ENCLOSURE 1

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT

FOR THE PERIOD OF JANUARY 1 TO DECEMBER 31, 1993

(S52 940407 305)

EFFLUENT AND WASTE DISPOSAL ANNUAL REPORT
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1. REGULATORY LIMITS

A. Gaseous Effluents

1. Dose rates due to radioactivity released in gaseous effluents from the site to areas at and beyond the site boundary shall be limited to the following:

a. Noble gases:- Less than or equal to 500 mrem/year to the total body.

- Less than or equal to 3000 mrem/year to the skin.

b. Iodine-131, iodine-133, tritium, and all radionuclides in particulate form with half-lives greater than 8 days:

- Less than or equal to 1500 mrem/year to any organ.

2. Air dose due to noble gases released in gaseous effluents to areas at and beyond the site boundary shall be limited to the following:

a. Less than or equal 5 mrad for gamma radiation and less than or equal to 10 mrad for beta radiation during any calendar quarter.

b. Less than or equal to 10 mrad for gamma radiation and less than or equal to 20 mrad for beta radiation during any calendar year.

3. Dose to a member of the public from iodine-131, iodine-133, tritium, and all radionuclides in particulate form with half-lives greater than eight days in gaseous effluents released to areas at and beyond the site boundary shall be limited to the following:

a. Less than or equal to 7.5 mrem to any organ during any calendar quarter.

b. Less than or equal to 15 mrem to any organ during any calendar year.

B. Liquid Effluents

1. The concentration of radioactivity released in liquid effluents to unrestricted areas shall be limited to the concentrations specified in Title 10 of the Code of Federal Regulations, Part 20 (Standards for Protection Against Radiation), Appendix B, Table II, Column 2, for radionuclides other than dissolved or entrained noble gases. For dissolved or entrained noble gases, the concentration shall be limited to 2.OE-04 microcuries/milliliter (uCi/ml) total activity.

2. The dose or dose commitment to a member of the public from radioactivity in liquid effluents released to unrestricted areas shall be limited to:

   a. Less than or equal to 1.5 mrem to the total body and less than or equal to 5 mrem to any organ during any calendar quarter.

   b. Less than or equal to 3 mrem to the total body and less than or equal to 10 mrem to any organ during any calendar year.

2. MAXIMUM PERMISSIBLE CONCENTRATION

A. Liquids

*1. The maximum permissible concentrations (MPC) for liquids are those listed in 10 CFR 20, Appendix B, Table II, Column 2, with the most restrictive MPC being used in all cases. For dissolved and entrained gases the MPC of 2.0E-04 uCi/ml is applied. This MPC is based on the Xe-135 MPC in air (submersion dose) converted to an equivalent concentration in water as discussed in the International Commission on Radiological Protection (ICRP), Publication 2.

B. Gaseous

*1. The maximum permissible dose rates for gaseous releases are defined in plant Offsite Dose Calculation Manual (ODCM).

   a. Noble gas dose rate at the site boundary:

      - Less than or equal to 500 mrem/year to the total body,
      - Less than or equal to 3000 mrem/year to skin.

   b. Iodine-131, iodine-133, tritium, and particulates with half-lives greater than eight days dose rate at the site boundary:

      - Less than or equal to 1500 mrem/year to any organ.

3. AVERAGE ENERGY

Sequoyah's ODCM limits the dose equivalent rates due to the release of noble gases 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. Therefore, the average beta and gamma energies (E), for gaseous effluents as described in Regulatory Guide 1.21, "Measuring, Evaluation, and Reporting Radioactivity in Solid Wastes and Releases of Radioactive Materials in Liquid and Gaseous Effluents from Light-Water-Cooled Nuclear Power Plants," are not applicable.

*These values are used as applicable limits for liquid and gaseous effluents.

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4. Measurements and Approximations of Total Radioactivity

NOTE: Every effort is made to ensure that effluent releases from Sequoyah are conducted such that all Offsite Dose Calculation Manual (ODCM) Lower Limit of Detection (LLD) values are met. Whenever an analysis does not identify a radioisotope, a "0.00E-01 Ci" is recorded for the release. This does not necessarily mean that no activity was released for that particular radionuclide, but that the concentration was below the ODCM and analysis LLD. Refer to Tables A and B for estimates of these typical LLD values.

a. Fission and Activation Gases

Airborne effluent gaseous activity is continuously monitored and recorded. Additional grab samples from the shield building, auxiliary building, service building, and condenser vacuum exhausts are taken and analyzed at least monthly to determine the quantity of noble gas activity released for the month based on the average vent flowrates recorded for the sample period. Also, noble gas samples are collected and evaluated for the shield and auxiliary buildings following startup, shutdown, or rated thermal power change exceeding 15 percent within one hour (sampling only required if dose equivalent I-131 concentration in the primary coolant or the noble gas activity monitor shows that the containment activity has increased more than a factor of 3).

The quantity of noble gases released through the shield and auxiliary building exhausts due to purging or venting of containment and releases of waste gas decay tanks are also determined.

The total noble gas activity released for the month is then determined by summing all of the activity released from each vent for all sampling periods.

b. Iodines and Particulates

Iodine and particulate activity is continuously sampled. Charcoal and particulate samples are taken from the shield and auxiliary building exhausts and analyzed at least weekly to determine the total activity released from the plant based on the average vent flowrates recorded for sampling period.

Also, particulate and charcoal samples are taken from the auxiliary and shield building exhausts once per 24 hours for 2 days following startup, shutdown, or a rated thermal power change exceeding 15 percent within one hour. The quantity of iodine and particulate released from each vent during each sampling period is then determined using the average vent flowrates recorded for the sampling period and activity concentration.

The total particulate and iodine activity released for the month is then determined by summing all of the activity released from the shield and auxiliary building exhausts for all sampling periods.

4. Measurements and Approximation of Total Radioactivity (continued)

c. Liquid Effluents

Batch (Radwaste and during periods of primary to secondary leakage, condensate regenerants to cooling tower blowdown)

Total gamma isotopic activity concentrations are determined on each batch of liquid effluent prior to release. The total activity of a released batch is determined by summing each nuclide's concentration and multiplying by the total volume discharged. The total activity released during a month is then determined by summing the activity content of each batch discharged during the month.

Continuous Releases and Periodic Continuous Releases (Condensate regenerants, turbine building sump and steam generator blowdown)

Total gamma isotopic activity concentration is determined daily on a composite sample from the condensate system and turbine building sump and weekly for steam generator blowdown. The total activity of the continuous release is determined by summing each nuclide's concentration and multiplying by the total volume discharged. The total activity released during the month is then determined by summing the activity content of each daily and weekly composite for the month.

5. Batch

	Value		Units
	1st Half	2nd Half	
a. Liquid (Radwaste only)			
1. Number of releases	86	106	Each
2. Total time period of releases	18,269	14,984	Minutes
3. Maximum time period of release	316	184	Minutes
4. Average time period of releases	212	141	Minutes
5. Minimum time period for release	98	87	Minutes
6. Average dilution stream flow during release periods cubic feet/second (CFS)	40,051	26,515	CFS
b. Gaseous (Batches only)			
1. Number of releases	164	83	Each
2. Total time period of releases	31,525	8,156	Minutes
3. Maximum time period for release	9,680	1,332	Minutes
4. Average time period for releases	192	98	Minutes
5. Minimum time period for release	1	29	Minutes

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6. Abnormal Releases	Value 1st Half	Value 2nd Half	Units
a. Liquid			
Number of Releases	0	0	
Total Activity Released	0.00E-01	0.00E-01	Ci
b. Gaseous			
Number of Releases	0	0	
Total Activity Released	0.00E-01	0.00E-01	Ci

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LIQUID EFFLUENTS - SUMMATION OF ALL RELEASES

		Unit	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr	%Error
A.	Fission and Activation Products						
	1. Total Released	Curies	7.84E-02	5.72E-01	4.64E-01	4.06E-01	±1.8E+01
	2. Average Diluted Conc. During Period of All Identified Isotopes	uCi/ml	1.14E-07	1.60E-06	1.27E-06	8.38E-07	
	3. Percent of Applicable Limit (ΣMPC≤1)	%	8.93E-01	3.66E+00	3.54E+00	1.43E+00	
B.	Tritium						
	1. Total Released	Curies	3.37E+02	7.58E+01	6.21E+01	8.46E+01	±1.8E+01
	2. Average Diluted Conc. During Period	uCi/ml	4.92E-04	2.12E-04	1.70E-04	1.75E-04	
	3. Percent of Applicable Limit (3.0E-03 uCi/ml)	%	1.64E+01	7.06E+00	5.66E+00	5.82E+00	
C.	Dissolved and Entrained Gases						
	1. Total Released	Curies	7.93E-02	2.15E-04	0.00E-01	1.20E-02	±3.9E+01
	2. Average Diluted Conc. During Period	uCi/ml	1.16E-07	6.00E-10	0.00E-01	2.48E-08	
	3. Percent of Applicable Limit (2.0E-04 uCi/ml)	%	5.79E-02	3.00E-04	0.00E-01	1.24E-02	
D.	Gross Alpha Radioactivity						
	1. Total Released	Curies	0.00E-01	0.00E-01	4.13E-05	0.00E-01	±2.0E+01
E.	Volume of Waste Released	Liters	2.89E+06	1.95E+06	2.41E+06	3.59E+06	±4.0E+00
F.	Volume of Dilution Water for Period	Liters	6.82E+08	3.55E+08	3.63E+08	4.81E+08	±1.1E+01

NOTE: Percent of applicable limit is based on identified isotope concentration after dilution, related to their appropriate MPC concentration and sum of all the isotope fractions compared to 1.0.

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LIQUID EFFLUENTS - TOTAL PLANT DISCHARGE

G. Nuclide Summary (Note: Refer to Table A for ODCM nuclides reported as 0.00E-01)

Required by ODCM/Others

Fission and Activation Products

Nuclide	Unit	Continuous Mode		Batch Mode	
		Quarter 1st	Quarter 2nd	Quarter 1st	Quarter 2nd
1. Strontium-89	Ci	0.00E-01	0.00E-01	0.00E-01	2.40E-04
2. Strontium-90	Ci	0.00E-01	0.00E-01	0.00E-01	1.44E-04
3. Iron-55	Ci	0.00E-01	0.00E-01	1.51E-02	2.87E-02
4. Manganese-54	Ci	0.00E-01	0.00E-01	2.98E-04	5.34E-03
5. Cobalt-58	Ci	0.00E-01	1.40E-06	8.62E-03	2.60E-01
6. Iron-59	Ci	0.00E-01	0.00E-01	5.91E-04	7.06E-04
7. Cobalt-60	Ci	3.27E-06	0.00E-01	5.75E-03	3.27E-02
8. Zinc-65	Ci	0.00E-01	0.00E-01	5.63E-06	3.74E-02
9. Molybdenum-99	Ci	0.00E-01	0.00E-01	1.74E-05	0.00E-01
10. Iodine-131	Ci	0.00E-01	0.00E-01	8.45E-04	3.26E-05
11. Cesium-134	Ci	3.75E-06	0.00E-01	1.52E-02	3.27E-02
12. Cesium-137	Ci	2.40E-05	0.00E-01	2.37E-02	5.27E-02
13. Cerium-141	Ci	0.00E-01	0.00E-01	0.00E-01	0.00E-01
14. Cerium-144	Ci	0.00E-01	0.00E-01	2.79E-05	3.31E-04
15. Antimony-125	Ci	0.00E-01	1.64E-06	6.70E-03	9.93E-02
16. Cobalt-57	Ci	0.00E-01	0.00E-01	4.30E-05	1.06E-03
17. Chromium-51	Ci	0.00E-01	0.00E-01	9.09E-04	5.72E-03
18. Niobium-95	Ci	0.00E-01	0.00E-01	6.63E-05	1.07E-03

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LIQUID EFFLUENTS - TOTAL PLANT DISCHARGE

(CONTINUED)

Nuclide	Unit	Continuous Mode		Batch Mode	
		Quarter 1st	Quarter 2nd	Quarter 1st	Quarter 2nd
19. Iodine-133	Ci	0.00E-01	0.00E-01	1.45E-05	0.00E-01
20. Zirconium-95	Ci	0.00E-01	0.00E-01	0.00E-01	4.90E-04
21. Technetium-99m	Ci	0.00E-01	0.00E-01	1.74E-05	0.00E-01
22. Ruthenium-103	Ci	0.00E-01	0.00E-01	0.00E-01	1.49E-04
23. Tellurium-132	Ci	0.00E-01	0.00E-01	1.75E-05	3.36E-05
24. Antimony-124	Ci	0.00E-01	0.00E-01	1.96E-04	9.89E-03
25. Lanthanum-140	Ci	0.00E-01	0.00E-01	9.56E-05	0.00E-01
26. Cesium-136	Ci	0.00E-01	0.00E-01	1.16E-04	0.00E-01
27. Sodium-24	Ci	0.00E-01	0.00E-01	1.13E-05	1.57E-04
28. Cesium-138	Ci	0.00E-01	0.00E-01	0.00E-01	7.74E-05
29. Niobium-97	Ci	0.00E-01	0.00E-01	0.00E-01	7.21E-05
30. Strontium-91	Ci	0.00E-01	0.00E-01	2.34E-05	0.00E-01
31. Nickel-65	Ci	0.00E-01	0.00E-01	0.00E-01	1.51E-05
32. Silver-110m	Ci	0.00E-01	0.00E-01	0.00E-01	5.22E-04
33. Tellurium-129m	Ci	0.00E-01	0.00E-01	0.00E-01	2.03E-03
34. Yttrium-91m	Ci	0.00E-01	0.00E-01	2.07E-05	0.00E-01
35. Zinc-69m	Ci	0.00E-01	0.00E-01	0.00E-01	3.94E-06
Total for Period	Ci	3.10E-05	3.04E-06	7.84E-02	5.72E-01

G. Nuclide Summary (NOTE: Refer to Table A for ODCM nuclides reported as 0.00E-01)

Required by ODCM/Others

Dissolved and Entrained Noble Gases

Nuclide	Unit	Continuous Mode		Batch Mode	
		Quarter 1st	Quarter 2nd	Quarter 1st	Quarter 2nd
1. Krypton-87	Ci	0.00E-01	0.00E-01	0.00E-01	0.00E-01
2. Krypton-88	Ci	0.00E-01	0.00E-01	0.00E-01	0.00E-01
3. Xenon-133	Ci	0.00E-01	0.00E-01	7.52E-02	2.14E-04
4. Xenon-133m	Ci	0.00E-01	0.00E-01	1.16E-03	0.00E-01
5. Xenon-135	Ci	0.00E-01	0.00E-01	2.87E-03	0.00E-01
6. Xenon-138	Ci	0.00E-01	0.00E-01	0.00E-01	0.00E-01
7. Krypton-85m	Ci	0.00E-01	0.00E-01	0.00E-01	0.00E-01
8. Xenon-131m	Ci	0.00E-01	0.00E-01	5.62E-05	0.00E-01
9. Xenon-135m	Ci	0.00E-01	0.00E-01	0.00E-01	0.00E-01
10. Krypton-85	Ci	0.00E-01	0.00E-01	0.00E-01	0.00E-01
11. Argon-41	Ci	0.00E-01	0.00E-01	0.00E-01	0.00E-01
Total for Period	Ci	0.00E-01	0.00E-01	7.93E-02	2.14E-04

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LIQUID EFFLUENTS - TOTAL PLANT DISCHARGE

G. Nuclide Summary (Note: Refer to Table A for ODCM nuclides reported as 0.00E-01)

Required by ODCM/Others

Fission and Activation Products

Nuclide	Unit	Continuous Mode		Batch Mode	
		Quarter 3rd	Quarter 4th	Quarter 3rd	Quarter 4th
1. Strontium-89	Ci	0.00E-01	0.00E-01	1.13E-04	0.00E-01
2. Strontium-90	Ci	0.00E-01	0.00E-01	1.42E-04	0.00E-01
3. Iron-55	Ci	0.00E-01	0.00E-01	5.00E-02	7.35E-02
4. Manganese-54	Ci	0.00E-01	0.00E-01	3.05E-03	5.10E-03
5. Cobalt-58	Ci	0.00E-01	0.00E-01	1.10E-01	9.46E-02
6. Iron-59	Ci	0.00E-01	0.00E-01	1.28E-04	6.13E-04
7. Cobalt-60	Ci	0.00E-01	0.00E-01	5.35E-02	8.37E-02
8. Zinc-65	Ci	0.00E-01	0.00E-01	2.16E-02	1.05E-03
9. Molybdenum-99	Ci	0.00E-01	0.00E-01	0.00E-01	0.00E-01
10. Iodine-131	Ci	0.00E-01	0.00E-01	0.00E-01	8.99E-05
11. Cesium-134	Ci	0.00E-01	0.00E-01	3.39E-02	4.25E-03
12. Cesium-137	Ci	0.00E-01	0.00E-01	5.98E-02	7.88E-03
13. Cerium-141	Ci	0.00E-01	0.00E-01	0.00E-01	0.00E-01
14. Cerium-144	Ci	0.00E-01	0.00E-01	7.98E-04	4.86E-04
15. Antimony-125	Ci	0.00E-01	0.00E-01	9.64E-02	1.12E-01
16. Cobalt-57	Ci	0.00E-01	0.00E-01	8.76E-04	1.75E-03
17. Chromium-51	Ci	0.00E-01	0.00E-01	4.64E-03	4.53E-03
18. Niobium-95	Ci	0.00E-01	0.00E-01	2.40E-03	2.11E-03

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Nuclide	Unit	Continuous Mode		Batch Mode	
		Quarter 3rd	Quarter 4th	Quarter 3rd	Quarter 4th
19. Iodine-133	Ci	0.00E-01	0.00E-01	0.00E-01	0.00E-01
20. Zirconium-95	Ci	0.00E-01	0.00E-01	1.10E-03	5.14E-04
21. Technetium-99m	Ci	0.00E-01	0.00E-01	0.00E-01	0.00E-01
22. Ruthenium-103	Ci	0.00E-01	0.00E-01	6.31E-05	0.00E-01
23. Tellurium-132	Ci	0.00E-01	0.00E-01	5.75E-05	3.76E-05
24. Antimony-124	Ci	0.00E-01	0.00E-01	2.28E-02	4.12E-03
25. Lanthanum-140	Ci	0.00E-01	0.00E-01	0.00E-01	3.65E-05
26. Barium-140	Ci	0.00E-01	0.00E-01	4.38E-05	5.22E-05
27. Sodium-24	Ci	0.00E-01	0.00E-01	6.92E-05	8.21E-06
28. Cesium-138	Ci	0.00E-01	0.00E-01	2.32E-04	1.33E-05
29. Strontium-92	Ci	0.00E-01	0.00E-01	3.97E-04	1.42E-04
30. Niobium-97	Ci	0.00E-01	0.00E-01	6.97E-04	4.88E-04
31. Yttrium-91	Ci	0.00E-01	0.00E-01	0.00E-01	7.58E-03
32. Silver-110m	Ci	0.00E-01	0.00E-01	9.09E-04	1.80E-03
Total for Period	Ci	0.00E-01	0.00E-01	4.64E-01	4.06E-01

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G. Nuclide Summary (NOTE: Refer to Table A for ODCM nuclides reported as 0.00E-01)

Required by ODCM/Others

Dissolved and Entrained Noble Gases

Nuclide	Unit	Continuous Mode		Batch Mode	
		Quarter 3rd	Quarter 4th	Quarter 3rd	Quarter 4th
1. Krypton-87	Ci	0.00E-01	0.00E-01	0.00E-01	0.00E-01
2. Krypton-88	Ci	0.00E-01	0.00E-01	0.00E-01	1.45E-05
3. Xenon-133	Ci	0.00E-01	0.00E-01	0.00E-01	8.26E-03
4. Xenon-133m	Ci	0.00E-01	0.00E-01	0.00E-01	0.00E-01
5. Xenon-135	Ci	0.00E-01	0.00E-01	0.00E-01	6.89E-05
6. Xenon-138	Ci	0.00E-01	0.00E-01	0.00E-01	0.00E-01
7. Krypton-85m	Ci	0.00E-01	0.00E-01	0.00E-01	0.00E-01
8. Xenon-131m	Ci	0.00E-01	0.00E-01	0.00E-01	0.00E-01
9. Xenon-135m	Ci	0.00E-01	0.00E-01	0.00E-01	0.00E-01
10. Krypton-85	Ci	0.00E-01	0.00E-01	0.00E-01	3.70E-03
11. Argon-41	Ci	0.00E-01	0.00E-01	0.00E-01	0.00E-01
Total for Period	Ci	0.00E-01	0.00E-01	0.00E-01	1.20E-02

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TABLE A

LIQUID "TYPICAL LLD" EVALUATION (1)

		Δt (2)			
Nuclide	ODCM LLD	15 min	30 min	1 hr	2 hr
Manganese-54	5.0E-07	9.12E-09	9.12E-09	9.12E-09	9.12E-09
Cobalt-58	5.0E-07	8.21E-09	8.21E-09	8.21E-09	8.21E-09
Iron-59	5.0E-07	1.62E-08	1.62E-08	1.62E-08	1.62E-08
Cobalt-60	5.0E-07	1.08E-08	1.08E-08	1.08E-08	1.08E-08
Zinc-65	5.0E-07	2.14E-08	2.14E-08	2.14E-08	2.14E-08
Molybdenum-99	5.0E-07	5.24E-08	5.25E-08	5.28E-08	5.34E-08
Cesium-134	5.0E-07	9.82E-09	9.82E-09	9.82E-09	9.82E-09
Cesium-137	5.0E-07	9.31E-09	9.31E-09	9.31E-09	9.31E-09
Cerium-141	5.0E-07	1.06E-08	1.06E-08	1.07E-08	1.07E-08
Cerium-144	5.0E-06	4.03E-08	4.03E-08	4.03E-08	4.03E-08
Iodine-131	1.0E-06	7.28E-09	7.28E-09	7.30E-09	7.32E-09
Krypton-87	1.0E-05	1.62E-08	1.85E-08	2.43E-08	4.20E-08
Krypton-88	1.0E-05	2.13E-08	2.27E-08	2.56E-08	3.27E-08
Xenon-133	1.0E-05	2.03E-08	2.07E-08	2.04E-08	2.05E-08
Xenon-133m	1.0E-05	5.05E-08	5.07E-08	5.10E-08	5.17E-08
Xenon-135	1.0E-05	5.60E-09	5.70E-09	5.93E-09	6.40E-09
Xenon-138	1.0E-05	2.82E-08	5.87E-08	2.55E-07	4.79E-06

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TABLE A

LIQUID "TYPICAL LLD" EVALUATION (1)

(Continued)

Nuclide	ODCM LLD	Typical LLD
Tritium	1.0E-05	1.0E-06
Gross Alpha	1.0E-07	2.0E-08
Strontium-89	5.0E-08	2.0E-08
Strontium-90	5.0E-08	1.0E-08
Iron-55	1.0E-06	3.0E-07

NOTES: (1) LLD values are in uCi/ml. Sample analyses are performed to ensure that ODCM LLD limits are met. These are typical LLD values.

(2) Δt is the time between sample collection and counting time.

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GASEOUS EFFLUENTS-SUMMATION OF ALL RELEASES

(GROUND LEVEL RELEASES)

Summation of All Releases	Unit	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr	%Error
A. Noble Gases						
1. Total Released	Ci	5.60E+01	2.04E+01	0.00E-01	7.03E-01	±1.1E+01
2. Average Release Rate of Period	uCi/sec	7.20E+00	2.60E+00	0.00E+01	8.84E-02	
3. Percent of Applicable Limit	%	4.55E-03	7.82E-04	0.00E-01	7.96E-07	
B. Iodines						
1. Total Iodine-131	Ci	1.93E-06	0.00-01	0.00E-01	0.00E-01	±1.3E+01
2. Average Release Rate for Period	uCi/sec	2.48E-07	0.00E-01	0.00E-01	0.00E-01	
3. Percent of Applicable Limit (1.60E-01 µCi/sec)	%	1.55E-04	0.00E-01	0.00E-01	0.00E.01	
C. Particulates						
1. Particulates with half-lives >8 days	Ci	3.40E-07	0.00-01	1.19E-05	0.00E-01	±1.6E+01
2. Average Release Rate for Period	uCi/sec	4.37E-08	0.00E-01	1.50E-06	0.00E-01	
3. Percent of Applicable Limit	%	1.10E-08	0.00E-01	2.89E-05	0.00E-01	
4. Gross Alpha Radio-activity	Ci	0.00E-01	0.00E-01	0.00E-01	0.00E-01	±2.1E+01
D. Tritium						
1. Total Release	Ci	2.14E+01	9.14E+00	7.12E+00	1.92E+00	±1.5E+01
2. Average Release Rate for Period	uCi/sec	2.75E+00	1.16E+00	8.96E-01	2.41E-01	
3. Percent of Applicable Limit (8.47E+04 µCi/sec)		3.25E-03	1.37E-03	1.06E-03	2.85E-04	

EFFLUENT AND WASTE DISPOSAL ANNUAL REPORT

1993

GASEOUS EFFLUENTS-SUMMATION OF ALL RELEASES

(GROUND LEVEL RELEASES)

	Unit	Continuous Mode		Batch Mode	
		Quarter 1st	Quarter 2nd	Quarter 1st	Quarter 2nd
F. Noble Gases					
Required by ODCM/Others					
1. Krypton-87	Ci	2.94E-03	0.00E-01	0.00E-01	0.00E-01
2. Krypton-88	Ci	4.57E-04	0.00E-01	2.41E-02	0.00E-01
3. Xenon-133	Ci	1.25E-01	0.00E-01	5.16E+01	2.03E+01
4. Xenon-133m	Ci	0.00E-01	0.00E-01	2.36E-01	0.00E-01
5. Xenon-135	Ci	2.33E-02	0.00E-01	1.93E+00	0.00E-01
6. Xenon-138	Ci	0.00E-01	0.00E-01	0.00E-01	0.00E-01
7. Krypton-85	Ci	0.00E-01	0.00E-01	8.18E-02	1.20E-01
8. Argon-41	Ci	1.82E-02	0.00E-01	1.70E+00	0.00E-00
9. Krypton-85m	Ci	1.16E-03	0.00E-01	4.03E-02	0.00E-01
10. Xenon-131m	Ci	0.00E-01	0.00E-01	1.54E-01	6.91E-03
11. Xenon-135m	Ci	1.66E-02	0.00E-01	0.00E-01	0.00E-01
Total for Period	Ci	1.88E-01	0.00E-01	5.58E+01	2.04E+01
G. Idoines					
1. Iodine-131	Ci	1.93E-06	0.00E-01		
2. Iodine-133	Ci	1.15E-06	0.00E-01		
3. Iodine-135	Ci	0.00E-01	0.00E-01		
Total for Period	Ci	3.08E-06	0.00E-01		

NOTE: Refer to Table B for ODCM nuclides reported as 0.00E-01.

EFFLUENT AND WASTE DISPOSAL ANNUAL REPORT

1993

GASEOUS EFFLUENTS-SUMMATION OF ALL RELEASES

(GROUND LEVEL RELEASES)

H. Particulates

Required by ODCM/Others

Nuclide	Unit	Continuous Mode Quarter 1st	Continuous Mode Quarter 2nd
1. Strontium-89	Ci	0.00E-01	0.00E-01
2. Strontium-90	Ci	0.00E-01	0.00E-01
3. Iron-59	Ci	0.00E-01	0.00E-01
4. Cobalt-60	Ci	2.79E-07	0.00E-01
5. Zinc-65	Ci	0.00E-01	0.00E-01
6. Manganese-54	Ci	5.98E-08	0.00E-01
7. Cobalt-58	Ci	0.00E-01	0.00E-01
8. Molybdenum-99	Ci	0.00E-01	0.00E-01
9. Cesium-134	Ci	0.00E-01	0.00E-01
10. Cesium-137	Ci	0.00E-01	0.00E-01
11. Cerium-141	Ci	0.00E-01	0.00E-01
12. Cerium-144 Others (Specify)	Ci	0.00E-01	0.00E-01
13. Technetium-99m	Ci	0.00E-01	0.00E-01
14. Sodium-24	Ci	0.00E-01	0.00E-01
Total for Period	Ci	3.39E-07	0.00E-01

NOTE: Refer to Table B for ODCM nuclides reported as 0.00E-01.

EFFLUENT AND WASTE DISPOSAL ANNUAL REPORT

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GASEOUS EFFLUENTS-SUMMATION OF ALL RELEASES

(GROUND LEVEL RELEASES)

		Unit	Continuous Mode		Batch Mode	
			Quarter 3rd	Quarter 4th	Quarter 3rd	Quarter 4th
F.	Noble Gases					
	Required by ODCM/Others					
	1. Krypton-87	Ci	0.00E-01	0.00E-01	0.00E-01	0.00E-00
	2. Krypton-88	Ci	0.00E-01	0.00E-01	0.00E-01	0.00E-01
	3. Xenon-133	Ci	0.00E-01	0.00E-01	0.00E-01	6.10E-01
	4. Xenon-133m	Ci	0.00E-01	0.00E-01	0.00E-01	0.00E-01
	5. Xenon-135	Ci	0.00E-01	0.00E-01	0.00E-01	2.50E-02
	6. Xenon-138	Ci	0.00E-01	0.00E-01	0.00E-01	0.00E-01
	7. Krypton-85	Ci	0.00E-01	0.00E-01	0.00E-01	0.00E-01
	8. Argon-41	Ci	0.00E-01	0.00E-01	0.00E-01	6.63E-02
	9. Krypton-85m	Ci	0.00E-01	0.00E-01	0.00E-01	8.35E-04
	10. Xenon-131m	Ci	0.00E-01	0.00E-01	0.00E-01	0.00E-01
	11. Xenon-135m	Ci	0.00E-01	0.00E-01	0.00E-01	0.00E-01
	Total for Period	Ci	0.00E-01	0.00E-01	0.00E-01	7.02E-01
G.	Idoines					
	1. Iodine-131	Ci	0.00E-01	0.00E-01		
	2. Iodine-133	Ci	0.00E-01	0.00E-01		
	3. Iodine-135	Ci	0.00E-01	0.00E-01		
	Total for Period	Ci	0.00E-01	0.00E-01		

NOTE: Refer to Table B for ODCM nuclides reported as 0.00E-01.

EFFLUENT AND WASTE DISPOSAL ANNUAL REPORT

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GASEOUS EFFLUENTS-SUMMATION OF ALL RELEASES

(GROUND LEVEL RELEASES)

H. Particulates

Required by ODCM/Others

Nuclide	Unit	Continuous Mode	
		Quarter 3rd	Quarter 4th
1. Strontium-89	Ci	0.00E-01	0.00E-01
2. Strontium-90	Ci	0.00E-01	0.00E-01
3. Iron-59	Ci	0.00E-01	0.00E-01
4. Cobalt-60	Ci	7.48E-06	0.00E-01
5. Zinc-65	Ci	0.00E-01	0.00E-01
6. Manganese-54	Ci	0.00E-01	0.00E-01
7. Cobalt-58	Ci	4.40E-06	0.00E-01
8. Molybdenum-99	Ci	0.00E-01	0.00E-01
9. Cesium-134	Ci	0.00E-01	0.00E-01
10. Cesium-137	Ci	0.00E-01	0.00E-01
11. Cerium-141	Ci	0.00E-01	0.00E-01
12. Cerium-144 Others (Specify)	Ci	0.00E-01	0.00E-01
13. Technetium-99m	Ci	0.00E-01	0.00E-01
14. Sodium-24	Ci	0.00E-01	0.00E-01
Total for Period	Ci	1.18E-05	0.00E-01

NOTE: Refer to Table B for ODCM nuclides reported as 0.00E-01.

EFFLUENT AND WASTE DISPOSAL ANNUAL REPORT

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TABLE B

GASEOUS "TYPICAL" LLD EVALUATION (1)

Noble Gas

Nuclide	ODCM LLD	Δt(2) 1 hr	1.5 hr
Krypton-87	1.0E-04	1.19E-06	2.69E-06
Krypton-88	1.0E-04	1.22E-06	1.76E-06
Xenon-133	1.0E-04	5.51E-07	5.56E-07
Xenon-133m	1.0E-04	1.99E-06	2.02E-06
Xenon-135	1.0E-04	2.59E-07	2.90E-07
Xenon-138	1.0E-04	5.38E-05	8.55E-05

Particulate Sample		2.02 da	2.79 da	5.79 da
Manganese-54	1.0E-10	1.83E-12	7.65E-14	1.10E-14
Cobalt-58	1.0E-10	1.60E-12	4.79E-14	9.99E-15
Iron-59	1.0E-10	3.21E-12	1.36E-13	2.03E-14
Cobalt-60	1.0E-10	1.79E-12	7.46E-14	1.07E-14
Zinc-65	1.0E-10	4.08E-12	1.71E-13	2.46E-14
Molybdenum-99	1.0E-10	2.08E-12	1.05E-13	3.18E-14
Cesium-134	1.0E-10	2.03E-12	8.45E-14	1.21E-14
Cesium-137	1.0E-10	.85E-12	7.71E-14	1.10E-14
Cerium-141	1.0E-10	2.32E-12	9.82E-14	1.50E-14
Cerium-144	1.0E-10	1.03E-12	4.28E-13	6.16E-14
Iodine-131	1.0E-10	1.85E-12	8.22E-14	1.52E-14

Charcoal Sample		2.0 da	2.5 da	5.5 da
Iodine-131	1.0E-11	2.53E-12	1.10E-13	2.00E-14

EFFLUENT AND WASTE DISPOSAL ANNUAL REPORT

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TABLE B

GASEOUS "TYPICAL" LLD EVALUATION (1)

(continued)

Nuclide	ODCM LLD	Typical LLD
Tritium	1.0E-06	1.0E-11
Gross Alpha	1.0E-11	1.5E-14
Strontium-89	1.0E-11	1.0E-14
Strontium-90	1.0E-11	1.0E-15

NOTES: (1) LLD values are in µCi/cc.

(2) Δt for noble gases is the time from sampling to analysis. Δt for charcoal and particulate samples is the midpoint of sampling to analysis.

EFFLUENT AND WASTE DISPOSAL ANNUAL REPORT
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SOLID WASTE (RADIOACTIVE SHIPMENTS)

A. Solid Waste Shipped Offsite for Burial or Disposal (not Irradiated Fuel)

1. Type of Waste	Unit	12 Month Period	Est. Tot. Error %
a. Spent resins, filter sludges,	m^3	1.05E+01	±1.00E-1
evaporator bottoms, etc.	Ci	1.70E+01	±1.50E+1
b. Dry Active Waste, Compressible Waste	m^3	3.80E+01	±1.00E-1
Contaminated Equipment, etc.	Ci	6.68E+00	±1.50E+1
c. Irradiated Components,	m^3	None	N/A
Control Rods, etc.	Ci	None	N/A
d. Other: Mechanical Filters	m^3	5.86E+00	±1.00E-1
Floor Drain Media	Ci	6.26E+01	±1.50E+1

2. Estimate of Major Nuclide Composition (by type of waste)

a. Spent resins, filter sludges, evaporator bottoms, etc.
(nuclides determined by measurement)

	Curies	Percent
1. Manganese-54	3.04E-01	1.79E+00
2. Iron-55	3.39E+00	2.00E+01
3. Cobalt-58	7.01E-01	4.12E+00
4. Cobalt-60	6.36E+00	3.74E+01
5. Nickel-63	4.37E+00	2.57E+01
6. Antimony-125	2.32E-01	1.36E+00
7. Cesium-134	4.79E-01	2.82E+00
8 Cesium-137	8.69E-01	5.11E+00

b. Dry active waste, compressible waste, contaminated equipment, etc.
(nuclides determined by estimate)

1. Chromium-51	6.49E-01	9.71E+00
2. Manganese-54	1.28E-01	1.91E+00
3. Iron-55	1.51E+00	2.25E+01
4. Cobalt-58	2.05E+00	3.06E+01
5. Cobalt-60	8.77E-01	1.31E+01
6. Nickel-63	2.48E-01	3.71E+00
7. Beryllium-7	1.38E-01	2.07E+00
8. Niobium-95	3.11E-01	4.66E+00
9. Zirconium-95	1.89E-01	2.83E+00
10. Cesium-134	1.91E-01	2.86E+00
11. Cesium-137	2.50E-01	3.74E+00
12. Barium/Lanthanum-140	9.73E-02	1.46E+00
c. Irradiated Components	N/A	N/A

EFFLUENT AND WASTE DISPOSAL ANNUAL REPORT
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SOLID WASTE (RADIOACTIVE SHIPMENTS)

2. Estimate of Major Nuclide Composition (by type of waste) Continued

d. Other: Mechanical Filters, Floor Drain Media
(nuclides determined by estimate)

		Curies	Percent
1.	Manganese-54	2.81E+00	4.49E+00
2.	Iron-55	3.67E+01	5.86E+01
3.	Cobalt-58	6.10E+00	9.74E+00
4.	Cobalt-60	7.67E+00	1.22E+01
5.	Nickel-63	6.76E+00	1.08E+01
6.	Chromium-51	6.43E-01	1.03E+00

3. Solid Waste Disposition

Number of Shipments	Type Quantity	Mode of Transportation	Destination
a) Spent resins, filter sludges, evaporator bottoms, etc.			
2	B-LSA	Motor Freight	Barnwell, SC
1	A-LSA	Motor Freight	Barnwell, SC

Number of Shipments	Type Quantity	Mode of Transportation	Destination
b) Dry active waste, compressible waste, contaminated equipment, etc.			
63	A-LSA	Motor Freight	Barnwell, SC

Number of Shipments	Type Quantity	Mode of Transportation	Destination
c) Irradiated components, control rods, etc.			
None			

Number of Shipments	Type Quantity	Mode of Transportation	Destination
d) Other: Mechanical Filters, Floor Drain Media			
2	B-LSA	Motor Freight	Barnwell, SC

4. Irradiated Fuel Shipments (Disposition)

Number of Shipments	Type Quantity	Mode of Transportation	Destination
None	N/A	N/A	N/A

5. Solidification of Waste

Was solidification performed? NO

If yes, solidification media: N/A

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Attachment 1.0

INOPERABLE INSTRUMENTATION

Pursuant to ODCM Section 1.1.1, the following information is provided concerning radioactive effluent monitoring instrumentation which was inoperable for greater than 30 consecutive days during the period of January 1, 1993, through December 31, 1993.

Radiation Monitor Number	System Monitored	Date/Time Out of Service		Date/Time Returned to Service		Total Days
O-RM-90-134/141	ERCW-Train B	1/8/93	1320	2/13/93	1425	37
		5/16/93	0705	7/23/93	1500	38
O-RM-90-212	Turbine Bldg. Sump	5/11/93	1433	6/15/93	1638	35
O-RM-90-133/140	ERCW-Train A	5/18/93	1140	7/23/93	1500	37
O-RM-90-225	Condensate Demin Eff.	11/11/93	1035	12/23/93	1510	41

ERCW radiation monitors (O-RM-90-133/140, 134/141) were inoperable numerous times throughout the year. The primary downtime was related to the ability to maintain radiation monitor sample flow. Both ERCW train were in an outage which essentially placed the train out-of-service thus not having adequate volume to maintain radiation monitor sample flow.

ERCW-Train B radiation monitors were inoperable due to flow switches being found out-of-calibration tolerance during the required quarterly evaluation. The flow switches were unable to be calibrated within tolerance and were declared inoperable. A work request was prepared for both monitors to implement the use of a new and different flow switch. Since the required modifications in the flow switch required a design change the 30-day ODCM time frame was exceeded.

The turbine building sump (O-RM-90-212) was inoperable for greater than 30 days due to a shutdown board 1A-A outage followed by flow restriction problems.

Condensate demin radiation monitor was inoperable due to air inleakage from the mechanical seals of an associated discharge pump. Air in the sample prevented the monitor from receiving an adequate sample. Since the problem was not at the monitor itself, it took longer than normal to troubleshoot. The pump seals have since been replaced.

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1993

Attachment 2.0

Missed Surveillance

ODCM Section 1.2.2.1 requires that if samples were not collected and analyzed according to a specified frequency then report with an explanation as to why they were missed and actions taken to prevent reoccurrence.

ODCM SR 2.2.2.1.2 requires monitoring of the applicable units shield building exhaust once per day for tritium during refueling when the refueling canal is flooded. Unit 1 had completed all refueling operations, the head had been put in place but not fully tensioned, and was in preparation for draindown. The table below identifies the partial July '93 sampling frequency for the shield building exhaust. Samples for 7/13 through 7/15 were not collected and analyzed due to a communication error between Operations and Chemistry personnel in verifying the status of the refueling canal.

DATE-Time	H-3 conc. uCi/cc	Shield Bldg. Flow CFM	Dose mrem/yr
7/10-11:03	8.31E-08	9430	6.55E-03
7/11-00:05	8.01E-08	12109	8.11E-03
7/12-12:08	1.11E-07	10960	1.02E-02
7/16-16:08	1.70E-07	5485	7.79E-03
7/17-15:57	1.54E-07	5725	7.37E-03
7/18-15:26	1.85E-07	5750	8.89E-03
AVERAGE	1.31E-07		8.15E-03

The average concentration of the sample period before and after the missed samples is 1.31E-07 uCi/cc with an average dose of 8.15E-03 mrem/yr. The sample collected on 7/16-16:08 was used in covering the time frame in question. If the average concentration was used to evaluate the release period the dose rate would decrease due to the low flowrate. The instruction used by Chemistry was revised to more clearly identify the surveillance and the applicability with regard to the refueling canal.

ENCLOSURE 2

SEQUOYAH NUCLEAR PLANT

RADIOLOGICAL IMPACT ASSESSMENT REPORT

(S52 940407 305)