Docket 50-305

KEWAUNEE NUCLEAR POWER PLANT

SEMIANNUAL

EFFLUENT RELEASE REPORT

JULY - DECEMBER 1978

Wisconsin Public Service Corporation
Green Bay, Wisconsin
February, 1979

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1.0 INTRODUCTION

This report is being submitted in accordance with the requirements of Kewaunee Technical Specifications, section 6.9.3.b. The data reported covers the releases made from July through December 1978. The report contains a summary of the gaseous and liquid releases made to the environment including the quantity, characterization, time duration and percent of technical specification limits of the releases. A summation of solid waste disposal is also included.

1.1 Technical Specification Limits and Objectives

Specifications and objectives are set to insure that as low as practical releases are made to unrestricted areas and still allow for practical and dependable operation of the Kewaunee Plant. The annual objectives for release of gaseous wastes are: noble gases and particulates with half lives greater than eight days should not exceed 1.7×10^{3} uCi/sec; and halogens and other particulates with half lives greater than eight days should not exceed 9.2×10^{-4} uCi/sec. Technical Specifications limit gaseous releases to 4.45×10^{3} uCi/sec for gross gaseous activity (based on Xe-135): and 6.12×10^{-2} uCi/sec for halogens and particulates ($T_{\frac{1}{2}}$ > eight days) when averaged over any calendar quarter. The noble gas activity limit is based on Xe-135 as the most restrictive isotope.

The following are the Kewaunee Plant objectives for the release of liquid effluents to unrestricted areas.

a. The annual total quantity of radioactive materials in liquid waste, excluding tritium and dissolved gases, should not exceed 5 curies.

b. The annual average concentration of radioactive material in liquid waste, prior to dilution in Lake Michigan, excluding tritium and dissolved gases, should not exceed 2.0 E-8 uCi/ml.

c. The annual average concentration of tritium in liquid waste, prior to dilution in Lake Michigan should not exceed 5.0 E-6 uCi/ml.

Technical specification limits for the release of liquid effluents are:

a. The instantaneous gross radioactivity release concentration in liquid effluents shall not exceed the values specified in 10 CFR Part 20 Appendix B, for unrestricted areas.

b. The release rate of radioactive liquid effluents, excluding tritium and dissolved gases, shall not exceed 10 curies during any calendar quarter.

c. The annual average concentration of tritium prior to dilution in a natural body of water shall not exceed 3.0 E-3 uCi/cc.

1.2 Batch Release Data

Gaseous

The following is a summation of the total gaseous batch releases made during the second half of 1978.

Number of batch releases	13
Total time for all batch releases (sec)	2.51 E+5
Maximum time for one batch release (sec)	4.31 E+4
Average time for a batch release (sec)	1.93 E+4
Minimum time for a batch release (sec)	3.60 E+3

Liquid

The following is a summary of the batch liquid radioactive discharges made in the second half of 1978.

Number of Releases and Gallonage		
Laundry	118	93,035 gal.
Boron Recycle	50	164,770 gal.
Miscellaneous Sources	187	1,153,957 gal.
Total time for all releases		46,647 min.
Maximum time for one release		565 min.
Minimum time for one release		13 min.
Average time for a release		131.4 min.

1.3 Abnormal Releases

No abnormal releases were made from the Kewaunee Plant during the report period.

1.4 Lower Limits of Detection (LLD)

All routine releases of radioactive liquid wastes are made in the batch mode. Each batch is quantitatively analyzed for gamma emitters and tritium and an allowable release rate specified to maintain the concentration of radionuclides prior to dilution in Lake Michigan less than the limits stated in Section 1.1. A fraction of each sample is retained for a monthly proportional composite analysis for alpha emitters, Strontium 89, and Strontium 90. The lower limits of detection (LLD) for the various radio analyses are:

Analysis	LLD (uCi/ml)
Gross beta-gamma	1.2 E-7
Dissolved Noble Gases	7 E-8 to 6 E-7
I-131, Ba-La-140	2 E-7 to 7 E-7
Gamma emitters	7 E-8 to 1 E-6
Tritium	1.5 E-6
Gross Alpha	2.3 E-8
Sr-89, 90	1 E-8

Gaseous radioactive effluents are released in both the continuous mode (Auxiliary Building Stack) and the batch mode (Containment Venting or Gas Decay Tanks). The Auxiliary Building Stack is sampled continuously for particulates, halogens and strontium by "off-line" sample trains. The stack is also grab-sampled daily for gaseous gamma emitters. The LLDs for these radio analyses are:

Analysis	LLD (nCi/cc)
Gross Gamma (Gas)	2 E-7
Gamma Emitters (Gas)	4.5 E-8 to 3.2 E-7 (Kr-85, 1.72 E-5)
Iodines	1.8 E-13
Gross beta-gamma (Particulate)	5 E-15
Gamma Emitters (Particulate)	9.9 E-13
Sr-89, 90 (Particulate)	8 E-14
Gross alpha (Particulate)	3 E-15

The batch releases are sampled for particulates, halogens, tritium and fission gases prior to release to determine allowable release rates. The actual amounts released are quantified by samplers downstream of any filters in the release path. The LLDs for these releases are dependent on the duration of the release and, in the case of particulates and iodines, are typically a factor of 6 to 10 higher than those given above for the continuous release mode. The gas LLDs are the same as those given above.

2.0 GASEOUS EFFLUENTS

The release rates for gaseous activity, excluding halogens and particulates with half-lives greater than eight days, were well below applicable Technical Specification limits and annual objectives for the second six months of 1978. The average release rates versus Technical Specifications are shown below.

	3rd Qtr	4th Qtr
Specification (uCi/sec)	4.45 E+3	4.45 E+3
Average (uCi/sec)	4.47 E-1	1.20 E 0
% of Specification	1.00 E-2	2.70 E-2

The average annual release rate was 1.05 E 0 uCi/sec which is 0.062% of Kewaunee's annual release rate objective.

The release rates for halogens and particulates with half-lives greater than eight days were also below Technical Specification limits and Kewaunee annual objectives. Those average quarterly release rates are:

	3rd Qtr	4th Qtr
Specification (uCi/sec)	6.12 E-2	6.12 E-2
Average (uCi/sec)	5.38 E-5	2.78 E-5
% of Specification	8.79 E-2	4.54 E-2

The average release rate for the period was 4.08 E-5 uCi/sec which is 4.4% of Kewaunee's annual release rate objective.

Table 2.1 presents a quarterly summation of the total release, average release rates, and percent of Technical Specifications for four categories of gaseous effluents. Table 2.2 lists the quarterly sums of individula gaseous radionuclides released by continuous and batch modes. Table 2.3 is essentially the same data presented in a monthly summation as required by Technical Specifications.

Table 2.1
Semiannual Effluent Report 1978
Gaseous Effluents - Summation of All Releases

	3rd Quarter	4th Quarter
Fission and Activiation Gases		
Total Release (Ci)	3.56 E 0	9.57 E 0
Ave. Release Rate (uCi/sec)	4.47 E-1	1.20 E 0
% of Tech Spec (based on Xe-135)	1.00 E-2	2.70 E-2
Iodine - 131		
Total Release (Ci)	6.31 E-6	4.21 E-6
Ave. Release Rate (uCi/sec)	7.93 E-7	5.29 E-7
% of Tech Spec	1.29 E-3	8.64 E-4
Particulate ($T_{1/2}$ 8d)		
Total Release (Ci)	4.14 E-4	2.11 E-4
Ave. Release Rate (uCi/sec)	5.20 E-5	2.65 E-5
% of Tech Spec	8.50 E-2	4.33 E-2
Gross Alpha Released (Ci)	7.29 E-5	3.15 E-5
Tritium		
Total Release (Ci)	7.14 E-1	2.65 E 0
Ave. Release Rate (uCi/sec)	8.98 E-2	3.30 E-1
There is no applicable Tech Spec limiting tritium release rates		

Table 2.2
Semiannual Effluent Report 1978
Gaseous Effluents - Elevated Release

Nuclides Released (Ci)	Continuous Mode 3rd Qtr	Continuous Mode 4th Qtr	Batch Mode 3rd Qtr	Batch Mode 4th Qtr
Fission Gases				
Kr-85	-	-	-	1.34 E 0
Kr-85m	-	-	-	1.84 E-2
Kr-88	-	-	-	9.74 E-3
Xe-133	-	-	6.45 E-1	4.87 E 0
Xe-135	4.43 E-1	-	4.36 E-2	4.60 E-1
Xe-133m	-	-	-	5.23 E-2
Ar-41	-	-	1.30 E-1	8.65 E-1
Unidentified	< 2.30 E 0	< 1.91 E 0	< 2.87 E-4	4.64 E-2
Total for Period	< 2.74 E 0	< 1.91 E 0	< 8.19 E-1	7.66 E 0
Iodines				
I-131	5.82 E-6	1.35 E-6	4.90 E-7	2.86 E-6
I-132	-	-	-	1.78 E-7
I-133	6.35 E-6	4.12 E-7	1.01 E-6	4.60 E-6
I-135	-	-	-	8.04 E-7
Total for Period	1.22 E-5	1.76 E-6	1.50 E-6	8.44 E-6
Particulates				
Sr-89	2.53 E-5	< 4.40 E-7	-	-
Sr-90	< 5.33 E-6	< 4.40 E-7	-	-
Co-58	1.30 E-5	9.64 E-7	-	-
Co-60	1.26 E-5	8.23 E-6	2.68 E-7	4.39 E-7
Cs-134	-	2.14 E-7	2.30 E-7	-
Cs-137	1.85 E-6	1.94 E-6	-	-
Rb-88	-	-	-	1.79 E-6
Na-24	-	-	5.40 E-7	-
Cs-138	-	-	-	2.20 E-7
Unidentified	9.55 E-6	1.46 E-5	3.47 E-4	1.84 E-4
Total for Period	< 6.58 E-5	< 2.68 E-5	3.48 E-4	1.86 E-4

TOTAL

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GASEOUS RELEASE

	JULY	AUGUST	SEPTEMBER	3rd Qtr
NOBLE GASES (Curies)				
Isotope				TOTAL
Ar 41	-	1.30 E-1	-	1.30 E-1
Kr 85	-	-	-	-
Kr 85m	-	-	-	-
Kr 87	-	-	-	-
Kr 88	-	-	-	-
Xe-133	-	6.45 E-1	-	6.45 E-1
Xe-133m	-	-	-	-
Xe-135	-	4.36 E-2	4.43 E-1	4.87 E-1
Xe-135m	-	-	-	-
Unident.	≤1.13 E+0	≤ 6.27 E-1	≤5.47 E-1	≤2.30 E+0
Total	≤1.13 E+0	≤1.45 E+0	≤9.90 E-1	≤ 3.56 E+0
PARTICULATES (Curies)				
Co-58	5.55 E-6	4.65 E-6	2.79 E-6	1.30 E-5
Co-60	3.35 E-6	6.09 E-6	3.48 E-6	1.30 E-5
Cs-134	-	2.30 E-7	-	2.30 E-7
Cs-137	1.14 E-6	4.54 E-7	2.64 E-7	1.85 E-6
Ba/La-140	-	-	-	-
Sr-89	2.51 E-5	≤1.16 E-7	≤1.31 E-7	≤2.53 E-5
Sr-90	≤ 5.03 E-6	≤1.16 E-7	≤1.92 E-7	≤ 5.34 E-6
Na-24	-	5.40 E-7	-	5.40 E-7
Rb-88	-	-	-	-
Rn-222	3.18 E-5	1.74 E-5	1.77 E-5	6.69 E-5
Unident.	1.43 E-4	1.27 E-4	8.68 E-5	≤3.57 E-4
Total	≤ 2.15 E-4	≤ 1.57 E-4	≤1.11 E-4	≤4.82 E-4
HALOGENS (Curies)				
I-131	2.54 E-7	4.90 E-7	5.57 E-6	6.31 E-6
I-132	-	-	-	-
I-133	-	1.58 E-6	5.78 E-6	7.36 E-6
I-135	-	-	-	-
Total	2.54 E-7	2.07 E-6	1.14 E-5	1.37 E-5

	JULY	AUGUST	SEPTEMBER	TOTAL
TOTAL NOBLE GASES (Ci)	≤ 1.13 E+0	≤1.45 E+0	≤ 9.90 E-1	≤3.56 E+0
TOTAL HALOGENS (Ci)	2.54 E-7	2.07 E-6	1.14 E-5	1.37 E-5
TOTAL PARTICULATE GROSS BETA-GAMMA	≤2.15 E-4	≤1.57 E-4	1.11 E-4	≤ 4.82 E-4
TOTAL PARTICULATE GROSS BETA-GAMMA ($t_{1/2}$ 8 Days)	1.83 E-4	1.37 E-4	9.36 E-5	4.14 E-4
TOTAL TRITIUM (Ci)	1.50 E-1	3.97 E-1	1.67 E-1	7.14 E-1
TOTAL PARTICULATE GROSS ALPHA (Ci)	2.87 E-5	2.68 E-5	1.74 E-5	7.29 E-5
MAXIMUM NOBLE GAS RELEASE RATE (uCi/sec)	6.19 E-1	3.44 E+2	5.12 E+0	

Table 2.3A

TOTAL

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GASEOUS RELEASE

	OCTOBER	NOVEMBER	DECEMBER	4th Qtr TOTAL
NOBLE GASES (Curies)				
Isotope				
Ar-41	1.60 E-1	3.02 E-1	4.03 E-1	8.65 E-1
Kr-85	7.21 E-1	-	6.23 E-1	1.34 E+0
Kr-85m	-	2.49 E-3	1.59 E-2	1.84 E-2
Kr-87	-	-	-	-
Kr-88	-	-	9.74 E-3	9.74 E-3
Xe-133	6.68 E-1	1.55 E+0	2.66 E+0	4.88 E+0
Xe-133m	-	-	5.23 E-2	5.23 E-2
Xe-135	3.87 E-2	8.92 E-2	3.32 E-1	4.60 E-1
Xe-135m	-	-	-	-
Unident.	≤6.50 E-1	6.77 E-1	≤6.28 E-1	≤1.96 E+0
Total	≤2.24 E+0	2.62 E+0	≤4.72 E+0	≤9.59 E+0
PARTICULATES (Curies)				
Co-58	9.64 E-7	-	-	9.64 E-7
Co-60	3.55 E-6	2.59 E-6	2.53 E-6	8.67 E-6
Cs-134	2.14 E-7	-	-	2.14 E-7
Cs-137	7.35 E-7	4.12 E-7	7.99 E-7	1.95 E-6
Ba/La-140	-	-	-	-
Sr-89	≤1.50 E-7	≤1.53 E-7	≤1.37 E-7	≤4.40 E-7
Sr-90	≤1.50 E-7	≤1.53 E-7	≤1.37 E-7	≤4.40 E-7
Cs-138	-	-	2.20 E-7	2.20 E-7
Rb-88	-	-	1.79 E-6	1.79 E-6
Ra-222	1.55 E-5	7.30 E-6	1.05 E-5	3.33 E-5
Unident.	1.12 E-4	4.17 E-5	4.54 E-5	1.99 E-4
Total	≤1.33 E-4	≤5.23 E-5	6.15 E-5	≤2.48 E-4
HALOGENS (Curies)				
I-131	1.07 E-6	1.19 E-6	1.95 E-6	4.21 E-6
I-132	-	1.78 E-7	-	1.78 E-7
I-133	1.32 E-6	1.57 E-6	2.12 E-6	5.01 E-6
I-135	-	8.04 E-7	-	8.04 E-7
Total	2.39 E-6	3.74 E-6	4.07 E-6	1.02 E-5

	OCTOBER	NOVEMBER	DECEMBER	TOTAL
TOTAL NOBLE GASES (Ci)	≤2.24 E+0	2.62 E+0	≤4.72 E+0	≤9.59 E+0
TOTAL HALOGENS (Ci)	2.39 E-6	3.74 E-6	4.07 E-6	1.02 E-5
TOTAL PARTICULATE GROSS BETA-GAMMA	≤1.33 E-4	≤5.23 E-5	≤6.15 E-5	≤2.48 E-4
TOTAL PARTICULATE GROSS BETA-GAMMA ($t_{\frac{1}{2}}$ >8 Days)	1.18 E-4	4.50 E-5	5.11 E-6	1.68 E-4
TOTAL TRITIUM (Ci)	1.18 E-1	4.75 E-1	2.05 E+0	2.64 E+0
TOTAL PARTICULATE GROSS ALPHA (Ci)	1.74 E-5	8.15 E-6	5.95 E-6	3.15 E-5
MAXIMUM NOBLE GAS RELEASE RATE (uCi/sec)	6.35 E+2	3.51 E+2	8.40 E+2	

Table 2.3A

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GASEOUS RELEASE

CONTINUOUS

NOBLE GASES (Curies)	JULY	AUGUST	SEPTEMBER	3rd Qtr TOTAL
Isotope				
Ar-41	-	-	-	-
Kr-85	-	-	-	-
Kr-85m	-	-	-	-
Kr-87	-	-	-	-
Kr-88	-	-	-	-
Xe-133	-	-	-	-
Xe-133m	-	-	-	-
Xe-135	-	-	4.43 E-1	4.43 E-1
Xe-135m	-	-	-	-
Unident.	≤1.13 E+0	≤6.27 E-1	≤5.47 E-1	≤2.30 E+0
Total	≤1.13 E+0	≤6.27 E-1	≤ 9.90 E-1	≤2.74 E+0
PARTICULATES (Curies)				
Co-58	5.55 E-6	4.65 E-6	2.79 E-6	1.30 E-5
Co-60	3.35 E-6	5.82 E-6	3.48 E-6	1.27 E-5
Cs-134	-	-	-	-
Cs-137	1.14 E-6	4.54 E-7	2.64 E-7	1.86 E-6
Ba/La-140	-	-	-	-
Sr-89	2.51 E-5	≤1.16 E-7	≤ 1.31 E-7	≤2.53 E-5
Sr-90	≤5.03 E-6	≤1.16 E-7	≤ 1.92 E-7	≤5.34 E-6
Ma-54	-	-	-	-
Rb-88	-	-	-	-
Rn-222	-	6.10 E-7	-	6.10 E-7
Unident	-	6.10 E-6	3.45 E-6	9.55 E-6
Total	≤4.02 E-5	≤ 1.79 E-5	≤1.03 E-5	≤6.82 E-5
HALOGENS (Curies)				
I-131	2.54 E-7	-	5.57 E-6	5.82 E-6
I-132	-	-	-	-
I-133	-	5.73 E-7	5.78 E-6	6.35 E-6
I-135	-	-	-	-
Total	2.54 E-7	5.73 E-7	1.14 E-5	1.22 E-5

	JULY	AUGUST	SEPTEMBER	3rd Qtr TOTAL
TOTAL NOBLE GASES (Ci)	≤1.13 E+0	≤ 6.27 E-1	≤9.90 E-1	≤2.75 E+0
TOTAL HALOGENS (Ci)	2.54 E-7	5.73 E-7	1.13 E-5	1.21 E-5
TOTAL PARTICULATE GROSS BETA-GAMMA	≤4.01 E-5	≤1.78 E-5	≤1.03 E-5	≤6.82 E-5
TOTAL PARTICULATE GROSS BETA-GAMMA ($t_{\frac{1}{2}}$ > 8 Days)	≤4.01 E-5	≤ 1.72 E-5	≤1.03 E-5	≤6.76 E-5
TOTAL TRITIUM (Ci)	1.46 E-1	3.46 E-1	1.66 E-1	6.58 E-1
TOTAL PARTICULATE GROSS ALPHA (Ci)	9.44 E-7	1.57 E-6	8.98 E-7	3.41 E-6
MAXIMUM NOBLE GAS RELEASE RATE (uCi/sec)	5.93 E-1	≤2.96 E-1	5.12 E+0	

Table 2.3B

CONTINUOUS

SEMIANNUAL EFFLUENT REPORT FOR 1978
GASEOUS RELEASE

	OCTOBER	NOVEMBER	DECEMBER	4th Qtr
NOBLE GASES (Curies)				
Isotope				TOTAL
Ar-41				
Kr-85				
Kr-85m				
Kr-87				
Kr-88				
Xe-133				
Xe-133m				
Xe-135				
Xe-135m				
Unident.	≤6.50 E-1	≤6.31 E-1	≤6.28 E-1	≤1.91 E+0
Total	≤6.50 E-1	≤6.31 E-1	≤6.28 E-1	≤1.91 E+0
PARTICULATES (Curies)				
Co-58	9.64 E-7	-	-	9.64 E-7
Co-60	3.55 E-6	2.37 E-6	2.31 E-6	8.23 E-6
Cs-134	2.14 E-7	-	-	2.14 E-7
Cs-137	7.35 E-7	4.12 E-7	7.99 E-7	1.95 E-6
Ba/La-140	-	-	-	-
Sr-89	≤1.50 E-7	≤1.53 E-7	≤1.37 E-7	≤4.40 E-7
Sr-90	≤1.50 E-7	≤1.53 E-7	≤1.37 E-7	≤4.40 E-7
Mn-54	-	-	-	-
Rb-88	-	-	-	-
Rn-222	-	-	-	-
Unident.	7.15 E-6	5.99 E-6	1.51 E-6	1.47 E-5
Total	≤1.29 E-5	≤9.08 E-6	≤4.89 E-6	≤2.68 E-5
HALOGENS (Curies)				
I-131	4·99 E-7	2.72 E-7	5.83 E-7	1.35 E-6
I-132	-	-	-	-
I-133	2.02 E-7	2.10 E-7	-	4.12 E-7
I-135	-	-	-	-
Total	7.01 E-7	4.82 E-7	5.83 E-7	1.75 E-6

	OCTOBER	NOVEMBER	DECEMBER	4th Qtr TOTAL
TOTAL NOBLE GASES (Ci)	≤6.50 E-1	≤6.31 E-1	≤6.28 E-1	≤1.91 E+0
TOTAL HALOGENS (Ci)	7.01 E-7	4.82 E-7	5.83 E-7	1.77 E-6
TOTAL PARTICULATE GROSS BETA-GAMMA	≤1.29 E-5	≤9.08 E-6	≤4.89 E-6	≤2.69 E-5
TOTAL PARTICULATE GROSS BETA-GAMMA ($t_{1/2}$ > 8 Days)	≤1.29 E-5	≤9.08 E-6	≤4.89 E-6	≤2.69 E-5
TOTAL TRITIUM (Ci)	1.07 E-1	3.37 E-1	1.74 E+0	2.18 E+0
TOTAL PARTICULATE GROSS ALPHA (Ci)	1.42 E-6	7.38 E-7	5.36 E-7	2.69 E-6
MAXIMUM NOBLE GAS RELEASE RATE (uCi/sec)	2.41 E-1	2.95 E-1	2.43 E-1	

Table 2.3B

BATCH

SEMIANNUAL EFFLUENT REPORT FOR 1978
GASEOUS RELEASE

NOBLE GASES (Curies)	JULY	AUGUST	SEPTEMBER	3rd Qtr
Isotope				TOTAL
Ar 41		1.30 E-1		1.30 E-1
Kr-85		-		-
Kr-85m		-		-
Kr-87		-		-
Kr-88		-		-
Xe-133		6.45 E-1		6.45 E-1
Xe-133m		-		-
Xe-135		4.36 E-2		4.36 E-2
Xe-135m		-		-
Unident.	≤1.92 E-4	-	≤9.54 E-5	≤ 2.87 E-4
Total	≤1.92 E-4	8.19 E+2	≤9.54 E-5	≤ 8.19 E-1
PARTICULATES (Curies)				
Co-58	-	-	-	-
Co-60	-	2.68 E-7	-	2.68 E-7
Cs-134	-	2.30 E-7	-	2.30 E-7
Cs-137	-	-	-	-
Ba/La-140	-	-	-	-
Sr-89	-	-	-	-
Sr-90	-	-	-	-
Na-24	-	5.40 E-7	-	5.40 E-7
Rb-88	-	-	-	-
Rn-222	3.18 E-5	1.68 E-5	1.77 E-5	6.63 E-5
Unident.	1.43 E-4	1.21 E-4	8.33 E-5	3.47 E-4
Total	1.75 E-4	1.39 E-4	1.01 E-4	4.14 E-4
HALOGENS (Curies)				
I-131		4.90 E-7		4.90 E-7
I-132		-		-
I-133		1.01 E-6		1.01 E-6
I-135		-		-
Total		1.50 E-6		1.50 E-6

	JULY	AUGUST	SEPTEMBER	3rd Qtr TOTAL
TOTAL NOBLE GASES (Ci)	≤1.92 E-4	8.19 E-1	≤9.54 E-5	≤8.19 E-1
TOTAL HALOGENS (Ci)	-	1.50 E-6	-	1.50 E-6
TOTAL PARTICULATE GROSS BETA-GAMMA	1.75 E-4	1.39 E-4	1.01 E-4	4.14 E-4
TOTAL PARTICULATE GROSS BETA-GAMMA ($t_{1/2}$ > 8 Days)	1.43 E-4	1.20 E-4	8.33 E-5	3.46 E-4
TOTAL TRITIUM (Ci)	3.86 E-3	5.09 E-2	≤1.44 E-3	≤5.62 E-2
TOTAL PARTICULATE GROSS ALPHA (Ci)	2.78 E-5	2.52 E-5	1.65 E-5	6.95 E-5
MAXIMUM NOBLE GAS RELEASE RATE (uCi/sec)	≤1.22 E-1	≤3.44 E+2	≤ 5.88 E-2	

Table 2.3C

BATCH

SEMIANNUAL EFFLUENT REPORT FOR 1978
GASEOUS RELEASE

	OCTOBER	NOVEMBER	DECEMBER	4th Qtr TOTAL
NOBLE GASES (Curies)				
Isotope				
Ar-41	1.60 E-1	3.02 E-1	4.03 E-1	8.65 E-1
Kr-85	7.21 E-1	-	6.23 E-1	1.34 E+0
Kr-85m	-	2.49 E-3	1.59 E-2	1.84 E-2
Kr-87	-	-	-	-
Kr-88	-	-	9.74 E-3	9.74 E-3
Xe-133	6.68 E-1	1.55 E+0	2.66 E+0	4.88 E+0
Xe-133m	-	-	5.23 E-2	5.23 E-2
Xe-135	3.87 E-2	8.92 E-2	3.32 E-1	4.60 E-1
Xe-135m	-	-	-	-
Unident.	-	4.63 E-2	≤1.06 E-4	≤4.64 E-2
Total	1.59 E+0	1.99 E+0	≤4.10 E 0	≤7.68 E 0
PARTICULATES (Curies)				
Co-58	-	-	-	-
Co-60	-	2.20 E-7	2.19 E-7	4.39 E-7
Cs-134	-	-	-	-
Cs-137	-	-	-	-
Ba/La-140	-	-	-	-
Sr-89	-	-	-	-
Sr-90	-	-	-	-
Cs-138	-	-	2.20 E-7	2.20 E-7
Rb-88	-	-	1.79 E-6	1.79 E-6
Rn-222	1.55 E-5	7.30 E-6	1.05 E-5	3.33 E-5
Unident.	1.05 E-4	3.57 E-5	4.39 E-5	1.85 E-4
Total	1.21 E-4	4.32 E-5	5.66 E-5	2.20 E-4
HALOGENS (Curies)				
I-131	5.69 E-7	9.22 E-7	1.37 E-7	2.86 E-6
I-132	-	1.78 E-7	-	1.78 E-7
I-133	1.12 E-6	1.36 E-6	2.12 E-6	4.60 E-6
I-135	-	8.04 E-7	-	8.04 E-7
Total	1.69 E-6	3.26 E-6	3.49 E-6	8.44 E-6

	OCTOBER	NOVEMBER	DECEMBER	4th Qtr TOTAL
TOTAL NOBLE GASES (Ci)	1.59 E+0	1.99 E+0	≤4.10 E+0	≤7.68 E+0
TOTAL HALOGENS (Ci)	1.69 E-6	3.26 E-6	3.49 E-6	8.44 E-6
TOTAL PARTICULATE GROSS BETA-GAMMA	1.21 E-4	4.32 E-5	5.66 E-5	2.20 E-4
TOTAL PARTICULATE GROSS BETA-GAMMA ($t_{1/2}$ > 8 Days)	1.05 E-4	3.59 E-5	2.19 E-7	1.41 E-4
TOTAL TRITIUM (Ci)	≤1.13 E-2	1.38 E-1	3.06 E-1	4.55 E-1
TOTAL PARTICULATE GROSS ALPHA (Ci)	1.60 E-5	7.42 E-6	5.42 E-6	2.88 E-5
MAXIMUM NOBLE GAS RELEASE RATE (uCi/sec)	6.35 E+2	3.51 E+2	8.40 E+2	

Table 2.3C

3.0 LIQUID EFFLUENTS

The total liquid radioactive release for each quarter was well below the Technical Specification limits of 10 curies per quarter. The 3rd quarter releases were 8.5% of the yearly objective applied by quarter of 1.25 curies, and the 4th quarter releases were 4.7% of the objective.

Instantaneous release concentrations are limited by the individual radionuclide concentrations established in 10 CFR 20, Appendix B, for unrestricted areas. During the report period, none of the isotopes released exceeded the concentrations specified in Appendix B.

The 3rd and 4th quarter release concentrations for liquids, excluding tritium and dissolved gases, were 3.00 E-9 uCi/ml and 1.89 E-9 uCi/ml respectively, averaging 2.46 E-9 uCi/ml for the report period. The average concentration of tritium released was well below both Technical Specification limits and annual objectives.

Table 3.1 presents a quarterly summation of the total release, average concentration and percent of applicable Technical Specification limit for three categories of liquid effluents. It also presents the gross alpha release, volume of waste released and volume of dilution water used. Table 3.2 is a monthly summation of the same information in Table 3.1, plus the quantity of the individual isotopes released to unrestricted areas.

Table 3.1

Semiannual Effluent Report (1978)
Liquid Effluents - Summation of All Releases

	3rd Qtr	4th Qtr	Total
Fission and Activation Products			
Total Release (excluding H_3 and dissolved gases) (Ci)	1.06 E-1	5.85 E-2	1.65 E-1
Average Concentration (uCi/ml)	3.00 E-9	1.86 E-9	2.46 E-9
Percent of Tech Spec (10 Ci/Qtr) (%)	1.06 E 0	5.85 E-1	-
Tritium			
Total Release (Ci)	6.89 E+1	7.82 E+1	1.47 E+2
Average Concentration (uCi/ml)	1.95 E-6	2.48 E-6	2.20 E-6
Percent of Tech Spec (3.0 E-3 uCi/ml) (%)	6.50 E-2	8.27 E-2	7.33 E-2
Dissolved Gases			
Total Release (Ci)	6.08 E-4	7.85 E-5	6.87 E-4
Average Concentration (uCi/ml)	5.33 E-11	7.7 E-12	3.05 E-11
No applicable Tech Spec			
Gross Alpha Activity			
Total Release (Ci)	< 2.66 E-4	< 2.78 E-4	< 5.44 E-4
Volume of Waste Released			
(liters)	2.66 E+6	2.78 E+6	5.44 E+6
Volume of Dilution Water			
(liters)	3.53 E+10	3.15 E+10	6.68 E+10

Table 3.2
Semiannual Effluent Report
Liquid Effluents

LIQUID RELEASES	MONTH / UNITS	July	August	September	October	November	December	TOTAL
1. GROSS RADIOACTIVITY *								
a. Total Released	Curies	5.16 E-2	2.88 E-2	2.60 E-2	3.05 E-2	1.82 E-2	1.03 E-2	1.65 E-1
b. Average Conc. Released	µCi/ml	4.69 E-9	2.23 E-9	2.28 E-9	2.72 E-9	1.80 E-9	1.01 E-9	
c. Maximum Conc. Released	µCi/ml	3.68 E-8	1.52 E-8	2.55 E-8	1.20 E-8	1.00 E-8	4.30 E-9	
2. TRITIUM								
a. Total Released	Curies	1.04 E+1	2.11 E+1	3.74 E+1	3.63 E+1	2.60 E+1	1.59 E+1	1.47 E+2
b. Average Conc. Released	µCi/ml	9.45 E-7	1.64 E-6	3.28 E-6	3.24 E-6	2.57 E-6	1.56 E-6	
3. DISSOLVED NOBLE GASES								
a. Total Released	Curies	-	-	6.08 E-4	-	-	7.85 E-5	6.87 E-4
b. Average Conc. Released	µCi/ml	-	-	5.33 E-11	-	-	7.70 E-12	
4. GROSS ALPHA ACTIVITY								
a. Total Released	Curies	≤7.91 E-5	≤9.47 E-5	≤9.19 E-5	≤9.22 E-5	≤8.68 E-5	≤9.87 E-5	≤5.43 E-4
b. Average Conc. Released	µCi/ml	≤1.0 E-7	≤1.0 E-7	≤1.0 E-7	≤1.0 E-7	≤1.0 E-7	≤1.0 E-7	
5. VOLUME OF LIQUID WASTE RELEASED	Liters	7.91 E+5	9.47 E+5	9.19 E+5	9.22 E+5	8.68 E+5	9.87 E+5	5.43 E+6
6. VOLUME OF DILUTION WATER	Liters	1.10 E+10	1.29 E+10	1.14 E+10	1.12 E+10	1.01 E+10	1.02 E+10	6.68 E+10

Table 3.2
Semiannual Effluent Report
Liquid Effluents

LIQUID RELEASES (CONT.)	MONTH / UNITS	July	August	September	October	November	December	TOTAL
7. ISOTOPES RELEASED								
Sr 89	Curies	1.11 E-5	1.33 E-5	1.29 E-5	7.01 E-6	6.60 E-6	7.50 E-6	5.84 E-5
Sr 90	Curies	3.72 E-6	4.45 E-6	4.32 E-6	<3.59 E-6	3.39 E-6	<3.85 E-6	<2.33 E-5
	Curies							
Co 58	Curies	1.85 E-2	7.79 E-3	4.73 E-3	1.25 E-2	4.12 E-3	3.63 E-3	5.13 E-2
Co 60	Curies	6.08 E-3	4.70 E-3	3.83 E-3	9.44 E-3	5.96 E-3	4.23 E-3	3.42 E-2
Mn 54	Curies	5.83 E-4	5.60 E-4	2.46 E-4	6.73 E-4	3.07 E-4	1.57 E-4	2.53 E-3
Cs 137	Curies	6.66 E-4	2.23 E-5	3.31 E-3	9.72 E-4	1.20 E-3	3.00 E-5	6.20 E-3
Sb 124	Curies	5.39 E-4	-	2.30 E-4	-	-	-	7.69 E-4
Sb 125	Curies	4.13 E-4	-	7.82 E-4	3.72 E-4	-	9.34 E-4	2.50 E-3
Fe 59	Curies	1.52 E-3	-	-	-	-	-	1.52 E-3
Cs 134	Curies	8.09 E-4	2.68 E-5	1.33 E-5	1.11 E-3	2.33 E-3	3.14 E-5	5.64 E-3
Cs 136	Curies	1.99 E-4	1.93 E-4	-	-	-	-	3.92 E-4
Nb 95	Curies	5.75 E-4	5.95 E-4	7.83 E-6	-	-	-	1.18 E-3
Cr 51	Curies	7.36 E-3	5.96 E-4	-	-	-	-	7.96 E-3
Ag 110 m	Curies	1.41 E-2	1.44 E-2	1.08 E-2	5.44 E-3	4.24 E-3	1.13 E-3	5.01 E-2
Xe 133	Curies	-	-	3.54 E-4	-	-	7.85 E-5	4.33 E-4
Xe-135	Curies	-	-	2.54 E-4	-	-	-	2.54 E-4
I-131	Curies	-	-	5.48 E-5	-	-	-	5.48 E-5
Na 24	Curies	-	-	3.25 E-5	-	-	-	3.25 E-5

4.0 SOLID WASTE DISPOSAL

Table 4.1 is a summation of solid wastes shipped for the second half of 1978. Presented are the types of waste, major nuclide composition and disposition of wastes. No irradiated fuel shipments were made during the report period.

Table 4.1
July thru December 1978 Solid Waste and Irradiated Fuel Shipments

A. Solid Waste Shipped Off-site for Burial or Disposal (Not Irradiated Fuel)

1. Type of Waste	Unit	6 Mo. Period
a. Concreted spent resins	m^3	3.05 E+1
	Ci	1.02 E+3
b. Contaminated filters in concrete drums	m^3	1.91 E 0
	Ci	8.75 E 0
c. Dry compressible waste & contaminated scrap	m^3	2.12 E-1
	Ci	3.70 E-1

2. Estimate of Major Nuclide by Composition (By Type of Waste)	%	Ci
a. Cobalt - 58	2.4	2.45 E+1
Cobalt - 60	42.3	4.32 E+2
Cesium - 137	32.0	3.26 E+2
Cesium - 134	17.0	1.73 E+2
Manganese - 54	6.3	6.43 E+1
b. Cobalt - 60	42.3	3.70 E 0
Cesium - 137	32.0	2.80 E 0
Cesium - 134	17.0	1.48 E 0
Manganese - 54	6.3	5.51 E-1
Cobalt - 58	2.4	2.10 E-1
c. Cobalt - 60	42.3	1.56 E-1
Cesium - 137	32.0	1.18 E-1
Cesium - 134	17.0	6.29 E-2
Manganese - 54	6.3	2.33 E-2
Cobalt - 58	2.4	8.88 E-3

3. Solid Waste Disposition

Date of Shipments	Mode of Transportation	Destination
7-19	Highway Carrier Type B Overpack	Barnwell, SC
7-26	Highway Carrier Type B Overpack	Barnewll, SC
8-2	Highway Carrier Type B Overpack	Barnwell, SC
8-10	Highway Carrier Type B Overpack	Barnwell, SC
8-23	Highway Carrier Type B Overpack	Barnwell, SC

Date of Shipments	Mode of Transportation	Destination
9-7	Highway Carrier Type B Overpack	Barnwell, SC
9-13	Highway Carrier Type B Overpack	Barnwell, SC
9-20	Highway Carrier Type B Overpack	Barnwell, SC
10-11	Highway Carrier Type B Overpack	Barnwell, SC
10-18	Highway Carrier Type B Overpack	Barnwell, SC
10-25	Highway Carrier Type B Overpack	Barnwell, SC

B. Irradiated Fuel Shipments

No irradiated fuel shipments were made from the Kewaunee Nuclear Plant during the second six months of 1978.

5.0 CHANGES TO PREVIOUS REPORTS

5.1 The "total" Ag-110m liquid effluent reported on page 17 of the July - December 1977 report is in error. The correct figure is 1.10 E-3.

5.2 The volume of waste in the July - December 1976 report is in error. A corrected page 18 is attached to replace the previous page 18.

TABLE 4.1

SEMIANNUAL EFFLUENT REPORT (1976)

JULY - DECEMBER

SOLID WASTE AND IRRADIATED FUEL SHIPMENTS

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

1. TYPE OF WASTE	UNIT	6 MO. PERIOD
a. Spent Resins, Evaporator Bottoms, Etc.	(m^3)	5.94 E+0
	(Ci)	1.70 E+0
b. Dry Compressible Waste, Contaminated Equipment and Scrap, Etc.	(m^3)	7.22 E+0
	(Ci)	5.04 E+0
c. Irradiated Components, Control Rods, Vessel Head Seals	(m^3)	2.54 E+0
	(Ci)	1.04 E+1

2. ESTIMATE OF MAJOR NUCLIDE BY COMPOSITION (BY TYPE OF WASTE)		
a. Mixed Fission and Corrosion Products	100%	1.70 E+0 Ci
b. Mixed Fission and Corrosion	100%	5.04 E+0 Ci
c. Mixed Fission and Corrosion	100%	1.04 E+1 Ci

3. SOLID WASTE DISPOSITION

Number of Shipments	Mode of Transportation	Destination
1	Exclusive Use Vehicle (Tri-State Trucking Co.)	Atcor Inc. Park Mall Peekskill, NY 10566

B. Irradiated Fuel Shipments (Disposal)

No irradiated fuel was shipped from Kewaunee Nuclear Plant during the second six months of 1976.