

## **Radioactive Effluent Release Report for 2006**

# **Brunswick Steam Electric Plant Radioactive Effluent Release Report January 1, through December 31, 2006**

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Attachment 1  
Effluent and Waste Disposal Report Supplemental Information

Facility: Brunswick Steam Electric Plant  
Licensee: Carolina Power & Light Company, now doing business as Progress Energy Carolinas, Inc.

1. Regulatory Limits

- A. Fission and activation gases (Off-Site Dose Calculation Manual Specification (ODCMS) 7.3.8)
  - (1) Calendar Quarter<sup>1</sup>
    - (a)  $\leq 10$  mrad gamma
    - (b)  $\leq 20$  mrad beta
  - (2) Calendar Year
    - (a)  $\leq 20$  mrad gamma
    - (b)  $\leq 40$  mrad beta
- B. Iodine-131, iodine-133, tritium, and particulates with half-lives greater than eight days (ODCMS 7.3.9)
  - (1) Calendar Quarter<sup>1</sup>
    - (a)  $\leq 15$  mrem to any organ
  - (2) Calendar Year
    - (a)  $\leq 30$  mrem to any organ
  - (3) Calendar Quarter for Burning Contaminated Oil<sup>1</sup>
    - (a)  $< 0.1$  % of limits for calendar quarter of (1)
    - (b) 436  $\mu$ Ci (ODCM Appendix H)
  - (4) Calendar Year for Burning Contaminated Oil
    - (a)  $< 0.1\%$  of limits for calendar year
    - (b) 872  $\mu$ Ci (ODCM Appendix H)
- C. Liquid Effluents (ODCMS 7.3.4)
  - (1) Calendar Quarter<sup>2</sup>
    - (a)  $\leq 3$  mrem to total body
    - (b)  $\leq 10$  mrem to any organ
  - (2) Calendar Year
    - (a)  $\leq 6$  mrem to total body
    - (b)  $\leq 10$  mrem to any organ

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NOTE: Dose calculations are determined in accordance with the ODCM

<sup>1</sup> Used for percent of ODCMS limit determination in Attachment 2, Table 1A

<sup>2</sup> Used for percent of ODCMS limit determination in Attachment 2, Table 2A

Attachment 1  
Effluent and Waste Disposal Report Supplemental Information

2. Maximum permissible concentration and dose rates which determine maximum instantaneous release rates.

A. Fission and activation gases (ODCMS 7.3.7.a)

- (1)  $\leq 500$  mrem/year to total body
- (2)  $\leq 3000$  mrem/year to the skin

B. Iodine-131, iodine-133, tritium, and particulates with half-lives greater than eight days (ODCMS 7.3.7.b)

- (1)  $\leq 1500$  mrem/year to any organ

C. Liquid effluents (ODCMS 7.3.3)

The concentration of radioactive material released in liquid effluents to unrestricted areas after dilution in the discharge canal shall be limited to 10 times the concentrations specified in Appendix B, Table 2, Column 2 to 10 CFR 20.1001 - 20.2401 for radionuclides other than dissolved or entrained noble gases. For dissolved or entrained noble gases, the concentration shall be limited to the value given in the ODCM specifications.

- (1) Tritium: limit =  $1.00E-03 \mu\text{Ci}/\text{ml}^3$
- (2) Dissolved and entrained noble gases: limit =  $2.00E-04 \mu\text{Ci}/\text{ml}^3$

3. Measurements and Approximations of Total Radioactivity

A. Fission and activation gases

- (1) Analyses for specific radionuclides in representative grab samples by gamma spectroscopy.

B. Iodines

- (1) Analysis for specific radionuclides collected on charcoal cartridges by gamma spectroscopy.

C. Particulates

- (1) Analysis for specific radionuclides collected on filter papers by gamma spectroscopy.

D. Particulates for Burning Oil

- (1) Analysis for specific radionuclides by grab samples of each batch of oil to be burned.

E. Liquid Effluents

- (1) Analysis for specific radionuclides of individual releases by gamma spectroscopy.

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<sup>3</sup> Used as applicable limits for Attachment 2, Table 2A

Nuclear counting statistics are reported utilizing 1-sigma error. Total error where reported represents a best effort to approximate the total of all individual and sampling errors.

Attachment 1  
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4. Batch Releases

A. Liquid

(1) Number of batch releases:	6.10E+01
(2) Total time period for batch releases:	5.88E+03 Minutes
(3) Maximum time period for a batch release:	3.00E+02 Minutes
(4) Average time period for a batch release:	9.64E+01 Minutes
(5) Minimum time period for a batch release:	1.20E+01 Minutes
(6) Average stream flow during periods of release of effluent into a flowing stream:	7.32E+05 Gallons per Minute

B. Gaseous

(1) Number of batch releases:	0.00E+00
(2) Total time period for batch releases:	0.00E+00 Minutes
(3) Maximum time period for a batch release:	0.00E+00 Minutes
(4) Average time period for a batch release:	0.00E+00 Minutes
(5) Minimum time period for a batch release:	0.00E+00 Minutes

5. Abnormal Releases<sup>4</sup>

A. Liquid

(1) Number of releases:	0.00E+00
(2) Total activity released:	0.00E+00 Curies

B. Gaseous

(1) Number of releases:	0.00E+00
(2) Total activity released:	0.00E+00 Curies

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<sup>4</sup> There were no abnormal releases that exceeded 10 CFR 20 or 10 CFR 50 limits. See page 5 for a discussion of release events that occurred.

Attachment 1  
Effluent and Waste Disposal Report Supplemental Information

Discussion of tritium in the Storm Drain Stabilization Pond

Approximately  $3.30\text{E}+07$  gallons containing  $1.02\text{E}+02$  curies of tritium were released from the Storm Drain Stabilization Pond (SDSP) to the intake canal during this reporting period. This resulted in an estimated maximum dose to the individual of  $1.41\text{E}-04$  mrem. The SDSP is a permitted release point.

Discussion of releases from the Storm Drain Collector Basin

Due to heavy rain events, the Storm Drain Collector Basin (SDCB) was released directly to the discharge canal on five occasions in 2006. The SDCB is a permitted release point during periods of inclement weather to protect plant personnel and equipment. Approximately  $5.96\text{E}+05$  gallons containing  $7.27\text{E}-01$  curies of tritium and  $2.33\text{E}-03$  curies of iodine were released. This resulted in an estimated maximum dose to the individual of  $1.49\text{E}-06$  mrem.

Summary

The SDSP and SDCB curie totals are included in the quarterly summaries for FISSION AND ACTIVATION PRODUCTS and TRITIUM on Attachment 2, Table 2A when applicable.

The quantity of rainwater released from the SDSP and/or the SDCB is not included in the average diluted concentration determination or VOLUME OF WASTE RELEASED on Attachment 2, Table 2A.

Attachment 2  
Effluent and Waste Disposal Data

Table 1A	Gaseous Effluents - Summation of all Releases
Table 1B	Gaseous Effluents - Elevated Releases
Table 1C	Gaseous Effluents - Ground Level Releases
Table 1D	Gaseous Effluents - Ground Level Releases for Burning Contaminated Oil
Table 2A	Liquid Effluents - Summation of all Releases
Table 2B	Liquid Effluents - Batch Mode
	Lower Limits of Detection
Table 3A	Solid Waste and Irradiated Fuel Shipments - Waste Class A
Table 3B	Solid Waste and Irradiated Fuel Shipments - Waste Class B
Table 3C	Solid Waste and Irradiated Fuel Shipments - Waste Class C
	Combustion of Waste Oil

Attachment 2  
Effluent and Waste Disposal Data

Table 1A: Gaseous Effluents - Summation of all Releases

A. FISSION AND ACTIVATION GASES

	Unit	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Estimated Total Percent Error
1. Total release	Ci	1.87E+02	5.71E+02	7.84E+02	7.17E+02	4.50E+01
2. Average release rate for period	μCi/sec	2.41E+01	7.27E+01	9.87E+01	9.02E+01	NA
3. Percent of ODCM limit	%	3.80E-02	1.84E-01	5.06E-01	1.51E-01	NA

B. IODINES

	Unit	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Estimated Total Percent Error
1. Total Iodine - 131 release	Ci	2.02E-02	4.06E-02	5.43E-02	3.76E-02	3.50E+01
2. Average release rate for period	μCi/sec	2.60E-03	5.16E-03	6.83E-03	4.74E-03	NA

C. PARTICULATES

	Unit	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Estimated Total Percent Error
1. Total release	Ci	1.59E-03	7.91E-03	2.14E-02	9.95E-03	3.50E+01
2. Average release rate for period	μCi/sec	2.05E-04	1.01E-03	2.69E-03	1.25E-03	NA
3. Gross Alpha	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.50E+01

D. TRITIUM

	Unit	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Estimated Total Percent Error
1. Total release	Ci	6.15E+01	6.53E+01	8.36E+01	4.25E+01	3.00E+01
2. Average release rate for period	μCi/sec	7.91E+00	8.30E+00	1.05E+01	5.34E+00	NA



Attachment 2  
Effluent and Waste Disposal Data

Table 1A: Gaseous Effluents - Summation of all Releases

E. IODINE-131, IODINE-133, TRITIUM AND PARTICULATES

	Unit	Quarter 1	Quarter 2	Quarter 3	Quarter 4
1. Total release	Ci	6.16E+01	6.56E+01	8.42E+01	4.28E+01
2. Average release rate for period	μCi/sec	7.93E+00	8.34E+00	1.06E+01	5.38E+00
3. Percent of ODCM limit	%	8.53E-01	1.46E+00	1.98E+00	1.32E+00

F. PARTICULATES VIA BURINING CONTAMINATED OIL

	Unit	Quarter 1	Quarter 2	Quarter 3	Quarter 4
1. Total release	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00
2. Average release rate for period	μCi/sec	0.00E+00	0.00E+00	0.00E+00	0.00E+00
3. Percent of ODCM limit	%	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Attachment 2  
Effluent and Waste Disposal Data

Table 1B: Gaseous Effluents - Elevated Releases  
Continuous Release

Nuclides Released

1. FISSION GASES

	<u>Unit</u>	<u>Quarter 1</u>	<u>Quarter 2</u>	<u>Quarter 3</u>	<u>Quarter 4</u>
krypton-85m	Ci	1.37E+01	2.17E+01	7.74E+00	6.89E+00
krypton-87	Ci	7.41E+00	1.51E+01	2.12E+01	1.66E+01
krypton-88	Ci	9.03E+00	1.77E+01	1.48E+01	9.78E+00
xenon-133	Ci	5.70E+01	6.14E+01	2.15E+01	2.65E+01
xenon-133m	Ci	≤ LLD	1.10E+00	≤ LLD	≤ LLD
xenon-135	Ci	1.19E+01	5.76E+01	5.88E+01	4.74E+01
xenon-135m	Ci	1.79E+01	6.87E+01	8.15E+01	6.81E+01
xenon-137	Ci	1.72E+01	1.37E+02	2.46E+02	3.23E+02
xenon-138	Ci	5.04E+01	1.44E+02	2.24E+02	1.85E+02
total for period	Ci	1.84E+02	5.25E+02	6.75E+02	6.83E+02

2. GASEOUS IODINES

	<u>Unit</u>	<u>Quarter 1</u>	<u>Quarter 2</u>	<u>Quarter 3</u>	<u>Quarter 4</u>
iodine-131	Ci	1.66E-02	3.77E-02	5.22E-02	3.66E-02
iodine-132	Ci	9.20E-02	2.11E-01	3.15E-01	1.77E-01
iodine-133	Ci	8.60E-02	2.74E-01	4.86E-01	2.83E-01
iodine-134	Ci	1.98E-01	6.07E-01	9.63E-01	6.61E-01
iodine-135	Ci	1.43E-01	4.60E-01	8.66E-01	4.79E-01
total for period	Ci	5.36E-01	1.59E+00	2.68E+00	1.64E+00

3. PARTICULATES

	<u>Unit</u>	<u>Quarter 1</u>	<u>Quarter 2</u>	<u>Quarter 3</u>	<u>Quarter 4</u>
chromium-51	Ci	≤ LLD	≤ LLD	≤ LLD	≤ LLD
manganese-54	Ci	≤ LLD	≤ LLD	≤ LLD	≤ LLD
cobalt-58	Ci	3.06E-05	≤ LLD	2.22E-05	≤ LLD
cobalt-60	Ci	1.20E-05	≤ LLD	≤ LLD	4.29E-06
zinc-65	Ci	≤ LLD	≤ LLD	≤ LLD	≤ LLD
strontium-89	Ci	3.30E-04	1.95E-03	2.58E-03	1.86E-03
strontium-90	Ci	4.16E-06	7.04E-06	4.26E-05	1.18E-05
niobium-95	Ci	≤ LLD	≤ LLD	≤ LLD	≤ LLD
cesium-134	Ci	≤ LLD	≤ LLD	≤ LLD	≤ LLD
cesium-137	Ci	≤ LLD	8.68E-06	≤ LLD	8.37E-06
barium-140	Ci	2.51E-04	2.03E-03	6.46E-03	2.83E-03
lanthanum-140	Ci	4.19E-04	3.50E-03	1.13E-02	4.95E-03
total for period	Ci	1.05E-03	7.50E-03	2.04E-02	9.66E-03

Attachment 2  
Effluent and Waste Disposal Data

Table 1B: Gaseous Effluents - Elevated Releases  
Continuous Release

4. TRITIUM

	<u>Unit</u>	<u>Quarter 1</u>	<u>Quarter 2</u>	<u>Quarter 3</u>	<u>Quarter 4</u>
hydrogen-3	Ci	2.54E+01	2.38E+01	4.03E+01	1.96E+01

Attachment 2  
Effluent and Waste Disposal Data

Table 1C: Gaseous Effluents - Ground Level Releases  
Continuous Release

Nuclides Released

1. FISSION GASES

	Unit	Quarter 1	Quarter 2	Quarter 3	Quarter 4
krypton-85m	Ci	1.01E-02	7.52E-01	1.33E+00	4.77E-02
krypton-87	Ci	≤ LLD	1.30E+00	7.13E+00	4.04E-01
krypton-88	Ci	≤ LLD	1.81E+00	5.28E+00	1.44E-01
xenon-133	Ci	2.07E-01	1.01E+01	1.14E+01	1.53E+00
xenon-135	Ci	2.37E+00	1.72E+01	2.72E+01	1.24E+01
xenon-135m	Ci	≤ LLD	1.29E+01	3.22E+01	1.84E+01
xenon-137	Ci	≤ LLD	≤ LLD	3.89E+00	≤ LLD
<u>Xenon-138</u>	Ci	≤ LLD	2.27E+00	2.07E+01	1.13E+00
total for period	Ci	2.59E+00	4.64E+01	1.09E+02	3.40E+01

2. GASEOUS IODINES

	Unit	Quarter 1	Quarter 2	Quarter 3	Quarter 4
iodine-131	Ci	3.68E-03	2.83E-03	2.09E-03	1.06E-03
iodine-132	Ci	6.40E-03	3.22E-03	1.49E-02	6.12E-03
iodine-133	Ci	9.58E-03	5.28E-03	2.00E-02	9.05E-03
iodine-134	Ci	8.02E-03	8.25E-03	4.73E-02	2.69E-02
<u>iodine-135</u>	Ci	1.19E-02	7.66E-03	3.37E-02	1.64E-02
total for period	Ci	3.95E-02	2.72E-02	1.18E-01	5.95E-02

3. PARTICULATES

	Unit	Quarter 1	Quarter 2	Quarter 3	Quarter 4
chromium-51	Ci	1.29E-04	1.71E-04	≤ LLD	≤ LLD
manganese-54	Ci	3.75E-06	1.45E-06	≤ LLD	≤ LLD
cobalt-58	Ci	1.80E-05	1.71E-05	≤ LLD	≤ LLD
cobalt-60	Ci	8.41E-05	1.15E-04	6.23E-05	6.45E-05
zinc-65	Ci	≤ LLD	≤ LLD	≤ LLD	≤ LLD
strontium-89	Ci	1.79E-04	1.81E-05	4.77E-04	2.31E-05
strontium-90	Ci	2.35E-06	2.54E-07	7.82E-06	1.18E-06
strontium-91	Ci	≤ LLD	≤ LLD	≤ LLD	4.67E-05
niobium-95	Ci	5.31E-07	≤ LLD	≤ LLD	≤ LLD
cesium-134	Ci	≤ LLD	5.18E-06	7.71E-07	1.46E-06
cesium-137	Ci	2.00E-06	1.22E-05	8.36E-06	7.57E-06
barium-140	Ci	5.18E-05	2.69E-05	2.54E-04	5.85E-05
lanthanum-140	Ci	7.41E-05	4.28E-05	1.66E-04	9.13E-05
<u>cerium-141</u>	Ci	3.07E-06	≤ LLD	≤ LLD	≤ LLD
total for period	Ci	5.48E-04	4.10E-04	9.76E-04	2.94E-04

Attachment 2  
Effluent and Waste Disposal Data

Table 1C: Gaseous Effluents - Ground Level Releases  
Continuous Release

4. TRITIUM

	<u>Unit</u>	<u>Quarter 1</u>	<u>Quarter 2</u>	<u>Quarter 3</u>	<u>Quarter 4</u>
hydrogen-3	Ci	3.61E+01	4.14E+01	4.34E+01	2.29E+01

Attachment 2  
Effluent and Waste Disposal Data

Table 1D: Gaseous Effluents - Ground Level Releases For Burning Contaminated Oil

Nuclides Released

1. PARTICULATES

	<u>Unit</u>	<u>Quarter 1</u>	<u>Quarter 2</u>	<u>Quarter 3</u>	<u>Quarter 4</u>
No releases made	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Attachment 2  
Effluent and Waste Disposal Data

Table 2A: Liquid Effluents - Summation of all Releases

A. FISSION AND ACTIVATION PRODUCTS (NOTE 1)

	Unit	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Estimated Total Percent Error
1. Total release (excluding tritium, gases, and alpha)	Ci	5.14E-04	1.74E-03	6.53E-04	1.29E-03	4.00E+01
2. Average diluted concentration (NOTE 2)	μCi/ml	1.14E-10	6.53E-10	1.87E-10	2.29E-10	NA
3. Percent of applicable limit	%	2.84E-03	8.87E-04	8.33E-04	2.95E-03	NA

B. TRITIUM (NOTE 1)

	Unit	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Estimated Total Percent Error
1. Total release	Ci	7.99E+01	3.57E+01	2.41E+01	5.19E+01	4.50E+01
2. Average diluted concentration (NOTE 2)	μCi/ml	1.77E-05	1.34E-05	6.89E-06	9.25E-06	NA
3. Percent of applicable limit	%	1.77E+00	1.34E+00	6.89E-01	9.25E-01	NA

C. DISSOLVED AND ENTRAINED GASES (NOTE 1)

	Unit	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Estimated Total Percent Error
1. Total release	Ci	3.14E-02	6.32E-02	6.82E-03	1.48E-02	4.00E+01
2. Average diluted concentration (NOTE 2)	μCi/ml	6.95E-09	2.37E-08	1.95E-09	2.64E-09	NA
3. Percent of applicable limit	%	3.47E-03	1.18E-02	9.76E-04	1.32E-03	NA

D. GROSS ALPHA RADIOACTIVITY

	Unit	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Estimated Total Percent Error
1. Total release	Ci	≤ LLD	≤ LLD	≤ LLD	≤ LLD	4.00E+01

NOTE 1: Includes radionuclides released via abnormal and/or non-routine releases

NOTE 2: Does not include rainwater (i.e. Storm Drain Collector Basin and/or Storm Drain Stabilization Pond)

Attachment 2  
Effluent and Waste Disposal Data

Table 2A: Liquid Effluents - Summation of all Releases

E. VOLUME OF WASTE RELEASED (NOTE 2)

	<u>Unit</u>	<u>Quarter 1</u>	<u>Quarter 2</u>	<u>Quarter 3</u>	<u>Quarter 4</u>	<u>Estimated Total Percent Error</u>
1. Total volume	liters	8.08E+05	3.76E+05	4.08E+05	1.04E+06	1.50E+01

F. VOLUME OF DILUTION WATER

	<u>Unit</u>	<u>Quarter 1</u>	<u>Quarter 2</u>	<u>Quarter 3</u>	<u>Quarter 4</u>	<u>Estimated Total Percent Error</u>
1. Total volume (used during release for average diluted concentration)	liters	4.52E+09	2.67E+09	3.49E+09	5.61E+09	1.5E+01

G. VOLUME OF COOLING WATER DISCHARGED FROM PLANT

	<u>Unit</u>	<u>Quarter 1</u>	<u>Quarter 2</u>	<u>Quarter 3</u>	<u>Quarter 4</u>	<u>Estimated Total Percent Error</u>
1. Total volume	liters	3.47E+11	4.63E+11	4.96E+11	4.28E+11	1.50E+01

NOTE 1: Includes radionuclides released via abnormal and/or non-routine releases

NOTE 2: Does not include rainwater (i.e. Storm Drain Collection Basin and/or Storm Drain Stabilization Pond)



Attachment 2  
Effluent and Waste Disposal Data

Table 2B: Liquid Effluents - Batch Mode

Nuclides Released

1. FISSION AND ACTIVATION PRODUCTS

	<u>Unit</u>	<u>Quarter 1</u>	<u>Quarter 2</u>	<u>Quarter 3</u>	<u>Quarter 4</u>
manganese-54	Ci	3.89E-05	1.23E-06	≤ LLD	≤ LLD
iron-55	Ci	5.57E-05	≤ LLD	9.06E-05	3.04E-04
cobalt-58	Ci	≤ LLD	≤ LLD	≤ LLD	≤ LLD
cobalt-60	Ci	3.30E-04	6.50E-05	2.20E-04	4.56E-04
strontium-89	Ci	≤ LLD	1.28E-05	≤ LLD	≤ LLD
strontium-90	Ci	≤ LLD	8.04E-06	≤ LLD	≤ LLD
zirconium-95	Ci	≤ LLD	≤ LLD	2.12E-07	≤ LLD
ruthenium-103	Ci	≤ LLD	2.92E-05	≤ LLD	≤ LLD
ruthenium-106	Ci	≤ LLD	≤ LLD	9.88E-06	≤ LLD
iodine-131	Ci	≤ LLD	1.08E-04	2.30E-05	1.03E-04
iodine-132	Ci	≤ LLD	2.26E-04	1.57E-05	≤ LLD
iodine-133	Ci	≤ LLD	4.81E-04	1.30E-04	2.41E-04
iodine-134	Ci	≤ LLD	1.75E-04	≤ LLD	≤ LLD
iodine-135	Ci	≤ LLD	6.24E-04	1.45E-04	1.57E-04
cesium-134	Ci	2.74E-05	1.76E-06	1.27E-06	1.09E-06
cesium-137	Ci	6.21E-05	8.45E-06	1.74E-05	1.81E-05
barium-140	Ci	≤ LLD	≤ LLD	≤ LLD	2.65E-06
lanthanum-140	Ci	≤ LLD	≤ LLD	≤ LLD	2.81E-06
cerium-144	Ci	≤ LLD	≤ LLD	≤ LLD	1.76E-06
total for period	Ci	5.14E-04	1.74E-03	6.53E-04	1.29E-03

2. DISSOLVED AND ENTRAINED GASES

	<u>Unit</u>	<u>Quarter 1</u>	<u>Quarter 2</u>	<u>Quarter 3</u>	<u>Quarter 4</u>
xenon-133	Ci	8.92E-03	1.25E-02	1.11E-03	3.90E-03
xenon-133m	Ci	5.67E-04	9.97E-04	≤ LLD	2.12E-05
xenon-135	Ci	2.18E-02	4.97E-02	5.71E-03	1.09E-02
xenon-135m	Ci	7.45E-05	1.65E-05	≤ LLD	7.78E-06
total for period	Ci	3.14E-02	6.32E-02	6.82E-03	1.48E-02

Attachment 2  
Effluent and Waste Disposal Data

Lower Limits of Detection

Units:  $\mu\text{Ci/ml}$

1. LIQUID RELEASES

Alpha	3.65E-08
H-3	2.55E-06
Cr-51	1.68E-07
Mn-54	1.53E-08
Fe-55	8.60E-08
Co-58	1.38E-08
Fe-59	2.74E-08
Co-60	1.67E-08
Zn-65	3.69E-08
Sr-89	3.06E-08
Sr-90	2.39E-08
Zr-95	2.41E-08
Mo-99	1.65E-07
Ru-103	1.33E-08
Ru-106	1.88E-07
I-131	2.14E-08
I-132	2.83E-08
I-133	1.95E-08
I-134	3.50E-08
I-135	1.11E-07
Cs-134	1.90E-08
Cs-137	2.24E-08
Ba-140	7.97E-08
La-140	4.40E-08
Ce-141	2.60E-08
Ce-144	1.34E-07
Kr-87	4.23E-08
Kr-88	5.91E-08
Xe-133	4.81E-08
Xe-133m	1.28E-07
Xe-135	1.62E-08
Xe-135m	8.11E-08
Xe-138	2.11E-07

2. GASEOUS RELEASES

Kr-85m	3.93E-09
Kr-87	6.23E-09
Kr-88	1.01E-08
Xe-133	5.22E-09
Xe-133m	3.17E-08
Xe-135	3.73E-09
Xe-135m	1.82E-08
Xe-137	3.97E-07
Xe-138	1.27E-08

3. IODINES AND PARTICULATES

Alpha	1.93E-15
H-3	4.18E-11
Cr-51	4.97E-12
Mn-54	5.30E-13
Co-58	3.00E-13
Fe-59	1.00E-12
Co-60	7.34E-13
Zn-65	1.13E-12
Sr-89	2.69E-15
Sr-90	1.43E-15
Sr-91	5.31E-12
Nb-95	2.84E-13
Mo-99	3.15E-12
I-131	4.56E-13
Cs-134	4.83E-13
Cs-137	6.34E-13
Ba-140	1.17E-12
La-140	1.16E-12
Ce-141	5.57E-13
Ce-144	1.96E-12

NOTES:

1. The above values represent typical "a priori" LLDs for isotopes where values of " $\leq$  LLD" are indicated in Tables 1A, 1B, 1C, 2A, and 2B. Also included are isotopes specified in ODCMS 7.3.3 and 7.3.7.
2. Where activity for any nuclide is reported as " $\leq$  LLD," that nuclide is considered not present and the LLD activity listed is not considered in the summary data.

Attachment 2  
Effluent and Waste Disposal Data

Table 3A: Solid Waste and Irradiated Fuel Shipments – Waste Class A

Waste Class A

1. Total volume shipped (cubic meters) 6.20E+02  
     Total curie quantity (estimated) 5.36E+01

2. Type of Waste

	<u>Unit</u>	<u>Period</u>	<u>Estimated Total %Error</u>
a. Spent resins, filter, sludges	meter <sup>3</sup>	2.37E+01	
	Curies	4.70E+01	1.00E+01
b. Dry active waste, compacted/non-compactd	meter <sup>3</sup>	5.96E+02	
	Curies	6.58E+00	1.00E+01
c. Irradiated components	meters <sup>3</sup>	0.00E+00	
	Curies	0.00E+00	N/A
d. Others (describe)	meters <sup>3</sup>	0.00E+00	
	Curies	0.00E+00	N/A

3. Estimate of major radionuclides composition

- a. C-14      1.1E+00 %
- Mn-54    3.1E+00 %
- Fe-55    2.2E+01 %
- Co-60    5.3E+01 %
- Ni-63    1.4E+01 %
- Zn-65    2.3E+00 %
- Cs-137    2.6E+00 %
  
- b. Fe-55    4.8E+01 %
- Co-60    3.9E+01 %
- Ni-63    1.0E+01 %
- Cs-137    1.0E+00 %
  
- c. N/A
  
- d. N/A

NOTE:

Solid Radioactive Waste listed above was shipped for processing to various waste processing services or directly shipped to a licensed disposal facility.

Attachment 2  
Effluent and Waste Disposal Data

Table 3A: Solid Waste and Irradiated Fuel Shipments – Waste Class A

4. Cross reference table, waste stream, form, and container type

<u>Stream</u>	<u>Form</u>	<u>Container Type</u> Type A/Type B	<u>No. of shipments</u>
a. Resin	Dewatered	Type A or GP	8.0E+00
b. Dry active waste	Compacted/ Non-compacted	Type A or GP	2.0E+01
c. Irradiated components		N/A	N/A
d. Others (describe)		N/A	N/A

5. Shipment Disposition

a. Solid Waste

<u>Number of Shipments</u>	<u>Mode of Transportation</u>	<u>Destination</u>
1.30E+01	Highway	Oak Ridge, TN
2.00E+00	Highway	Erwin, TN
2.00E+00	Highway	Richland, WA
1.00E+01	Rail	Clive, UT
1.00E+00	Highway	Clive, UT

b. Irradiated Fuel

<u>Number of Shipments</u>	<u>Mode of Transportation</u>	<u>Destination</u>
0	N/A	N/A

Attachment 2  
Effluent and Waste Disposal Data

Table 3B: Solid Waste and Irradiated Fuel Shipments – Waste Class B

Waste Class B

1. <u>Total volume shipped</u> (cubic meters)	1.37E+01
Total curie quantity (estimated)	5.62E+02

2. Type of Waste

	<u>Unit</u>	<u>Period</u>	<u>Estimated Total %Error</u>
a. Spent resins, filter, sludges	meter <sup>3</sup>	1.37E+01	
	Curies	5.62E+02	1.00E+01
b. Dry active waste, compacted/non-compactd	meter <sup>3</sup>	0.00E+00	
	Curies	0.00E+00	N/A
c. Irradiated components	meters <sup>3</sup>	0.00E+00	
	Curies	0.00E+00	N/A
d. Others (describe)	meters <sup>3</sup>	0.00E+00	
	Curies	0.00E+00	N/A

3. Estimate of major radionuclides composition

a.	Cr-51	4.4E+00 %
	Mn-54	3.3E+00 %
	Fe-55	2.5E+01 %
	Co-58	4.2E+00 %
	Co-60	4.9E+01 %
	Ni-63	5.4E+00 %
	Zn-65	4.3E+00 %
	Cs-134	1.0E+00 %
	Cs-137	1.9E+00 %
b.	N/A	
c.	N/A	
d.	N/A	

NOTE:

Solid Radioactive Waste was shipped either directly for disposal or to a waste processor for processing and then transported for disposal by the processor.

Attachment 2  
Effluent and Waste Disposal Data

Table 3B: Solid Waste and Irradiated Fuel Shipments – Waste Class B

4. Cross reference table, waste stream, form, and container type

<u>Stream</u>	<u>Form</u>	<u>Container Type</u> Type A/Type B	<u>No. of shipments</u>
a. Resin & Filters	Dewatered	Type B	4.00E+00
b. Dry active waste	Compacted/ Non-compacted	N/A	N/A
c. Irradiated components		N/A	N/A
d. Others (describe)		N/A	N/A

5. Shipment Disposition

a. Solid Waste

<u>Number of Shipments</u>	<u>Mode of Transportation</u>	<u>Destination</u>
4.00E+00	Highway	Erwin, TN

b. Irradiated Fuel

<u>Number of Shipments</u>	<u>Mode of Transportation</u>	<u>Destination</u>
0	N/A	N/A

Attachment 2  
Effluent and Waste Disposal Data

Table 3C: Solid Waste and Irradiated Fuel Shipments – Waste Class C

Waste Class C

1.	<u>Total volume shipped</u> (cubic meters)	1.33E+01
	Total curie quantity (estimated)	9.56E+04

2. Type of Waste

	<u>Unit</u>	<u>Period</u>	<u>Estimated Total %Error</u>
a. Spent resins, filter, sludges	meter <sup>3</sup>	0.00E+00	
	Curies	0.00E+00	N/A
b. Dry active waste, compacted/non-compactd	meter <sup>3</sup>	0.00E+00	
	Curies	0.00E+00	N/A
c. Irradiated components	meters <sup>3</sup>	1.33E+01	
	Curies	9.56E+04	1.00E+01
d. Others (describe)	meters <sup>3</sup>	0.00E+00	
	Curies	0.00E+00	N/A

3. Estimate of major radionuclides composition

- a. N/A
- b. N/A
- c. Mn-54      2.2E+00 %  
           Fe-55      4.3E+01 %  
           Co-60      5.1E+01 %  
           Ni-63      3.3E+00 %
- d. N/A

NOTE:

Solid Radioactive Waste was shipped either directly for disposal or to a waste processor for processing and then transported for disposal by the processor.

Attachment 2  
Effluent and Waste Disposal Data

Table 3C: Solid Waste and Irradiated Fuel Shipments – Waste Class C

4. Cross reference table, waste stream, form, and container type

<u>Stream</u>	<u>Form</u>	<u>Container Type</u> Type A/Type B	<u>No. of shipments</u>
a. Resin & Filters	Dewatered	N/A	N/A
b. Dry active waste	Compacted/ Non-compacted	N/A	N/A
c. Irradiated components		Type B	6.00E+00
d. Others (describe)		N/A	N/A

5. Shipment Disposition

a. Solid Waste

<u>Number of Shipments</u>	<u>Mode of Transportation</u>	<u>Destination</u>
5.00E+00	Highway	Barnwell, SC
1.00E+00	Highway	Erwin, TN

b. Irradiated Fuel

<u>Number of Shipments</u>	<u>Mode of Transportation</u>	<u>Destination</u>
7.00E+00	Rail	New Hill, NC



Attachment 2  
Effluent and Waste Disposal Data  
Combustion of Waste Oil

No contaminated waste oil was incinerated during this report period.

Attachment 3  
Environmental Monitoring Program

Enclosure 1: Milk and Vegetable Sample Location

Enclosure 2: Land Use Census

Attachment 3  
Environmental Monitoring Program  
Enclosure 1: Milk and Vegetable Sample Location

No milk animals are located in the area evaluated by the last Land Use Census, therefore, no milk sampling locations were available during this time period.

Attachment 3  
Environmental Monitoring Program

Enclosure 2: Land Use Census

The 2006 Land Use Census did not identify any locations that are reportable in the Radioactive Effluent Release Report for 2006.

The following is a summary of the nearest resident and garden locations identified within five miles of the plant for each of the 16 meteorological sectors. No milk animals were found within five miles of the plant.

<u>Direction</u>	<u>Residence</u>	<u>Garden</u>
NNE	0.7 miles	None
NE	None	None
ENE	None	None
E	None	None
ESE	1.4 miles	None
SE	0.9 miles	None
SSE	0.9 miles	None
S	1.1 miles	1.9 miles
SSW	1.2 miles	1.7 miles
SW	1.1 miles	3.0 miles
WSW	1.2 miles	1.5 miles
W	0.9 miles	0.9 miles
WNW	0.9 miles	None
NW	0.9 miles	1.0 miles
NNW	0.8 miles	4.5 miles
N	0.8 miles	None

Attachment 4  
Effluent Instrumentation

Enclosure 1: Radioactive Liquid Effluent Monitoring Instrumentation

Enclosure 2: Radioactive Gaseous Effluent Monitoring Instrumentation

Enclosure 3: Liquid Hold-Up Tank

Attachment 4  
Effluent Instrumentation

Enclosure 1: Radioactive Liquid Effluent Monitoring Instrumentation

No Radioactive Liquid Effluent Monitoring Instruments were inoperable for a period of greater than 30 days.

Attachment 4  
Effluent Instrumentation

Enclosure 2: Radioactive Gaseous Effluent Monitoring Instrumentation

No Radioactive Gaseous Effluent Monitoring Instruments were inoperable for a period of greater than 30 days.

Attachment 4  
Effluent Instrumentation  
Enclosure 3: Liquid Hold-Up Tank

No Liquid Hold-Up Tank exceeded the 10-Curie limit of ODCMS 7.3.6 during this reporting period.



## Attachment 5

### Major Modification To The Radioactive Waste Treatment Systems

In accordance with ODCMS 7.5.1, major changes to the liquid, gaseous, and solid Radioactive Waste Treatment Systems shall be reported to the NRC as part of the Radioactive Effluent Release Report or as part of the Updated Final Safety Analysis Report (UFSAR) update. No major modifications were made to the radioactive waste treatment systems during this reporting period.

## Attachment 6

### Meteorological Data

Per Technical Specification 5.6.3 and ODCMS 7.4.2, the annual summary of meteorological data collected over the calendar year has been retained in a file and is available for NRC review upon request.

Attachment 7

Annual Dose Assessment

Summary

**Liquid Effluents** <sup>(1)</sup>

Critical Age: Adult

Controlling location for liquid releases: SW sector at 0.1 miles

	<u>(mrem)</u>	<u>Limit: (mrem)</u>
GI-LLI	4.66E-04	2.00E+01
Bone	1.57E-04	2.00E+01
Liver	2.87E-04	2.00E+01
Lung	2.15E-04	2.00E+01
Total Body	2.21E-04	6.00E+00
Thyroid	2.11E-04	2.00E+01
Kidney	1.65E-04	2.00E+01

**Gaseous Effluents** <sup>(1)</sup>

Noble Gas: Critical Age: Infant

Controlling location: NE sector at 0.7 mile

	<u>(mrad)</u>	<u>Limit: (mrad)</u>
Gamma	8.79E-02	2.00E+01
Beta	4.90E-02	4.00E+01

Iodine, Particulates, and Tritium:

Critical Age: Infant

Controlling location: NE sector at 4.75 mile  
Assuming a cow milk pathway

	<u>(mrem)</u>	<u>Limit: (mrem)</u>
Thyroid	8.43E-01	3.00E+01
Kidney	4.91E-03	3.00E+01
Liver	4.47E-03	3.00E+01
Total Body	2.91E-03	3.00E+01
Skin	1.77E-03	3.00E+01
GI_LLI	1.89E-03	3.00E+01
Lung	1.77E-03	3.00E+01
Bone	2.93E-03	3.00E+01

<sup>(1)</sup> Reference – dose determined using site specific ODCM software

Off-Site Dose Calculation Manual (ODCM) And Process Control Program (PCP) Revisions

The PCP was not revised during the report period. ODCM Revision 29 was effective on January 30, 2006. An analysis of the major changes is as follows:

**ODCM Analysis:**

**1. Updated the list of effective pages for Revision 29.**

The list of effective pages and revision bars denotes the method for tracking ODCM changes and to meet the intent for administrative controls in Technical Specifications 5.5.1.

**2. Revised sections to allow prompt troubleshooting of annunciator problems without concerns on LCO impact.**

Section 7.3.1 Radioactive Liquid Effluent Monitoring Instrumentation, section B 7.3.1 Radioactive Liquid Effluent Monitoring Instrumentation Bases, section 7.3.2 Radioactive Gaseous Effluent Monitoring Instrumentation and section B 7.3.2 Radioactive Gaseous Effluent Monitoring Instrumentation Bases were revised to include a note that states the annunciator function may be removed from operation for performance of troubleshooting for up to 30 minutes provided the associated function maintains monitoring capability. Upon completion of troubleshooting, or expiration of the 30 minute allowance, the annunciator must be returned to operation or the applicable Condition entered and required Compensatory Measures taken. Since the 1/2-CAC-AT-1264 alarm is used as an EAL entry condition, removal of the 1/2-CAC-AT-1264 annunciator for 30 minutes for troubleshooting is prohibited when there are any fuel handling activities on the refuel floor or activities where there is the potential to cause a decrease in spent fuel pool water level.

**Offsite Dose Calculation Manual**  
**Revision 29**