VIRGIL C. SUMMER
JENKINSVILLE, SOUTH CAROLINA

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT
VIRGIL C. SUMMER NUCLEAR STATION

FOR THE OPERATING PERIOD
JANUARY 1, 2012 - DECEMBER 31, 2012

APRIL 2013

SCE&G SM
A SCANA COMPANY

Prepared by:

Michelle Westbury, Specialist
Health Physics

Reviewed by:

Timothy D. Riley, Supervisor
Health Physics

Approved by:

Moses Coleman, Manager
Health Physics and Safety Services

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT

JANUARY – DECEMBER, 2012

VIRGIL C. SUMMER NUCLEAR STATION
SOUTH CAROLINA ELECTRIC & GAS

Introduction

This report is being submitted as a summary of quantities of radioactive liquid and gaseous effluents and solid waste released from the Virgil C. Summer Nuclear Station. This report is submitted in fulfillment of the requirements in Technical Specifications Section 6.9.1.8, Offsite Dose Calculation Manual (ODCM) Section1.6.2 and 10CFR50.36(a) and follows the reporting details specified in USNRC Regulatory guide 1.21.

Summary information of radioactive gaseous and liquid effluents is presented along with a summary of radioactive waste disposal as well as an evaluation of the radiological impact on man due to operation of the Virgil C. Summer Nuclear Station . Supplemental information including release limits also required by USNRC Regulatory Guide 1.21 is provided as Appendix A.

During the reporting period there was one ODCM reportable incident. There was one change made to the Offsite Dose Calculation Manual (ODCM) during the 12-month period. Details are presented below.

A. Supplemental Information

Regulatory limits for doses, dose rate and effluent concentration limits presented in Supplemental Information are from the Virgil C. Summer Nuclear Station ODCM and 40 CFR 190. Average energy ($\bar{E}$ bar) is not applicable to the method for determining release rate limits for fission and activation gaseous effluents; therefore, it has been omitted. A compilation of required supplemental information is provided in Appendix A.

B. Gaseous Effluents

Gaseous effluents released from ground level are summarized in Tables 1 and 2. An elevated release pathway does not exist at Virgil C. Summer Nuclear Station. Cumulative doses are discussed in Section E.

The errors for gaseous effluent totals are given as the square root of the sum of squares of counting errors and flow or volume measurement errors. A systematic error estimate of 15% has been included in the calculation of total error.

C. Liquid Effluents

Liquid effluents are summarized in Tables 3 and 4. Estimated total errors are expressed as in Section B above.

D. Solid Waste Shipments

Solid waste shipments are summarized in Table 5. Curie content of radioactive waste packages is determined by dose rates and/or gamma spectroscopy analysis of samples. The total error for each type of curie content determination is conservatively estimated to be the sum of a 15% systematic error and a 20% photon response error for the detector used.

E. Radiological Impact on Man

Dose to the maximum exposed individual in the unrestricted area was calculated using measured plant gaseous effluents and meteorological data in accordance with the Offsite Dose Calculation Manual. The source term involved 1.1 days of Waste Gas Decay Tank (WGDT) releases, 4.8 days of 6-inch Reactor Building purge releases, 40.5 days of 36-inch Reactor Building purge releases and a continuous 12-month Main Plant vent release. Doses are summarized in Table 6. The total activities released are presented in Tables 1 and 2. The highest quarterly air doses at the station boundary resulting from the release of noble gases were 6.41E-04 mrad for gamma during the fourth quarter and 3.37E-04 mrad for beta also during the fourth quarter. The maximum quarterly organ dose attributed to the releases, excluding Carbon-14, was 4.04E-07 mrem. Cumulative annual dose was 6.44E-04 mrad, 3.38E-04 mrad and 5.94E-07 mrem for gamma, beta, and organ dose, respectively. Discussion of the impact of Carbon-14 is included in Section K.

Measured plant liquid effluent data was used to calculate estimates of doses to individuals in accordance with the Offsite Dose Calculation Manual. The source term consisted of the isotopic contents of 237 Waste Monitor Tank batch releases, 30 Condensate Backwash Receiver Tank batch releases, 17.5 days of Steam Generator Blowdown release and a continuous Turbine Building Sump release.

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT

JANUARY – DECEMBER, 2012

VIRGIL C. SUMMER NUCLEAR STATION
SOUTH CAROLINA ELECTRIC & GAS

Doses are summarized in Table 6 and total radioactivity released is described in Tables 3 and 4. The highest quarterly total body dose to the maximum exposed individual resulting from the release of radioactive liquid was 2.09E-03 mrem during the third quarter. The highest organ dose was 2.09E-03 mrem to the GI-LLI also for the third quarter. Cumulative annual doses for the hypothetical maximum exposed individual were 6.28E-03 mrem for the total body and 6.72E-3 mrem for the GI-LLI, the maximum annual organ. The GI-LLI was the maximum exposed organ for all four quarters.

Dose rates and concentrations were below station limits as specified in Supplemental Information, Section II A, B, and C during all the effluent releases.

Radiation exposure to members of the public within the site boundary was assessed through calculation of gamma and beta air dose at 0.25 miles of the gaseous effluent release point and direct measurement of exposure using thermoluminescent dosimeters. Onsite air dose for this reporting period was 2.10E-03 mrad gamma and 1.10E-03 mrad beta, well below levels that can be distinguished above background. Quarterly thermoluminescent dosimetry data from six onsite monitoring locations within 0.2 miles of the Reactor Building and five locations at the site boundary were analyzed and compared with respective pre-operational background and previous year history. Results showed that the 2012 quarterly dose rates did not differ significantly from the pre-operational or 2011 dose rates. It was concluded that doses to members of the public inside the site boundary were indistinguishable from normal background dose.

Radiation doses from radioactive effluents to workers at the Fairfield Hydro Station for this reporting period were calculated to be 3.05E-05 and 1.60E-05 mrad for gamma and beta, respectively.

Radiation doses from radioactive effluents to workers at the New Nuclear Site for this reporting period were calculated to be 2.62E-04 and 1.38E-04 mrad for gamma and beta, respectively.

Radiation doses from nearby uranium fuel cycle sources were not assessed. The ODCM, Sections 1.3.1 and B/1.3 establish a five (5) mile limit beyond which doses from nearby plants are insignificant. There are no uranium fuel cycle plants within a five (5) mile radius of Virgil C. Summer Nuclear Station.

F. Abnormal Releases

On October 26, 2012, during an A train bus outage, power was not available to the Main Plant Vent atmospheric monitor (RM-A3) and compensatory sampling with an alternate monitor was not performed as required by ODCM Section 1.2.1.1. The duration of this non compliance was less than 24 hours. Samples collected from RM-A3 prior to and after the occurrence showed no detectable activity. It was determined that there was no adverse affect on the health and safety of the public as a result of this temporarily unmonitored release pathway. Since continuous monitoring of the main plant vent is required, but was not fulfilled, this condition is reported here as an abnormal release.

G. Meteorology

The meteorological data for 2012 was collected and analyzed. An annual meteorological summary report providing joint frequency distributions of wind direction and speed by atmospheric stability class is maintained in plant records.

The wind direction and wind speed data used were acquired from the 10-meter level of the primary monitoring tower. Stability was determined by the primary differential temperature (61 to 10 meter).

The combined annual data recovery for wind direction, wind speed and stability was 95%. Primary variable recovery rates were as follows: wind direction (10 m) – 95%, wind speed (10 m) – 95%, and differential temperature (61 - 10 m) – 95%.

H. Offsite Dose Calculation Manual

The Virgil C. Summer Nuclear Station ODCM was revised on July 16, 2012.

Revision 28 corrected the calculation of exposure from Carbon- 14. The calculation of Carbon-14 exposure was incorrectly documented in NUREG 1301and the original ODCM. This was not an issue prior to Regulatory Guide 1.21 Rev 2 (June 2009) because Carbon-14 was not required to be measured or included in the exposure from gaseous releases.

The exposure calculation for Carbon-14 is based upon the correct method identified in Regulatory Guide 1.109. A complete copy of the ODCM is included as Enclosure A.

I. Offsite Dose Calculation Manual Reportable Incidences

The Plant Vent High Range Radiation Monitor RM-A13 required by ODCM Control 1.2.1.1b was out of service from 06/23/12 00:15 until 7/26/12 12:15 due to apparent over tightening of the high voltage insulator during detector installation. This over tightening resulted in excessive stress to the glass insulators on the ion chamber when the detector was removed or installed. The vendor suggested that the nut be tightened to finger tight and that additional tightening should only be performed if the connection was not secure. A precautionary note was added to the procedure as the corrective action.

The Condensate Backwash Effluent Radiation Monitor RM-L11 was out of service from 4/19/12 16:20 until 10/04/12 14:20 due to a failure to satisfactorily complete a quarterly operational test. The check could not be completed due to a breaker control panel on the Backwash Receiver Tank being tagged out for repair and awaiting parts. Upon repair of the breaker panel, the RM-L11 operational check was completed satisfactorily and the monitor returned to service. There were no releases via this pathway during the out of service period.

J. Major Changes to Radioactive Waste Treatment Systems

During 2012, there were no major changes to the Radioactive Waste Treatment System.

K. Carbon-14 Gaseous Effluents

Carbon-14 production and release estimates were calculated using EPRI Report 1021106, "Estimation of Carbon-14 in Nuclear Plant Gaseous Effluents". This calculation uses active core coolant mass, average neutron flux by energy and reactor coolant nitrogen concentrations to determine Carbon-14 generation based upon an effective full power year. The estimated generation for VC Summer Nuclear station for 2012 was 8.61 curies.

Public dose estimates were performed using Regulatory Guide 1.109 methodology. Carbon dioxide is assumed to make up 20% of the Carbon-14 gaseous emissions from the station based upon available references and on-site testing. Carbon-14 is the highest dose contributor of all radionuclides released in gaseous effluents. Annual dose resulting from Carbon-14 releases in gaseous effluents is estimated to be 1.40E-01 mrem total body and 7.03E-01 mrem to the maximum organ (bone).

APPENDIX A
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT

JANUARY – DECEMBER, 2012

VIRGIL C. SUMMER NUCLEAR STATION
SOUTH CAROLINA ELECTRIC & GAS

SUPPLEMENTAL INFORMATION

I. Regulatory Dose Limits:

A. Fission and Activation Gases:

The air dose to an individual due to noble gases released in gaseous effluents shall be limited to less than or equal to 5 mrad for gamma radiation and 10 mrad for beta radiation during any calendar quarter and 10 mrad for gamma radiation and 20 mrad for beta radiation during any calendar year (ODCM, Section 1.2.3.1).

B. Iodines, Particulates (half-lives > 8 days) and Tritium:

The dose to an individual from radioidines, tritium and radioactive materials in particulate form with half-lives greater than 8 days in gaseous effluents shall be limited to less than or equal to 7.5 mrem to any organ during any calendar quarter and 15 mrem to any organ during any calendar year (ODCM, Section 1.2.4.1).

C. Liquid Effluents:

The dose or dose commitment to an individual from radioactive materials in liquid effluents released shall be limited to less than or equal to 1.5 mrem to the total body and 5 mrem to any organ during any calendar quarter and 3 mrem to the total body and 10 mrem to any organ during any calendar year (ODCM, Section 1.1.3.1).

D. All Sources:

The annual dose equivalent shall not exceed 25 mrem to the whole body, 75 mrem to the thyroid and 25 mrem to any other organ (40 CFR 190).

II. Dose Rate and Effluent Concentration Limits:

A. Fission and Activation Gases

The dose rate in unrestricted areas due to radioactive materials released in gaseous effluents shall be limited to less than or equal to

500 mrem/year to the total body and less than or equal to 3000 mrem/year to the skin (ODCM, Section 1.2.2.1).

B. Iodines, Particulates (half-lives > 8 days) and Tritium:

The dose rate in unrestricted areas due to radioactive materials in effluents shall be limited to less than or equal to 1500 mrem/year to any organ (ODCM, Section 1.2.2.1).

C. Liquid Effluents:

The concentration of radioactive materials released from the site shall be limited to 10 times the concentrations specified in 10 CFR 20, Appendix B, Table 2, Column 2 for radionuclides other than dissolved or entrained noble gases. For dissolved or entrained noble gases, the concentration shall be limited to 2E-04 µCi/ml total activity (ODCM, Section 1.1.2.1).

III. Average Energy:

Not Applicable

IV. Measurements and Approximations of Total Radioactivity:

A. Fission and activation gases: Gamma spectrometry (HPGe)

B. Iodines: Gamma spectrometry (HPGe)

C. Particulates: Gamma spectrometry (HPGe), beta proportional counting, alpha proportional counting

D. Tritium: Liquid scintillation

E. Liquid effluents: Gamma spectrometry (HPGe), liquid scintillation (H-3), beta proportional counting, alpha proportional counting.

APPENDIX A
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT

JANUARY – DECEMBER, 2012

VIRGIL C. SUMMER NUCLEAR STATION
SOUTH CAROLINA ELECTRIC & GAS

V. Batch Releases:

A. Gaseous:

1. Number of batch releases: 4

2. Total time period for batch releases: 1535 min.

3. Maximum time period for a batch release: 538 min.

4. Average time period for a batch release: 384 min.

5. Minimum time period for a batch release: 266 min.

B. Liquid:

1. Number of batch releases:

42	For first quarter, 2012
41	For second quarter, 2012
64	For third quarter, 2012
120	For fourth quarter, 2012

2. Total time period for batch releases:

3.25E+03	min. for first quarter, 2012
3.23E+03	min. for second quarter, 2012
5.37E+03	min. for third quarter, 2012
8.78E+03	min. for fourth quarter 2012

3. Maximum time period for a batch release:

8.90E+01	min. for first quarter, 2012
8.80E+01	min. for second quarter, 2012
9.50E+01	min. for third quarter, 2012
9.40E+01	min. for fourth quarter, 2012

4. Average time period for batch releases:

   7.73E+01 min. for first quarter, 2012
   7.88E+01 min. for second quarter, 2012
   8.39E+01 min. for third quarter, 2012
   7.32E+01 min. for fourth quarter, 2012

5. Minimum time period for a batch release:

   4.80E+01 min. for first quarter, 2012
   7.20E+01 min. for second quarter, 2012
   7.80E+01 min. for third quarter, 2012
   1.90E+01 min. for fourth quarter, 2012

6. Average stream flow during periods of release of effluent into a flowing stream:

   4.89E+06 gpm for first quarter, 2012
   7.04E+06 gpm for second quarter, 2012
   9.43E+06 gpm for third quarter, 2012
   4.45E+06 gpm for fourth quarter, 2012

VI. Abnormal Releases:

A. Gaseous:

1. Number of releases: 1 (See Section F)

2. Total activity released: 0

B. Liquid:

1. Number of releases: 0

2. Total activity released: 0

ENCLOSURE A
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT

JANUARY – DECEMBER, 2012

VIRGIL C. SUMMER NUCLEAR STATION
SOUTH CAROLINA ELECTRIC & GAS

OFFSITE DOSE CALCULATION MANUAL

Revision 28 (July 2012)

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT
January - December 2012

Virgil C. Summer Nuclear Station
South Carolina Electric & Gas

Table 1
Gaseous Effluents Summation of All Releases

	UNITS	FIRST QUARTER	SECOND QUARTER	THIRD QUARTER	FOURTH QUARTER	2012 TOTAL	EST. ERROR %
A. Fission & Activation Gases							
1. Total release	Ci	1.34E-03	8.73E-04	0.00E+00	6.93E-01	6.95E-01	2.19E+01
2. Average release rate	uCi / sec	1.70E-04	1.11E-04	0.00E+00	8.72E-02	2.20E-02	
3. Percent ODCM Qtr. gamma air dose limit	%	4.33E-05	2.67E-05	0.00E+00	1.28E-02	N/A	
4. Percent ODCM annual gamma air dose limit	%	2.16E-05	3.50E-05 *	3.50E-05 *	6.44E-03 *	6.44E-03	
5. Percent ODCM Qtr. beta air dose limit	%	7.96E-06	5.00E-06	0.00E+00	3.37E-03	N/A	
6. Percent ODCM annual beta air dose limit	%	3.98E-06	6.48E-06 *	6.48E-06 *	1.69E-03 *	1.69E-03	
B. Iodines							
1.Total iodine - 131	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.50E+01
2. Average release rate	uCi / sec	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
C. Particulates							
1. Particulates with half - lifes > 8 days	Ci	0.00E+00	0.00E+00	0.00E+00	8.58E-05	8.58E-05	7.28E+01
2. Average release rate	uCi / sec	0.00E+00	0.00E+00	0.00E+00	1.08E-05	2.72E-06	
3. Gross alpha radioactivity	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
D. Tritium							
1. Total release	Ci	7.67E-04	3.60E-04	0.00E+00	0.00E+00	1.13E-03	3.01E+01
2. Average release rate	uCi / sec	9.75E-05	4.58E-05	0.00E+00	0.00E+00	3.57E-05	
E. Carbon 14							
1. Total release	Ci	2.14E+00	2.14E+00	2.16E+00	2.16E+00	8.61E+00	N/A
2. Average release rate	uCi / sec	2.72E-01	2.72E-01	2.72E-01	2.72E-01	2.72E-01	
F. Organ Dose (from B,C,and D)							
1. Percent ODCM Qtr. organ dose limit	%	5.39E-06	2.53E-06	0.00E+00	0.00E+00	N/A	
2. Percent ODCM annual organ dose limit	%	2.70E-06	3.96E-06 *	3.96E-06 *	3.96E-06 *	3.96E-06	

* Cumulative

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT
JANUARY - DECEMBER, 2012
TABLE 2
GASEOUS EFFLUENTS -- GROUND-LEVEL RELEASES

Nuclides Released	Units	Continuous Mode					Batch Mode				
		First Quarter	Second Quarter	Third Quarter	Fourth Quarter	Annual Total	First Quarter	Second Quarter	Third Quarter	Fourth Quarter	Annual Total
1 Fission gases											
Krypton-85	Ci	0	0	0	0	0	0	0	0	4.80E-02	4.80E-02
Krypton-85m	Ci	0	0	0	0	0	0	0	0	0	0
Krypton-87	Ci	0	0	0	0	0	0	0	0	0	0
Krypton-88	Ci	0	0	0	0	0	0	0	0	0	0
Xenon-131m	Ci	0	0	0	0	0	0	0	0	0	0
Xenon-133	Ci	1.80E-04	1.60E-04	0	1.73E-01	1.73E-01	0	0	0	3.30E-04	3.30E-04
Xenon-133m	Ci	0	0	0	0	0	0	0	0	0	0
Xenon-135	Ci	0	0	0	1.68E-01	1.68E-01	0	0	0	1.68E-06	1.68E-06
Xenon-135m	Ci	0	0	0	0	0	0	0	0	0	0
Xenon-138	Ci	0	0	0	0	0	0	0	0	0	0
Other: Ar-41	Ci	1.16E-03	7.13E-04	0	3.04E-01	3.07E-01	0	0	0	0	0
Unidentified: None	Ci	0	0	0	0	0	0	0	0	0	0
Total for Period	Ci	1.34E-03	8.73E-04	0	6.45E-01	6.48E-01	0	0	0	4.84E-02	4.84E-02
2 Iodines and other halogens											
Iodine-131	Ci	0	0	0	0	0	0	0	0	0	0
Iodine-132	Ci	0	0	0	0	0	0	0	0	0	0
Iodine-133	Ci	0	0	0	0	0	0	0	0	0	0
As-76	Ci	0	0	0	8.09E-05	8.09E-05	0	0	0	0	0
Br-82	Ci	0	0	0	2.13E-07	2.13E-07	0	0	0	0	0
Unidentified: None	Ci	0	0	0	0	0	0	0	0	0	0
Total for Period	Ci	0	0	0	8.11E-05	8.11E-05	0	0	0	0	0
3 Particulates											
Cromium-51	Ci	0	0	0	0	0	0	0	0	0	0
Manganese-54	Ci	0	0	0	0	0	0	0	0	0	0
Cobalt-58	Ci	0	0	0	0	0	0	0	0	0	0
Cobalt-60	Ci	0	0	0	0	0	0	0	0	0	0
Stronium-89	Ci	0	0	0	0	0	0	0	0	0	0
Stronium-90	Ci	0	0	0	0	0	0	0	0	0	0
Niobium-95	Ci	0	0	0	0	0	0	0	0	0	0
Cesium-134	Ci	0	0	0	0	0	0	0	0	0	0
Cesium-137	Ci	0	0	0	0	0	0	0	0	0	0
Other: Be-7	Ci	0	0	0	4.95E-06	4.95E-06	0	0	0	0	0
Unidentified: None	Ci	0	0	0	0	0	0	0	0	0	0
Total for Period	Ci	0	0	0	4.95E-06	4.95E-06	0	0	0	0	0

*Tritium and Carbon-14 not included. See Table 1.

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT
JANUARY-DECEMBER, 2012

Virgil C. Summer Nuclear Station
South Carolina Electric & Gas

TABLE 3
Liquid Effluents Summation of All Releases

	UNITS	FIRST QUARTER	SECOND QUARTER	THIRD QUARTER	FOURTH QUARTER	2012 TOTAL	EST. ERROR %
A. Fission & Activation Products							
1. Total release	**Ci**	3.38E-03	4.00E-03	1.70E-03	5.55E-03	1.46E-02	2.07E+01
2. Average diluted concentration	**uCi/ml**	1.05E-11	1.15E-11	3.72E-12	1.95E-11	1.04E-11	
B. Tritium							
1. Total release	**Ci**	6.88E+01	2.15E+02	4.56E+02	1.58E+02	8.97E+02	1.81E+01
2. Average diluted concentration	**uCi/ml**	2.14E-07	6.17E-07	9.96E-07	5.54E-07	6.35E-07	
C. Dissolved and entrained gases							
1. Total release	**Ci**	0.00E+00	9.12E-06	1.50E-03	2.94E-03	4.45E-03	1.96E+01
2. Average diluted concentration	**uCi/ml**	0.00E+00	2.62E-14	3.28E-12	1.03E-11	3.15E-12	
3.Percent ODCM limit (2.0E-4 uCi/ml)	**%**	0.00E+00	1.31E-08	1.64E-06	5.17E-06	1.58E-06	
D. Gross alpha radioactivity							
1. Total release	**Ci**	0	0	0	0	0	N/A
E. Volume of waste released (undiluted)	**liters**	9.44E+06	8.62E+06	1.03E+07	4.09E+07	6.92E+07	3.00E+00
F. Volume of dilution water	**liters**	3.22E+11	3.49E+11	4.57E+11	2.85E+11	1.41E+12	4.30E+00
G. ODCM limits (from A and B)							
1. Percent of ODCM Qtr total body limit	**%**	6.01E-02	1.01E-01	1.39E-01	1.19E-01	N/A	
2. Percent of ODCM annual total body limit	**%**	3.00E-02	8.03E-02 *	1.50E-01 *	2.09E-01 *	2.09E-01 *	
3. Percent of ODCM Qtr max. organ limit**	**%**	2.15E-02	3.16E-02	4.18E-02	3.95E-02	N/A	
4. Percent of ODCM annual max. organ limit**	**%**	1.07E-02	2.65E-02 *	4.74E-02 *	6.72E-02 *	6.72E-02 *	

* Cumulative

** See Section E for max. organ for each quarter and cumulative.

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT

JANUARY - DECEMBER, 2012

Virgil C. Summer Nuclear Station, South Carolina Electric & Gas

TABLE 4

LIQUID EFFLUENTS

Nuclides Released*	Units	Continuous Mode					Batch Mode				
		First Quarter	Second Quarter	Third Quarter	Fourth Quarter	Annual Total	First Quarter	Second Quarter	Third Quarter	Fourth Quarter	Annual Total
Strontium-89	Ci	0	0	0	0	0	0	0	0	0	0
Strontium-90	Ci	0	0	0	0	0	0	0	0	0	0
Cesium-134	Ci	0	0	0	0	0	1.31E-06	1.61E-06	2.65E-06	2.64E-06	8.21E-06
Cesium-137	Ci	0	0	0	0	0	5.39E-05	6.88E-05	4.57E-05	2.47E-05	1.93E-04
Iodine-131	Ci	0	0	0	0	0	0	0	0	0	0
Iodine-132	Ci	0	0	0	0	0	0	0	0	5.64E-05	5.64E-05
Cobalt-57	Ci	0	0	0	0	0	7.06E-07	0	0	0	7.06E-07
Cobalt-58	Ci	0	0	0	0	0	1.82E-04	4.01E-05	4.47E-06	1.44E-04	3.71E-04
Cobalt-60	Ci	0	0	0	0	0	1.13E-03	2.02E-03	1.01E-03	1.52E-03	5.68E-03
Iron-59	Ci	0	0	0	0	0	0	0	0	0	0
Zinc-65	Ci	0	0	0	0	0	6.73E-06	0	0	0	6.73E-06
Manganese-54	Ci	0	0	0	0	0	1.54E-04	1.74E-04	7.84E-05	1.48E-04	5.54E-04
Chromium-51	Ci	0	0	0	0	0	0	0	0	9.44E-05	9.44E-05
Zirconium-Niobium-95	Ci	0	0	0	0	0	1.09E-04	5.59E-05	5.70E-06	0	1.71E-04
Zirconium-97	Ci	0	0	0	0	0	0	0	0	1.46E-05	1.46E-05
Molybdenum-99	Ci	0	0	0	0	0	0	0	0	0	0
Technetium-99m	Ci	0	0	0	0	0	0	0	0	0	0
Cerium-144	Ci	0	0	0	0	0	0	0	0	0	0
Other: Be-7	Ci	0	0	0	0	0	8.81E-05	0	0	0	8.81E-05
Na-24	Ci	0	0	0	0	0	0	0	0	0	0
Fe-55	Ci	0	0	0	0	0	8.00E-04	3.05E-04	0	0	1.11E-03
As-76	Ci	0	0	0	0	0	0	0	0	1.29E-04	1.29E-04
Nb-94	Ci	0	0	0	0	0	7.54E-07	0	0	0	7.54E-07
Ag-110m	Ci	0	0	0	0	0	1.89E-06	0	0	2.45E-06	4.34E-06
Sb-122	Ci	0	0	0	0	0	0	0	0	0	0
Sb-124	Ci	0	0	0	0	0	3.64E-06	1.86E-06	7.49E-07	0	6.25E-06
Sb-125	Ci	0	0	0	0	0	8.50E-04	5.88E-04	1.34E-04	1.15E-04	1.69E-03
Te-123m	Ci	0	0	0	0	0	0	2.72E-07	0	9.35E-05	9.38E-05
Te-125m	Ci	0	0	0	0	0	0	7.37E-04	4.22E-04	3.02E-03	4.18E-03
Te-132	Ci	0	0	0	0	0	0	0	0	5.52E-05	5.52E-05
Total for Period (above)	Ci	0	0	0	0	0	3.38E-03	3.99E-03	1.70E-03	5.42E-03	1.45E-02
Ar-41	Ci	0	0	0	0	0	0	0	0	0	0
Kr-85m	Ci	0	0	0	0	0	0	0	0	3.85E-06	3.85E-06
Xenon-133	Ci	0	0	0	0	0	0	9.12E-06	1.44E-03	2.78E-03	4.23E-03
Xenon-133m	Ci	0	0	0	0	0	0	0	3.56E-06	8.88E-06	1.24E-05
Xenon-135	Ci	0	0	0	0	0	0	0	5.42E-05	1.48E-04	2.02E-04
Total Entrained Gases	Ci	0	0	0	0	0	0	9.12E-06	1.50E-03	2.94E-03	4.45E-03

*Tritium not included. See Table 3 for tritium numbers ------- No Unidentified nuclides found

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT
January - December, 2012

Virgil C. Summer Nuclear Station
South Carolina Electric & Gas
Table 5
SOLID WASTE SHIPMENTS

1. Solid Waste Shipped Offsite for Burial or Disposal (Not irradiated fuel).

Type of Waste	Unit	2012 Total	Est. Total Error, %
a. Spent resins, filters, sludge, evaporator bottoms, etc.	m^3 Ci	2.997E+01 7.030E+01	+/-2.5E+01
b. Dry compressible waste contaminated equip., etc.	m^3 Ci	1.542E+02 8.902E-02	+/-2.5E+01
c. Irradiated components, control rods, etc.	m^3 Ci	0 0	N/A
d. Other	m^3 Ci	0 0	N/A

2. Estimate of major nuclide composition for the year (by type of waste) for concentrations above 1.0%.

a.

Ni-63	42.1%	2.94E+01 Ci
Fe-55	34.5%	2.40E+01 Ci
Co-60	12.0%	8.35 E+00 Ci
Mn-54	5.7%	4.00E+00 Ci
Cs-137	1.5%	1.07E+00 Ci
Co-58	1.5%	1.04E+00 Ci
Sb-125	1.2%	8.52E-01 Ci

b.

Fe-55	30.9%	1.84E-01 Ci
Co-60	29.1%	1.74E-01 Ci
Cs-137	12.6%	7.54E-02 Ci
Ni-63	11.9%	7.12E-02 CI
C-14	3.3%	1.96E-02 Ci
Cs-134	2.0%	1.21E-02 Ci
Mn-54	2.0%	1.20E-02 Ci
Pu-241	1.7%	1.03E-02 Ci
Sb-125	1.7%	1.03E-02 Ci
H-3	1.5%	8.99E-03 Ci
Co-58	1.1%	6.29E-03 Ci

c.

None	N/A	N/A

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT
January - December, 2012

Virgil C. Summer Nuclear Station
South Carolina Electric & Gas
Table 5
SOLID WASTE SHIPMENTS

d.	None	N/A	N/A

3. Solid Waste Disposition

Numbers of Shipments	Mode of Transportation	Destination
3	Hittman Trucking	Barnwell Disposal Facility
1	Hittman Trucking	Barnwell Processing Facility
4	Hittman Trucking	Energy Solution-DuratekServices
1	Hubbard Trucking	Impact Services, Inc.

Notes:

Three (3) shipments were sent for direct burial at Barnwell Disposal Facility (Barnwell, SC).

One (1) shipment was sent to the Barnwell processing facility after being gross dewatered for a complete dewatering cycle and then shipped to the Barnwell disposal facility.

Four (4) shipments of DAW, contaminated metal, etc. went to Energy Solutions in TN. The waste was then disposed of at Clive, Ut.

(6) B-25 boxes of Penstock Soil was sent to Impact Services. The waste was then either sent to Clive, Ut for disposal or released as regulations allowed to an industrial landfill.

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT

JANUARY - DECEMBER 2012

Virgil C. Summer Nuclear Station
South Carolina Electric & Gas

Table 6
GASEOUS AND LIQUID DOSES

		FIRST QUARTER		SECOND QUARTER		THIRD QUARTER		FOURTH QUARTER		TOTAL
ODCM Section	GASEOUS LIMITS	DOSE	Percent of Limit	DOSE	Percent of Limit	DOSE	Percent of Limit	DOSE	Percent of Limit	ANNUAL DOSE
1.2.3.1.a,b	5 mrad gamma / qtr.	2.16E-06 mrad	4.33E-05	1.33E-06 mrad	2.67E-05	0.00E+00 mrad	0.00E+00	6.41E-04 mrad	1.28E-02	6.44E-04
	10 mrad gamma / yr.		2.16E-05		3.50E-05 *		3.50E-05 *		6.44E-03 *	
1.2.3.1.a,b	10 mrad beta / qtr.	7.96E-07 mrad	7.96E-06	5.00E-07 mrad	5.00E-06	0.00E+00 mrad	0.00E+00	3.37E-04 mrad	3.37E-03	3.38E-04
	20 mrad beta / yr.		3.98E-06		6.48E-06 *		6.48E-06 *		1.69E-03 *	
1.2.4.1.a,b	7.5 mrem organ/qtr	1.75E-01 mrem**	2.33E+00	1.75E-01 mrem**	2.33E+00	1.77E-01 mrem**	2.36E+00	1.77E-01 mrem**	2.36E+00	7.03E-01
	15 mrem organ/yr.		1.17E+00		2.33E+00 *		3.51E+00 *		4.69E+00 *	
	LIQUID LIMITS									
1.1.3.1a,b	1.5 mrem / qtr.	9.01E-04 mrem	6.01E-02	1.51E-03 mrem	1.01E-01	2.09E-03 mrem	1.39E-01	1.78E-03 mrem	1.19E-01	6.28E-03
	3 mrem / yr.		3.00E-02		8.03E-02 *		1.50E-01 *		2.09E-01 *	
1.1.3.1a,b	5 mrem organ/qtr***	1.07E-03 mrem	2.15E-02	1.58E-03 mrem	3.16E-02	2.09E-03 mrem	4.18E-02	1.98E-03 mrem	3.95E-02	6.72E-03
	10 mrem organ/yr.	(GI-LLI)	1.07E-02	(GI-LLI)	2.65E-02 *	(GI-LLI)	4.74E-02 *	(GI-LLI)	6.72E-02 *	(GI-LLI)

* Includes contribution from previous quarters
** Includes dose from all nuclides including Carbon-14
*** See Section E for max organ for each quarter