



Progress Energy

10 CFR 50.36a

APR 27 2006

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U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555-0001

Subject: Brunswick Steam Electric Plant, Unit Nos. 1 and 2
Docket Nos. 50-325 and 50-324/License Nos. DPR-71 and DPR-62
Radioactive Effluent Release Report for 2005

Ladies and Gentlemen:

In accordance with 10 CFR 50.36a and Technical Specification (TS) 5.6.3 for the Brunswick Steam Electric Plant (BSEP), Unit Nos. 1 and 2, Carolina Power & Light Company, now doing business as Progress Energy Carolinas, Inc., is submitting the enclosed Radioactive Effluent Release Report for BSEP Unit Nos. 1 and 2. This report covers the period from January 1, 2005, through December 31, 2005.

TS 5.5.1, "Offsite Dose Calculation Manual (ODCM)," requires changes to the ODCM be submitted as part of or concurrent with the Radioactive Effluent Release Report. No changes were made to the ODCM in 2005. As such, the ODCM is not included in this submittal.

No regulatory commitments are contained in this submittal. Please refer any questions regarding this submittal to Mr. Leonard R. Beller, Supervisor - Licensing/Regulatory Programs, at (910) 457-2073.

Sincerely,

Randy C. Ivey
Manager - Support Services
Brunswick Steam Electric Plant

MAT/mat

Enclosure:

Radioactive Effluent Release Report for 2005

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JE48

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Radioactive Effluent Release Report for 2005

Brunswick Steam Electric Plant Radioactive Effluent Release Report January 1, through December 31, 2005

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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 Quarter¹
 - (a) ≤ 10 mrad gamma
 - (b) ≤ 20 mrad beta
 - (2) Calendar Year
 - (a) ≤ 20 mrad gamma
 - (b) ≤ 40 mrad beta
- B. Iodine-131, iodine-133, tritium, and particulates with half-lives greater than eight days (ODCMS 7.3.9)
- (1) Calendar Quarter¹
 - (a) ≤ 15 mrem to any organ
 - (2) Calendar Year
 - (a) ≤ 30 mrem to any organ
 - (3) Calendar Quarter for Burning Contaminated Oil¹
 - (a) < 0.1 % of limits for calendar quarter of (1)
 - (b) 436 μ Ci (ODCM Appendix H)
 - (4) Calendar Year for Burning Contaminated Oil
 - (a) $< 0.1\%$ of limits for calendar year
 - (b) 872 μ Ci (ODCM Appendix H)
- C. Liquid Effluents (ODCMS 7.3.4)
- (1) Calendar Quarter²
 - (a) ≤ 3 mrem to total body
 - (b) ≤ 10 mrem to any organ
 - (2) Calendar Year
 - (a) ≤ 6 mrem to total body
 - (b) ≤ 10 mrem to any organ

NOTE: Dose calculations are determined in accordance with the ODCM

¹ Used for percent of ODCMS limit determination in Attachment 2, Table 1A

² 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) ≤ 500 mrem/year to total body
- (2) ≤ 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) ≤ 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 = $1.00\text{E-}03 \mu\text{Ci/ml}^3$
- (2) Dissolved and entrained noble gases: limit = $2.00\text{E-}04 \mu\text{Ci/ml}^3$

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.

³ 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
Effluent and Waste Disposal Report Supplemental Information

4. Batch Releases

A. Liquid

(1) Number of batch releases:	5.10E+01
(2) Total time period for batch releases:	5.15E+03 Minutes
(3) Maximum time period for a batch release:	1.95E+02 Minutes
(4) Average time period for a batch release:	1.01E+02 Minutes
(5) Minimum time period for a batch release:	2.00E+00 Minutes
(6) Average stream flow during periods of release of effluent into a flowing stream:	8.37E+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 Releases⁴

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

⁴ 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 $8.40\text{E}+07$ gallons containing $1.37\text{E}+02$ curies of tritium were released from the Storm Drain Stabilization Pond (SDSP) to the intake canal over this reporting period. This resulted in an estimated maximum dose to the individual of $2.40\text{E}-04$ mrem. The SDSP is a permitted release point.

Discussion of releases from the Storm Drain Collector Basin

Due to heavy rains from Hurricane Ophelia, Tropical Storm Tammy, and other unusual heavy rain events, the Storm Drain Collector Basin (SDCB) was released directly to the discharge canal on seven occasions in 2005. The SDCB is a permitted release point during periods of inclement weather to protect plant personnel and equipment. Approximately $1.83\text{E}+06$ gallons containing $1.28\text{E}+00$ curies of tritium were released. This resulted in an estimated maximum dose to the individual of $1.79\text{E}-06$ 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

	<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 release	Ci	3.81E+01	5.09E+01	4.57E+01	7.49E+01	4.50E+01
2. Average release rate for period	μCi/sec	4.90E+00	6.47E+00	5.76E+00	9.43E+00	NA
3. Percent of ODCM limit	%	1.14E-02	8.25E-03	1.04E-02	1.63E-02	NA

B. IODINES

	<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 Iodine - 131 release	Ci	2.36E-03	3.98E-03	7.81E-03	6.27E-03	3.50E+01
2. Average release rate for period	μCi/sec	3.03E-04	5.06E-04	9.83E-04	7.89E-04	NA

C. PARTICULATES

	<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 release	Ci	6.38E-04	9.19E-04	6.18E-04	5.14E-04	3.50E+01
2. Average release rate for period	μCi/sec	8.20E-05	1.17E-04	7.77E-05	6.47E-05	NA
3. Gross Alpha	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.50E+01

D. TRITIUM

	<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 release	Ci	4.77E+01	4.55E+01	6.63E+01	7.12E+01	3.00E+01
2. Average release rate for period	μCi/sec	6.14E+00	5.79E+00	8.34E+00	8.95E+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

	<u>Unit</u>	<u>Quarter 1</u>	<u>Quarter 2</u>	<u>Quarter 3</u>	<u>Quarter 4</u>
1. Total release	Ci	4.77E+01	4.56E+01	6.64E+01	7.12E+01
2. Average release rate for period	µCi/sec	6.14E+00	5.79E+00	8.35E+00	8.95E+00
3. Percent of ODCM limit	%	1.02E-01	1.38E-01	3.24E-01	2.13E-01

F. PARTICULATES VIA BURINING CONTAMINATED OIL

	<u>Unit</u>	<u>Quarter 1</u>	<u>Quarter 2</u>	<u>Quarter 3</u>	<u>Quarter 4</u>
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>
argon-41	Ci	7.53E-02	3.28E-01	≤ LLD	≤ LLD
krypton-85	Ci	≤ LLD	≤ LLD	7.23E-04	≤ LLD
krypton-85m	Ci	2.07E+00	1.15E+00	4.04E+00	5.47E+00
krypton-87	Ci	6.48E-01	9.32E-02	5.57E-01	3.11E+00
krypton-88	Ci	2.55E+00	1.69E-01	1.03E+00	4.52E+00
xenon-133	Ci	8.36E+00	1.48E+01	1.51E+01	2.63E+01
xenon-133m	Ci	8.81E-02	3.60E-01	≤ LLD	5.50E+00
xenon-135	Ci	6.53E+00	4.29E+00	3.06E+00	≤ LLD
xenon-135m	Ci	2.94E+00	6.32E+00	7.10E+00	9.06E+00
xenon-137	Ci	≤ LLD	≤ LLD	≤ LLD	≤ LLD
xenon-138	Ci	1.32E+01	1.12E+01	1.15E+01	1.99E+01
<u>total for period</u>	Ci	<u>3.64E+01</u>	<u>3.86E+01</u>	<u>4.25E+01</u>	<u>7.38E+01</u>

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	1.89E-03	3.49E-03	6.61E-03	6.17E-03
iodine-132	Ci	1.32E-02	1.08E-02	2.33E-02	2.60E-02
iodine-133	Ci	1.16E-02	1.24E-02	2.36E-02	2.20E-02
iodine-134	Ci	2.20E-02	1.61E-02	4.05E-02	3.91E-02
iodine-135	Ci	1.87E-02	1.97E-02	3.52E-02	3.39E-02
<u>total for period</u>	Ci	<u>6.74E-02</u>	<u>6.25E-02</u>	<u>1.29E-01</u>	<u>1.27E-01</u>

3. PARTICULATES

	<u>Unit</u>	<u>Quarter 1</u>	<u>Quarter 2</u>	<u>Quarter 3</u>	<u>Quarter 4</u>
chromium-51	Ci	1.69E-05	5.41E-06	≤ LLD	≤ LLD
manganese-54	Ci	1.23E-05	3.82E-05	≤ LLD	≤ LLD
cobalt-58	Ci	4.42E-05	1.87E-04	≤ LLD	≤ LLD
cobalt-60	Ci	1.42E-04	1.48E-04	6.66E-06	1.14E-06
zinc-65	Ci	1.22E-05	≤ LLD	≤ LLD	≤ LLD
strontium-89	Ci	2.59E-05	5.36E-05	9.66E-05	8.50E-05
strontium-90	Ci	3.71E-07	6.04E-07	1.21E-06	6.09E-07
cesium-134	Ci	≤ LLD	2.01E-05	≤ LLD	≤ LLD
cesium-137	Ci	8.75E-06	1.78E-05	1.42E-06	4.45E-06
barium-140	Ci	2.89E-05	6.25E-05	1.69E-04	1.36E-04
lanthanum-140	Ci	2.66E-05	1.12E-04	3.20E-04	2.37E-04
ruthenium-106	Ci	≤ LLD	2.35E-05	≤ LLD	≤ LLD
tellurium-129m	Ci	≤ LLD	5.78E-05	≤ LLD	≤ LLD
<u>total for period</u>	Ci	<u>3.19E-04</u>	<u>7.26E-04</u>	<u>5.94E-04</u>	<u>4.64E-04</u>

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	1.84E+01	1.68E+01	2.92E+01	3.70E+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	≤ LLD	≤ LLD	≤ LLD	2.25E-02
krypton-87	Ci	≤ LLD	≤ LLD	5.19E-02	≤ LLD
xenon-133	Ci	≤ LLD	1.15E+01	1.68E+00	≤ LLD
xenon-135	Ci	1.68E+00	7.25E-01	1.44E+00	1.11E+00
xenon-135m	Ci	≤ LLD	≤ LLD	5.96E-02	≤ LLD
<u>xenon-137</u>	Ci	≤ LLD	≤ LLD	6.64E-02	≤ LLD
total for period	Ci	1.68E+00	1.22E+01	3.29E+00	1.13E+00

2. GASEOUS IODINES

	Unit	Quarter 1	Quarter 2	Quarter 3	Quarter 4
iodine-131	Ci	4.69E-04	4.93E-04	1.20E-03	1.04E-04
iodine-132	Ci	1.68E-04	3.85E-06	5.93E-03	≤ LLD
iodine-133	Ci	1.06E-03	9.52E-05	4.75E-03	3.91E-04
iodine-134	Ci	≤ LLD	≤ LLD	≤ LLD	≤ LLD
<u>iodine-135</u>	Ci	9.50E-05	1.30E-05	5.26E-03	≤ LLD
total for period	Ci	1.79E-03	6.05E-04	1.71E-02	4.96E-04

3. PARTICULATES

	Unit	Quarter 1	Quarter 2	Quarter 3	Quarter 4
chromium-51	Ci	1.38E-04	8.29E-05	≤ LLD	≤ LLD
manganese-54	Ci	3.74E-06	7.31E-06	≤ LLD	≤ LLD
cobalt-58	Ci	2.73E-05	2.14E-05	2.11E-06	1.55E-06
cobalt-60	Ci	1.37E-04	8.08E-05	1.33E-05	1.93E-05
zinc-65	Ci	≤ LLD	≤ LLD	≤ LLD	≤ LLD
strontium-89	Ci	1.33E-05	≤ LLD	7.42E-06	≤ LLD
strontium-90	Ci	≤ LLD	≤ LLD	≤ LLD	≤ LLD
cesium-134	Ci	≤ LLD	≤ LLD	≤ LLD	1.05E-05
cesium-137	Ci	≤ LLD	≤ LLD	6.77E-07	1.90E-05
barium-140	Ci	1.80E-07	≤ LLD	≤ LLD	≤ LLD
<u>lanthanum-140</u>	Ci	3.32E-07	≤ LLD	≤ LLD	≤ LLD
total for period	Ci	3.19E-04	1.92E-04	2.35E-05	5.02E-05

4. TRITIUM

	Unit	Quarter 1	Quarter 2	Quarter 3	Quarter 4
hydrogen-3	Ci	2.94E+01	2.88E+01	3.71E+01	3.42E+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)

	<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 release (excluding tritium, gases, and alpha)	Ci	1.40E-03	2.26E-04	5.27E-04	9.66E-05	4.00E+01
2. Average diluted concentration (NOTE 2)	µCi/ml	5.59E-10	5.68E-11	8.09E-11	2.91E-11	NA
3. Percent of applicable limit	%	2.08E-03	1.31E-03	1.35E-03	1.32E-03	NA

B. TRITIUM (NOTE 1)

	<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 release	Ci	6.23E+01	3.71E+01	6.01E+01	5.19E+01	4.50E+01
2. Average diluted concentration (NOTE 2)	µCi/ml	2.49E-05	9.32E-06	9.23E-06	1.56E-05	NA
3. Percent of applicable limit	%	2.49E+00	9.32E-01	9.23E-01	1.56E+00	NA

C. DISSOLVED AND ENTRAINED GASES (NOTE 1)

	<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 release	Ci	5.36E-05	5.32E-04	4.70E-04	9.89E-04	4.00E+01
2. Average diluted concentration (NOTE 2)	µCi/ml	2.80E-11	1.33E-10	7.21E-11	2.98E-10	NA
3. Percent of applicable limit	%	1.07E-05	6.69E-05	3.61E-05	1.49E-04	NA

D. GROSS ALPHA RADIOACTIVITY

	<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 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	3.66E+05	6.15E+05	8.94E+05	5.15E+05	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	2.50E+09	3.98E+09	6.52E+09	3.32E+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	3.49E+11	4.61E+11	5.02E+11	4.62E+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	1.80E-04	2.16E-06	1.13E-04	≤ LLD
iron-55	Ci	1.19E-04	1.32E-04	≤ LLD	≤ LLD
Cobalt-58	Ci	2.05E-05	≤ LLD	≤ LLD	≤ LLD
cobalt-60	Ci	6.83E-04	8.49E-05	2.34E-04	9.27E-05
strontium-89	Ci	≤ LLD	≤ LLD	≤ LLD	≤ LLD
strontium-90	Ci	≤ LLD	≤ LLD	≤ LLD	≤ LLD
iodine-131	Ci	1.44E-06	≤ LLD	≤ LLD	2.34E-07
iodine-133	Ci	≤ LLD	≤ LLD	≤ LLD	≤ LLD
cesium-134	Ci	1.75E-04	1.81E-06	6.58E-05	≤ LLD
cesium-137	Ci	2.26E-04	4.61E-06	1.13E-04	3.64E-06
<u>total for period</u>	Ci	1.40E-03	2.26E-04	5.27E-04	9.66E-05

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	8.28E-06	1.12E-04	1.34E-04	1.75E-04
xenon-135	Ci	4.53E-05	4.20E-04	3.36E-04	8.14E-04
<u>total for period</u>	Ci	5.36E-05	5.32E-04	4.70E-04	9.89E-04

Attachment 2
Effluent and Waste Disposal Data
Lower Limits of Detection

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

1. LIQUID RELEASES

Alpha	2.19E-08
H-3	2.46E-06
Cr-51	1.37E-07
Mn-54	1.26E-08
Fe-55	7.54E-08
Co-58	1.90E-08
Fe-59	5.24E-08
Co-60	2.37E-08
Zn-65	4.13E-08
Sr-89	3.77E-08
Sr-90	2.35E-08
Mo-99	1.29E-07
I-131	2.02E-08
I-133	2.21E-08
I-135	9.31E-08
Cs-134	2.61E-08
Cs-137	1.95E-08
Ba-140	7.26E-08
La-140	3.98E-08
Ce-141	2.57E-08
Ce-144	9.26E-08
Kr-87	4.59E-08
Kr-88	4.77E-08
Xe-133	3.97E-08
Xe-133m	1.37E-07
Xe-135	2.02E-08
Xe-135m	8.15E-08
Xe-138	2.16E-07

2. GASEOUS RELEASES

Kr-85m	2.79E-09
Kr-87	7.58E-09
Kr-88	1.30E-03
Xe-133	5.26E-09
Xe-133m	2.15E-03
Xe-135	3.53E-09
Xe-135m	4.56E-03
Xe-137	1.70E-07
Xe-138	1.39E-07

3. IODINES AND PARTICULATES

Alpha	2.22E-15
H-3	1.55E-11
Cr-51	2.98E-13
Mn-54	3.72E-14
Co-58	4.38E-14
Fe-59	1.04E-13
Co-60	5.84E-14
Zn-65	6.72E-14
Sr-89	3.10E-15
Sr-90	9.56E-16
Mo-99	2.69E-13
I-131	2.54E-14
Cs-134	6.70E-14
Cs-137	3.62E-14
Ba-140	9.72E-14
La-140	4.80E-14
Ce-141	3.86E-14
Ce-144	1.69E-13

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

Waste Class A

1. <u>Total volume shipped</u> (cubic meters)	9.03E+02
Total curie quantity (estimated)	2.37E+01

2. Type of Waste

	<u>Unit</u>	<u>Period</u>	<u>Estimated Total %Error</u>
a. Spent resins, filter, sludges	meter ³	2.78E+01	1.00E+01
	Curies	1.99E+01	
b. Dry active waste, compacted/non-compactd	meter ³	8.75E+02	1.00E+01
	Curies	3.79E+00	
c. Irradiated components	meters ³	0.00E+00	N/A.
	Curies	0.00E+00	
d. Others (describe)	meters ³	0.00E+00	N/A.
	Curies	0.00E+00	

3. Estimate of major radionuclides composition

a.	H-3	4.20E+00 %
	C-14	2.20E+00 %
	Mn-54	2.40E+00 %
	Fe-55	1.37E+01 %
	Co-60	5.09E+01 %
	Ni-63	1.43E+01 %
	Cs-137	9.10E+00 %
	Zn-65	1.50E+00 %
b.	Mn-54	2.59E+00 %
	Fe-55	3.48E+01 %
	Co-60	5.52E+01 %
	Ni-63	3.57E+00 %
	Zn-65	2.13E+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 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	Dewatered	Type A or GP	5.00E+00
b. Dry active waste	Compacted/ Non-compacted	Type A or GP	2.30E+01
c. Irradiated components		N/A	N/A
d. Others (describe)		N/A	N/A

*Solidification agent or absorbent (e.g., cement, urea-formaldehyde)

5. Shipment Disposition

a. Solid Waste

<u>Number of Shipments</u>	<u>Mode of Transportation</u>	<u>Destination</u>
1.00E+01	Highway	Oak Ridge, TN
1.00E+00	Highway	Erwin, TN
1.00E+00	Highway	Richland, WA
8.00E+00	Rail	Clive, UT
1.00E+00	Highway	Clive, UT
7.00E+00	Highway	Wampum, PA

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 B

1. <u>Total volume shipped</u> (cubic meters)	1.39E+01
Total curie quantity (estimated)	5.15E+02

2. Type of Waste

	<u>Unit</u>	<u>Period</u>	<u>Estimated Total %Error</u>
a. Spent resins, filter, sludges	meter ³ Curies	1.39E+01 5.15E+02	1.00E+01
b. Dry active waste, compacted/non-compactd	meter ³ Curies	0.00E+00 0.00E+00	N/A
c. Irradiated components	meters ³ Curies	0.00E+00 0.00E+00	N/A
d. Others (describe)	meters ³ Curies	0.00E+00 0.00E+00	N/A

3. Estimate of major radionuclides composition

a.	Cr-51	1.62E+00 %
	Mn-54	3.48E+00 %
	Fe-55	2.52E+01 %
	Co-58	3.54E+00 %
	Co-60	5.71E+01 %
	Ni-63	2.22E+00 %
	Zn-65	3.69E+00 %
	Cs-137	2.22E+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 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	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

*Solidification agent or absorbent (e.g., cement, urea-formaldehyde)

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)	6.70E+00
Total curie quantity (estimated)	3.47E+04

2. Type of Waste

	<u>Unit</u>	<u>Period</u>	<u>Estimated Total %Error</u>
a. Spent resins, filter, sludges	meter ³ Curies	0.00E+00 0.00E+00	N/A
b. Dry active waste, compacted/non-compactd	meter ³ Curies	0.00E+00 0.00E+00	N/A
c. Irradiated components	meters ³ Curies	6.70E+00 3.47E+04	1.00E+01
d. Others (describe)	meters ³ Curies	0.00E+00 0.00E+00	N/A

3. Estimate of major radionuclides composition

- a. N/A
- b. N/A
- c. Fe-55 2.45E+01 %
 Co-60 7.25E+01 %
 Ni-63 2.02E+00 %
- d. N/A

NOTE:

Solid Radioactive Waste was shipped directly for disposal.

Attachment 2
Effluent and Waste Disposal Data

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

Effluent and Waste Disposal Annual Report for January 1, through December 31, 2005
Solid Waste and Irradiated Fuel Shipments

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	3.00E+00
d. Others (describe)		N/A	N/A

*Solidification agent or absorbent (e.g., cement, urea-formaldehyde)

5. Shipment Disposition

a. Solid Waste

<u>Number of Shipments</u>	<u>Mode of Transportation</u>	<u>Destination</u>
3.00E+00	Highway	Barnwell, S.C.

b. Irradiated Fuel

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

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 2005 Land Use Census did not identify any locations that are reportable in the Radioactive Effluent Release Report for 2005.

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	0.8 miles	None
NE	None	None
ENE	None	None
E	None	None
ESE	1.5 miles	None
SE	0.9 miles	None
SSE	1.0 miles	None
S	1.1 miles	1.8 miles
SSW	1.2 miles	1.5 miles
SW	1.0 miles	2.9 miles
WSW	1.2 miles	1.2 miles
W	0.8 miles	2.4 miles
WNW	0.8 miles	None
NW	0.9 miles	4.8 miles
NNW	0.8 miles	0.9 miles
N	0.7 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. Although no major modifications to the radioactive waste treatment systems will be submitted with the UFSAR in accordance with 10 CFR 50.71(e), a temporary modification, in August 2005, was installed in the Unit 2 Turbine Building ventilation system as part of testing. This modification resulted in a temporary, unfiltered pathway to the environment. The system operated for approximately 28 days in this configuration and accounted for approximately 1.50E14 cc of release volume. The ventilation system was restored to its normal configuration when the temporary modification was removed. The once-through pathway contributed the following to the 2005 annual source term:

Category	Curies
Noble Gas	1.86E+00
I-131	1.109E-03
I-133	4.432E-03

During the once-through ventilation test there was one period where sample flow was lost for particulate and iodine collection for approximately 4 hours and auxiliary sampling was not installed within the 45 minute time requirement of the ODCM. This was due to an inadvertent power loss to the sample pump. There were no alarms in the control room on the temporary sample apparatus and once discovered, power was immediately restored. It is estimated that approximately 8.3E-05 curies of iodine were released in this period, there were no particulates released in this 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 ⁽¹⁾

Critical Age: Adult

Controlling location for liquid releases: SW sector at 0.1 miles

	<u>(mrem)</u>	<u>Limit: (mrem)</u>
GI-LLI	3.78E-04	2.00E+01
Bone	9.81E-05	2.00E+01
Liver	2.27E-04	2.00E+01
Lung	1.47E-04	2.00E+01
Total Body	1.82E-04	6.00E+00
Thyroid	1.15E-04	2.00E+01
Kidney	1.30E-04	2.00E+01

Gaseous Effluents ⁽¹⁾

Noble Gas: Critical Age: Infant

Controlling location: NE sector at 0.7 mile

	<u>(mrad)</u>	<u>Limit: (mrad)</u>
Gamma	4.64E-03	2.00E+01
Beta	1.93E-03	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	1.17E-01	3.00E+01
Kidney	2.04E-03	3.00E+01
Liver	1.99E-03	3.00E+01
Total Body	1.77E-03	3.00E+01
Skin	1.63E-03	3.00E+01
GI_LLI	1.63E-03	3.00E+01
Lung	1.61E-03	3.00E+01
Bone	4.44E-04	3.00E+01

⁽¹⁾ Reference – dose determined using site specific ODCM software

Attachment 8

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

The PCP was not revised during the report period. The ODCM was not revised during the report period.