95	0.003%	3.43E-03
Tc-99	0.042%	4.51E-02
Ag-110m	0.409%	4.37E-01
I-129	0.000%	7.14E-05
I-131	0.205%	2.19E-01
Cs-134	0.085%	9.06E-02
Cs-137	11.300%	1.21E+01
Ba-140	0.137%	1.46E-01
La-140	0.057%	6.04E-02
Ce-141	0.038%	4.05E-02
Ce-144	0.292%	3.12E-01
Pu-238	0.001%	1.15E-03
Pu-239	0.000%	4.56E-04
Pu-240	0.000%	4.38E-04
Pu-241	0.055%	5.87E-02
Am-241	0.002%	2.46E-03
Cm-242	0.000%	4.34E-04
Cm-243	0.001%	8.56E-04
Cm-244	0.001%	8.53E-04
Resins, Filters, and Evap Bottom		
Waste Class All		
Nuclide Name	Percent Abundance	Curies
H-3	0.190%	2.03E-01
C-14	0.316%	3.37E-01
K-40	0.024%	2.58E-02
Cr-51	0.013%	1.38E-02
Mn-54	2.874%	3.07E+00
Fe-55	40.803%	4.36E+01
Fe-59	0.006%	5.90E-03
Co-57	0.001%	1.30E-03
Co-58	0.279%	2.98E-01
Co-60	37.745%	4.03E+01

# NRC Regulatory Guide 1.21 Reports

Report Date : 3/5/2010

Solid Waste Shipped Offsite for Disposal and Estimates of Major Nuclides by Waste Class and Stream  
 During Period From 01/01/2009 to 12/31/2009 Percent Cutoff: 0

Ni-63	1.411%	1.51E+00
Zn-65	3.379%	3.61E+00
Sr-89	0.249%	2.66E-01
Sr-90	0.081%	8.66E-02
Nb-95	0.003%	3.43E-03
Tc-99	0.042%	4.51E-02
Ag-110m	0.409%	4.37E-01
I-129	0.000%	7.14E-05
I-131	0.205%	2.19E-01
Cs-134	0.085%	9.06E-02
Cs-137	11.300%	1.21E+01
Ba-140	0.137%	1.46E-01
La-140	0.057%	6.04E-02
Ce-141	0.038%	4.05E-02
Ce-144	0.292%	3.12E-01
Pu-238	0.001%	1.15E-03
Pu-239	0.000%	4.56E-04
Pu-240	0.000%	4.38E-04
Pu-241	0.055%	5.87E-02
Am-241	0.002%	2.46E-03
Cm-242	0.000%	4.34E-04
Cm-243	0.001%	8.56E-04
Cm-244	0.001%	8.53E-04
Dry Active Waste		
Waste Class A		
Nuclide Name	Percent Abundance	Curies
H-3	0.865%	2.31E-03
Cr-51	3.077%	8.21E-03
Mn-54	5.051%	1.35E-02
Fe-55	19.964%	5.33E-02
Fe-59	0.662%	1.77E-03
Co-58	0.737%	1.97E-03
Co-60	43.619%	1.16E-01
Ni-63	3.887%	1.04E-02
Zn-65	3.339%	8.91E-03
Sr-89	0.030%	8.01E-05
Sr-90	0.094%	2.52E-04
Zr-95	0.148%	3.94E-04
Nb-95	0.254%	6.77E-04
Ru-103	0.060%	1.59E-04
Ag-110m	0.266%	7.10E-04
Sb-124	0.061%	1.64E-04
I-131	0.110%	2.93E-04
Cs-137	17.242%	4.60E-02
Ce-141	0.057%	1.53E-04
Ce-144	0.190%	5.07E-04
Pu-238	0.005%	1.30E-05
Pu-239	0.003%	7.94E-06
Pu-240	0.001%	3.52E-06
Pu-241	0.251%	6.71E-04

# NRC Regulatory Guide 1.21 Reports

Report Date : 3/5/2010

Solid Waste Shipped Offsite for Disposal and Estimates of Major Nuclides by Waste Class and Stream  
 During Period From 01/01/2009 to 12/31/2009 Percent Cutoff: 0

Am-241	0.023%	6.07E-05
Cm-242	0.000%	1.10E-06
Cm-243	0.002%	5.55E-06
Cm-244	0.002%	5.54E-06
<b>Dry Active Waste</b>		
<b>Waste Class All</b>		
<b>Nuclide Name</b>	<b>Percent Abundance</b>	<b>Curies</b>
H-3	0.865%	2.31E-03
Cr-51	3.077%	8.21E-03
Mn-54	5.051%	1.35E-02
Fe-55	19.964%	5.33E-02
Fe-59	0.662%	1.77E-03
Co-58	0.737%	1.97E-03
Co-60	43.619%	1.16E-01
Ni-63	3.887%	1.04E-02
Zn-65	3.339%	8.91E-03
Sr-89	0.030%	8.01E-05
Sr-90	0.094%	2.52E-04
Zr-95	0.148%	3.94E-04
Nb-95	0.254%	6.77E-04
Ru-103	0.060%	1.59E-04
Ag-110m	0.266%	7.10E-04
Sb-124	0.061%	1.64E-04
I-131	0.110%	2.93E-04
Cs-137	17.242%	4.60E-02
Ce-141	0.057%	1.53E-04
Ce-144	0.190%	5.07E-04
Pu-238	0.005%	1.30E-05
Pu-239	0.003%	7.94E-06
Pu-240	0.001%	3.52E-06
Pu-241	0.251%	6.71E-04
Am-241	0.023%	6.07E-05
Cm-242	0.000%	1.10E-06
Cm-243	0.002%	5.55E-06
Cm-244	0.002%	5.54E-06
<b>Other Waste</b>		
<b>Waste Class A</b>		
<b>Nuclide Name</b>	<b>Percent Abundance</b>	<b>Curies</b>
H-3	0.700%	8.51E-02
C-14	0.642%	7.80E-02
Cr-51	0.007%	8.77E-04
Mn-54	3.134%	3.81E-01
Fe-55	24.568%	2.98E+00
Fe-59	0.001%	1.79E-04
Co-58	0.415%	5.04E-02
Co-60	34.577%	4.20E+00
Ni-63	1.462%	1.77E-01
Zn-65	4.595%	5.58E-01
Sr-89	0.026%	3.17E-03

# NRC Regulatory Guide 1.21 Reports

Report Date : 3/5/2010

Solid Waste Shipped Offsite for Disposal and Estimates of Major Nuclides by Waste Class and Stream  
 During Period From 01/01/2009 to 12/31/2009 Percent Cutoff: 0

Sr-90	0.059%	7.13E-03
Zr-95	0.000%	3.89E-05
Nb-95	0.001%	7.04E-05
Ru-103	0.000%	1.63E-05
Ag-110m	0.536%	6.51E-02
Sb-124	0.000%	1.62E-05
I-131	0.038%	4.66E-03
Cs-134	0.005%	6.59E-04
Cs-137	29.015%	3.52E+00
Ba-140	0.024%	2.89E-03
La-140	0.014%	1.66E-03
Ce-141	0.004%	5.24E-04
Ce-144	0.117%	1.42E-02
Pu-238	0.002%	1.94E-04
Pu-239	0.001%	1.12E-04
Pu-240	0.001%	1.11E-04
Pu-241	0.045%	5.50E-03
Am-241	0.006%	7.13E-04
Cm-242	0.001%	7.70E-05
Cm-243	0.002%	2.43E-04
Cm-244	0.002%	2.43E-04
Other Waste		
Waste Class All		
Nuclide Name	Percent Abundance	Curies
H-3	0.700%	8.51E-02
C-14	0.642%	7.80E-02
Cr-51	0.007%	8.77E-04
Mn-54	3.134%	3.81E-01
Fe-55	24.568%	2.98E+00
Fe-59	0.001%	1.79E-04
Co-58	0.415%	5.04E-02
Co-60	34.577%	4.20E+00
Ni-63	1.462%	1.77E-01
Zn-65	4.595%	5.58E-01
Sr-89	0.026%	3.17E-03
Sr-90	0.059%	7.13E-03
Zr-95	0.000%	3.89E-05
Nb-95	0.001%	7.04E-05
Ru-103	0.000%	1.63E-05
Ag-110m	0.536%	6.51E-02
Sb-124	0.000%	1.62E-05
I-131	0.038%	4.66E-03
Cs-134	0.005%	6.59E-04
Cs-137	29.015%	3.52E+00
Ba-140	0.024%	2.89E-03
La-140	0.014%	1.66E-03
Ce-141	0.004%	5.24E-04
Ce-144	0.117%	1.42E-02
Pu-238	0.002%	1.94E-04
Pu-239	0.001%	1.12E-04

# NRC Regulatory Guide 1.21 Reports

Report Date : 3/5/2010

Solid Waste Shipped Offsite for Disposal and Estimates of Major Nuclides by Waste Class and Stream  
 During Period From 01/01/2009 to 12/31/2009 Percent Cutoff: 0

Pu-240	0.001%	1.11E-04
Pu-241	0.045%	5.50E-03
Am-241	0.006%	7.13E-04
Cm-242	0.001%	7.70E-05
Cm-243	0.002%	2.43E-04
Cm-244	0.002%	2.43E-04
Sum of All 4 Categories		
Waste Class A		
Nuclide Name	Percent Abundance	Curies
H-3	0.243%	2.90E-01
C-14	0.348%	4.15E-01
K-40	0.022%	2.58E-02
Cr-51	0.019%	2.29E-02
Mn-54	2.905%	3.46E+00
Fe-55	39.103%	4.66E+01
Fe-59	0.007%	7.84E-03
Co-57	0.001%	1.30E-03
Co-58	0.294%	3.50E-01
Co-60	37.435%	4.46E+01
Ni-63	1.422%	1.70E+00
Zn-65	3.503%	4.18E+00
Sr-89	0.226%	2.69E-01
Sr-90	0.079%	9.40E-02
Zr-95	0.000%	4.33E-04
Nb-95	0.004%	4.18E-03
Tc-99	0.038%	4.51E-02
Ru-103	0.000%	1.75E-04
Ag-110m	0.422%	5.03E-01
Sb-124	0.000%	1.80E-04
I-129	0.000%	7.14E-05
I-131	0.188%	2.24E-01
Cs-134	0.077%	9.13E-02
Cs-137	13.118%	1.56E+01
Ba-140	0.125%	1.49E-01
La-140	0.052%	6.20E-02
Ce-141	0.035%	4.12E-02
Ce-144	0.274%	3.26E-01
Pu-238	0.001%	1.36E-03
Pu-239	0.000%	5.76E-04
Pu-240	0.000%	5.53E-04
Pu-241	0.054%	6.49E-02
Am-241	0.003%	3.23E-03
Cm-242	0.000%	5.12E-04
Cm-243	0.001%	1.10E-03
Cm-244	0.001%	1.10E-03
Sum of All 4 Categories		
Waste Class All		
Nuclide Name	Percent Abundance	Curies
H-3	0.243%	2.90E-01

# NRC Regulatory Guide 1.21 Reports

Report Date : 3/5/2010

Solid Waste Shipped Offsite for Disposal and Estimates of Major Nuclides by Waste Class and Stream  
 During Period From 01/01/2009 to 12/31/2009 Percent Cutoff: 0

C-14	0.348%	4.15E-01
K-40	0.022%	2.58E-02
Cr-51	0.019%	2.29E-02
Mn-54	2.905%	3.46E+00
Fe-55	39.103%	4.66E+01
Fe-59	0.007%	7.84E-03
Co-57	0.001%	1.30E-03
Co-58	0.294%	3.50E-01
Co-60	37.435%	4.46E+01
Ni-63	1.422%	1.70E+00
Zn-65	3.503%	4.18E+00
Sr-89	0.226%	2.69E-01
Sr-90	0.079%	9.40E-02
Zr-95	0.000%	4.33E-04
Nb-95	0.004%	4.18E-03
Tc-99	0.038%	4.51E-02
Ru-103	0.000%	1.75E-04
Ag-110m	0.422%	5.03E-01
Sb-124	0.000%	1.80E-04
I-129	0.000%	7.14E-05
I-131	0.188%	2.24E-01
Cs-134	0.077%	9.13E-02
Cs-137	13.118%	1.56E+01
Ba-140	0.125%	1.49E-01
La-140	0.052%	6.20E-02
Ce-141	0.035%	4.12E-02
Ce-144	0.274%	3.26E-01
Pu-238	0.001%	1.36E-03
Pu-239	0.000%	5.76E-04
Pu-240	0.000%	5.53E-04
Pu-241	0.054%	6.49E-02
Am-241	0.003%	3.23E-03
Cm-242	0.000%	5.12E-04
Cm-243	0.001%	1.10E-03
Cm-244	0.001%	1.10E-03

# NRC Regulatory Guide 1.21 Reports

Report Date : 3/5/2010

Solid Waste Shipped Offsite for Disposal and Estimates of Major Nuclides by Waste Class and Stream  
During Period From 01/01/2009 to 12/31/2009

Manifest Number	Date Shipped	Waste Volume Used	Burial volume Used
09-122	12/18/2009	Yes	
09-119	11/16/2009	Yes	
09-116	11/9/2009	Yes	
09-114	10/23/2009	Yes	
09-086	7/28/2009	Yes	
09-092	7/7/2009	Yes	
09-091	6/30/2009	Yes	
09-089	6/26/2009	Yes	
09-088	6/23/2009	Yes	
09-087	6/19/2009	Yes	
09-084	6/16/2009	Yes	
09-085	6/11/2009	Yes	
09-29	6/9/2009	Yes	
09-81	5/21/2009	Yes	
09-80	5/21/2009	Yes	
09-77	5/12/2009	Yes	
09-76	5/12/2009	Yes	
09-71	4/27/2009	Yes	
09-68	4/24/2009	Yes	
09-60	4/21/2009	Yes	
09-56	4/16/2009	Yes	
09-55	4/15/2009	Yes	
09-54	4/14/2009	Yes	
09-47	4/6/2009	Yes	
09-36	3/25/2009	Yes	
09-18	2/27/2009	Yes	
09-26	2/25/2009	Yes	
1023-C	2/3/2009	Yes	
09-11	1/27/2009	Yes	
09-08	1/19/2009	Yes	

**ENCLOSURE 2**

**OFF-SITE RADIATION DOSE ASSESSMENT FOR  
JANUARY 1 – DECEMBER 31, 2009**

**5 pages follow**



# MONTICELLO NUCLEAR GENERATING PLANT

## Offsite Radiation Dose Assessment for January 1, - December 31, 2009

An assessment of radiation dose due to releases from the Monticello Nuclear Generating Plant during 2009 was performed in accordance with the Offsite Dose Calculation Manual (ODCM). Computed doses were well below the 40 CFR 190 Standards and 10 CFR Part 50, Appendix I 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 Radioactive Effluent Release Report for 2009.

### Offsite Dose from Gaseous Releases (ODCM -08.01 section 2.1.3)

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

### Offsite Dose From Liquid Releases (ODCM -08.01 section 2.1.3)

Dose from liquid releases are listed in Table 1.

Dose is based on release of Turbine Building Normal Waste Sump water containing H-3 in the fourth quarter. Whole body and organ dose due to this release are a small percentage of Appendix I Guidelines.

### Dose to Individuals Due to Their Activities Inside the Site Boundary (ODCM -08.01 section 2.1.3)

Computed dose to the whole body, skin and organ (thyroid), are reported in Table 1. There are several groups of concern, Security Officers training at the rifle range at the old EPA station, cleaning contractors at the new Receiving Warehouse and XCEL Energy Company transmission and distribution crews working in the substation. Use of a very conservative assumption of 40 hours/week spent inside the site boundary by these groups would conservatively represent the most exposed individual. The annual whole body, skin and organ dose was computed using plant stack and reactor building vent X/Q and D/Q values for the Substation (a bounding location due to predominant wind direction and nearness to the release points) as input to the GASPAR code. This computed dose was reduced by the factor of 40/168 to account for limited occupancy.

**Dose to the Likely Most Exposed Member of the General Public from Reactor Releases and Other Nearby Uranium Fuel Cycle Sources** (ODCM –08.01 section 2.1.4)

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

An Independent Spent Fuel Storage Facility (ISFSI) was constructed west of the plant in 2007. The initial loading campaign was completed in 2008 with 10 HCM's loaded with spent fuel. Neutron and Gamma monitoring results at the site boundary show no significant differences between these TLD's and the control TLD's.

Environmental TLD's were used to provide data on direct and skyshine radiation dose and the GASPAR code was used to provide data on dose from airborne pathways.

TLD results from the area of the site boundary and the 5 mile ring show no significant differences between these TLD's and the control TLD's.

Therefore, the likely 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 190 standards of 25 millirem to the whole body, 75 millirem to the thyroid, and 25 millirem to any other organ.

**Changes in Land Use and Non Obtainable Milk or Vegetable Samples**  
(ODCM –08.01 sections 2.1.8 and 2.1.9)

There were no changes in land use resulting in significant increases in calculated doses. Eight onsite monitoring wells (M-44 through M-51) were added to the program in the third and fourth quarters of 2009 and analyzed for tritium and gamma-emitting isotopes. There were no vegetable samples that could not be obtained during this reporting period.

**Table 1**

**Offsite Radiation Dose Assessment - Monticello**

**PERIOD: January 1, through December 31, 2009**

<b>GASEOUS RELEASES</b>	<b>DOSE</b>	<b>10CFR50 Appendix I Guidelines</b>
Maximum Site Boundary Gamma Air Dose (mrad/year)	0.0195	10
Maximum Site Boundary Beta Air Dose (mrad/year)	0.0207	20
Maximum Off-Site Dose to Any Organ (mrem/year)	0.0624	15
Maximum Dose to the Likely Most Exposed Member of the General Public (mrem/year)		
Whole Body	0.0362	5
Skin	0.0254	15
Max Organ (Thyroid)	0.0624	15
<b>LIQUID RELEASES</b>		
Maximum Off-Site Dose (mrem)		
Whole Body	3.21E-10	3
Max Organ (All except bone)	3.21E-10	10
<b>GASEOUS RELEASES</b>	<b>DOSE</b>	<b>40 CFR 190 LIMITS</b>
Maximum Dose to Individuals due to their Activities Inside the Site Boundary (mrem)		
Whole Body	0.0357	25
Thyroid	0.0502	75
Max Other Organ (Skin)	0.0440	25

**Table 2**

**Offsite Radiation Dose Assessment - Monticello  
Supplemental Information**

**PERIOD: January 1, through December 31, 2009**

<b>GASEOUS RELEASES</b>		
Maximum Site Boundary Dose Location (from Reactor Building Vents)		
Sector	SSE	
Distance (miles)	0.40	
Substation		
Sector	S	
Distance from Plant Stack (miles)	0.2	
Distance from Reactor Building Vents	0.2	
Critical Receptor Location		
Sector	SSW	
Distance from Reactor Building Vents (miles)	0.64	
Pathways	Plume, Ground, Inhalation, Vegetable	
Age Group	CHILD	
Organ	THYROID	
<b>LIQUID RELEASES</b>		
St. Paul Drinking Water Intake Location	Drinking Water	Drinking Water, Fish
Pathways	Infant	Adult
Age Group	Whole Body	GI Tract
Organ		
Dilution Factor (drinking water)	7:1	7:1

## **Bases for Radiation Dose Statements**

Thermoluminescent dosimeters (TLD) are stationed around MNGP to measure the ambient gamma radiation field. Monitoring stations are placed near the site boundary and approximately five (5) miles from the reactor, in locations representing sixteen (16) compass sectors. Other locations are chosen to measure the radiation field at places of special interest such as nearby residences, meeting places and population centers. Control sites are located further than ten (10) miles from the site, in areas that should not be affected by plant operations. The results from the TLD's are reported in the Annual Radiological Environmental Monitoring Report (REMP). The results from this effort indicated no excess dose to offsite areas.

Additionally, NUREG-0543, METHODS FOR DEMONSTRATING LWR COMPLIANCE WITH THE EPA URANIUM FUEL CYCLE STANDARD (40 CFR PART 190) states in section IV, "As long as a nuclear plant site operates at a level below the Appendix I reporting requirements, no extra analysis is required to demonstrate compliance with 40 CFR Part 190". The organ and whole body doses reported in Table 1 are determined using 10 CFR 50 Appendix I methodology. The doses reported are well below the limits of Appendix I.