

KEWAUNEE NUCLEAR POWER PLANT

SEMI-ANNUAL
EFFLUENT RELEASE REPORT
JULY - DECEMBER, 1990

WISCONSIN PUBLIC SERVICE CORPORATION

WISCONSIN POWER & LIGHT COMPANY

MADISON GAS & ELECTRIC COMPANY

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GREEN BAY, WISCONSIN
FEBRUARY 1991

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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. It includes data from all effluent releases made from July through December 1990. The report contains summaries of the gaseous and liquid releases made to the environment including the quantity, characterization, time duration and calculated radiation dose at the site boundary resulting from these releases. The report also includes a summation of solid waste disposal, revisions to the Process Control Program and the Offsite Dose Calculation Manual, and addresses the cumulative meteorological data.

1.1 Technical Specification Limits

Specifications are set to insure that offsite doses are maintained as low as reasonably achievable while still allowing for practical and dependable operation of the Kewaunee Plant.

The Kewaunee Offsite Dose Calculation Manual (ODCM) is used in conjunction with Section 7 of the Technical Specifications. The ODCM describes the methodology and parameters used in:

1. The calculation of radioactive liquid and gaseous effluent monitoring instrumentation alarm/trip setpoints.
2. The calculation of radioactive liquid and gaseous concentrations, dose rates and cumulative quarterly and annual doses. The ODCM methodology is acceptable for use in demonstrating compliance with 10 CFR 20.106; 10 CFR 50, Appendix I; and 40 CFR 190.

2.0 GASEOUS EFFLUENTS

2.1 Lower Limits of Detection (LLD) for Gaseous Effluents

Gaseous radioactive effluents are released in both the continuous mode and the batch mode. The auxiliary building stack is sampled continuously for particulates, halogens and Strontium by an "off-line" sample train. This stack is also grab-sampled daily for gaseous gamma emitters. Batch releases are sampled prior to release for principal gaseous and particulate gamma emitters, halogens and tritium.

*** The December 1990 proportional composites for Gross Alpha, Strontium 89 and Strontium 90 were not available at the time this report was written. When these values are available, applicable revisions shall be submitted.

The LLD's for gaseous radioanalyses, as listed in Table 8.4 of the Kewaunee Technical Specifications, are:

<u>Analysis</u>	<u>LLD (uCi/ml)</u>
Gaseous Gamma Emitters	1.00 E-04
Iodine 131	3.00 E-12
Particulate Gamma Emitters	1.00 E-11
Particulate Gross Alpha	1.00 E-11
Strontium 89, 90	1.00 E-11
Noble Gases, Gross Beta or Gamma	1.00 E-06

The nominal "a priori" LLD values are shown below.

<u>Isotope</u>	<u>a priori LLD (uCi/ml)</u>
a. Gaseous emissions:	
Kr-87	2.77 E-8
Kr-88	2.92 E-8
Xe-133	3.29 E-8
Xe-133m	7.78 E-8
Xe-135	8.49 E-9
Xe-138	4.10 E-8

b. Particulate emissions:

Mn-54	5.27 E-14
Fe-59	7.19 E-14
Co-58	2.99 E-14
Co-60	1.16 E-13
Zn-65	6.41 E-14
Mo-99	2.55 E-14
Cs-134	5.66 E-14
Cs-137	5.89 E-14
Ce-141	3.23 E-14
Ce-144	1.69 E-13

c. Other identifiable gamma emitters:

Ar-41	1.27 E-8
Kr-85	3.94 E-6
Kr-85m	9.13 E-9
Kr-89	4.04 E-7
Xe-127	1.49 E-8
Xe-131m	4.23 E-7
Xe-135m	1.54 E-8
Xe-137	1.50 E-7
I-131	4.40 E-14

d. Composite particulate samples:

Sr-89	1 E-14
Sr-90	1 E-14
Gross Alpha	1.00 E-14

These "a priori" LLDs represent the capabilities of the counting systems in use, not an after the fact "a posteriori" limit for a particular measurement.

2.2 Gaseous Batch Release Statistics

The following is a summation of all gaseous batch releases made during the second half of 1990.

Number of batch releases	8
Total time for all batch releases (Sec) . .	2.30 E+5
Maximum time for one batch release (Sec) . .	3.95 E+4
Average time for a batch release (Sec) . . .	2.88 E+4
Minimum time for a batch release (Sec) . . .	1.74 E+3

2.3 Gaseous Effluent Data

The following Table 2.1 presents a quarterly summation of the total activity released and average release rates of four categories of gaseous effluents. Table 2.2 lists the quarterly sums of individual gaseous radionuclides released by continuous and batch modes. Table 2.3 is essentially the same data, but is presented as monthly summations. Table 2.4 presents the dose limits for gaseous effluents for the 3rd and 4th quarters, and the calculated doses this year from gaseous effluents.

TABLE 2.1
Semiannual Radioactive Effluent Report 1990
Gaseous Effluents-Summation of all Releases

	<u>3rd Quarter</u>	<u>4th Quarter</u>
<u>Fission and Activation Gases</u>		
Total Activity Released (Ci)	1.35 E-2	1.44 E-1
Average Release Rate (uCi/Sec)	1.70 E-3	1.81 E-2
<u>Iodines</u>		
Total Activity Released (Ci)	-0-	-0-
Average Release Rate (uCi/Sec)	-0-	-0-
<u>Particulates</u>		
Total Activity Released (Ci)	1.13 E-3	***
Average Release Rate (uCi/Sec)	1.42 E-4	***
Gross Alpha Released (Ci)	6.35 E-4	2.94 E-4
<u>Tritium</u>		
Total Activity Released (Ci)	2.95 E-1	5.57 E-1
Average Release Rate (uCi/Sec)	3.71 E-2	7.01 E-2

TABLE 2.2
Semiannual Radioactive Effluent Report 1990
Gaseous Effluents

<u>Nuclides Released (Ci)</u>	<u>Continuous Mode</u>		<u>Batch Mode</u>	
	<u>3rd Qtr</u>	<u>4th Qtr</u>	<u>3rd Qtr</u>	<u>4th Qtr</u>
<u>Fission Gases</u>				
Kr-85	-	2.90 E-2	1.35 E-2	-
Xe-133	-	1.15 E-1	-	-
Xe-133m	-	-	-	-
Xe-135	-	-	-	-
Unidentified	-	-	-	-
Total for Period	-	1.44 E-1	1.35 E-2	-
<u>Particulates</u>				
Co-60	6.30 E-7	1.05 E-6	-	-
Cs-137	1.96 E-7	5.08 E-7	-	-
Sr-89	-	***	-	-
Sr-90	-	***	-	-
Unidentified	-	-	1.13 E-3	5.59 E-4
Total for Period	8.26 E-7	***	1.13 E-3	5.59 E-4
<u>Iodines</u>				
I-131	-	-	-	-
I-132	-	-	-	-
I-133	-	-	-	-
Total for Period	-	-	-	-

TABLE 2.3A
Semiannual Radioactive Effluent Report 1990
3rd Quarter Gaseous Release
Total of all Releases

Noble Gases (Curies)

<u>Isotope</u>	<u>July</u>	<u>August</u>	<u>September</u>	<u>Total</u>
Kr-85	-	-	1.35 E-2	1.35 E-2
Xe-133	-	-	-	-
Xe-133m	-	-	-	-
Xe-135	-	-	-	-
Unidentified	-	-	-	-
Total	-	-	1.35 E-2	1.35 E-2

Particulates (Curies)

<u>Isotope</u>	<u>July</u>	<u>August</u>	<u>September</u>	<u>Total</u>
Co-60	6.05 E-7	2.50 E-8	-	6.30 E-7
Cs-137	8.90 E-8	1.07 E-7	-	1.96 E-7
Sr-89	-	-	-	-
Sr-90	-	-	-	-
Unidentified	2.22 E-4	3.67 E-4	5.41 E-4	1.13 E-3
Total	2.23 E-4	3.67 E-4	5.41 E-4	1.13 E-3

Halogens (Curies)

<u>Isotope</u>	<u>July</u>	<u>August</u>	<u>September</u>	<u>Total</u>
I-131	-	-	-	-
I-132	-	-	-	-
I-133	-	-	-	-
Total	-	-	-	-

TABLE 2.3A (con't)
Semiannual Radioactive Effluent Report 1990
3rd Quarter Gaseous Release
Total of all Releases

Summary

	<u>July</u>	<u>August</u>	<u>September</u>	<u>Total</u>
Total Noble Gases (Ci)	-	-	1.35 E-2	1.35 E-2
Total Halogens (Ci)	-	-	-	-
Total Particulate Gross Beta-Gamma (Ci)	2.23 E-4	3.67 E-4	5.41 E-4	1.13 E-3
Total Particulate Gross Beta-Gamma Half-Lives >8 Days (Ci)	6.94 E-7	1.32 E-7	-	8.26 E-7
Total Tritium (Ci)	-	6.10 E-2	2.34 E-1	2.95 E-1
Total Particulate Gross Alpha (Ci)	1.38 E-4	2.17 E-4	2.80 E-4	6.35 E-4
Maximum Noble Gas Release Rate (uCi/Sec)	$\leq 9.98 \text{ E-1}$	$\leq 1.03 \text{ E+0}$	$\leq 8.99 \text{ E+0}$	-

TABLE 2.3A (con't)
Semiannual Radioactive Effluent Report 1990
4th Quarter Gaseous Release
Total of all Releases

Noble Gases (Curies)

<u>Isotope</u>	<u>October</u>	<u>November</u>	<u>December</u>	<u>Total</u>
Kr-85	2.90 E-2	-	-	2.90 E-2
Xe-133	1.15 E-1	-	-	1.15 E-1
Xe-133m	-	-	-	-
Xe-135	-	-	-	-
Unidentified	-	-	-	-
Total	1.44 E-1	-	-	1.44 E-1

Particulates (Curies)

<u>Isotope</u>	<u>October</u>	<u>November</u>	<u>December</u>	<u>Total</u>
Co-60	-	2.06 E-7	8.41 E-7	1.05 E-6
Cs-137	7.40 E-8	2.11 E-7	2.23 E-7	5.08 E-7
Sr-89	-	-	***	***
Sr-90	-	-	***	***
Unidentified	2.00 E-4	8.20 E-5	2.77 E-4	5.59 E-4
Total	2.00 E-4	8.24 E-5	***	***

Halogens (Curies)

<u>Isotope</u>	<u>October</u>	<u>November</u>	<u>December</u>	<u>Total</u>
I-131	-	-	-	-
I-132	-	-	-	-
I-133	-	-	-	-
Total	-	-	-	-

TABLE 2.3A (con't)
Semiannual Radioactive Effluent Report 1990
4th Quarter Gaseous Release
Total of all Releases

Summary

	<u>October</u>	<u>November</u>	<u>December</u>	<u>Total</u>
Total Noble Gases (Ci)	1.44 E-1	-	-	1.44 E-1
Total Halogens (Ci)	-	-	-	-
Total Particulate Gross Beta-Gamma (Ci)	2.00 E-4	8.24 E-5	***	***
Total Particulate Gross Beta-Gamma Half-Lives >8 Days (Ci)	7.40 E-8	4.17 E-7	***	***
Total Tritium (Ci)	3.73 E-1	1.84 E-1	-	5.57 E-1
Total Particulate Gross Alpha (Ci)	1.08 E-4	4.51 E-5	1.41 E-4	2.94 E-4
Maximum Noble Gas Release Rate (uCi/Sec)	1.48 E+0	≤9.31 E-1	≤9.14 E-1	-

TABLE 2.3B
Semiannual Radioactive Effluent Report 1990
3rd Quarter Gaseous Release
Continuous Mode Only

Noble Gases (Curies)

<u>Isotope</u>	<u>July</u>	<u>August</u>	<u>September</u>	<u>Total</u>
Kr-85	-	-	-	-
Xe-133	-	-	-	-
Xe-133m	-	-	-	-
Xe-135	-	-	-	-
Unidentified	-	-	-	-
Total	-	-	-	-

Particulates (Curies)

<u>Isotope</u>	<u>July</u>	<u>August</u>	<u>September</u>	<u>Total</u>
Co-60	6.05 E-7	2.50 E-8	-	6.30 E-7
Cs-137	8.90 E-8	1.07 E-7	-	1.96 E-7
Sr-89	-	-	-	-
Sr-90	-	-	-	-
Unidentified	-	-	-	-
Total	6.94 E-7	1.32 E-7	-	8.26 E-7

Halogens (Curies)

<u>Isotope</u>	<u>July</u>	<u>August</u>	<u>September</u>	<u>Total</u>
I-131	-	-	-	-
I-132	-	-	-	-
I-133	-	-	-	-
Total	-	-	-	-

TABLE 2.3B (con't)
Semiannual Radioactive Effluent Report 1990
3rd Quarter Gaseous Release
Continuous Mode Only

Summary

	<u>July</u>	<u>August</u>	<u>September</u>	<u>Total</u>
Total Noble Gases (Ci)	-	-	-	-
Total Halogens (Ci)	-	-	-	-
Total Particulate Gross Beta-Gamma (Ci)	6.94 E-7	1.32 E-7	-	8.26 E-7
Total Particulate Gross Beta-Gamma Half-Lives >8 Days (Ci)	6.94 E-7	1.32 E-7	-	8.26 E-7
Total Tritium (Ci)	-	6.10 E-2	2.34 E-1	2.95 E-1
Total Particulate Gross Alpha (Ci)	1.89 E-7	1.54 E-7	-	3.43 E-7
Maximum Noble Gas Release Rate (uCi/Sec)	≤8.56 E-1	≤8.68 E-1	≤9.03 E-1	-

TABLE 2.3B (con't)
Semiannual Radioactive Effluent Report 1990
4th Quarter Gaseous Release
Continuous Mode Only

Noble Gases (Curies)

<u>Isotope</u>	<u>October</u>	<u>November</u>	<u>December</u>	<u>Total</u>
Kr-85	2.90 E-2	-	-	2.90 E-2
Xe-133	1.15 E-1	-	-	1.15 E-1
Xe-133m	-	-	-	-
Xe-135	-	-	-	-
Unidentified	-	-	-	-
Total	1.44 E-1	-	-	1.44 E-1

Particulates (Curies)

<u>Isotope</u>	<u>October</u>	<u>November</u>	<u>December</u>	<u>Total</u>
Co-60	-	2.06 E-7	8.41 E-7	1.05 E-6
Cs-137	7.40 E-8	2.11 E-7	2.23 E-7	5.08 E-7
Sr-89	-	-	***	***
Sr-90	-	-	***	***
Unidentified	-	-	-	-
Total	7.40 E-8	4.17 E-7	***	***

Halogens (Curies)

<u>Isotope</u>	<u>October</u>	<u>November</u>	<u>December</u>	<u>Total</u>
I-131	-	-	-	-
I-132	-	-	-	-
I-133	-	-	-	-
Total	-	-	-	-

TABLE 2.3B (con't)
Semiannual Radioactive Effluent Report 1990
4th Quarter Gaseous Release
Continuous Mode Only

Summary

	<u>October</u>	<u>November</u>	<u>December</u>	<u>Total</u>
Total Noble Gases (Ci)	1.44 E-1	-	-	1.44 E-1
Total Halogens (Ci)	-	-	-	-
Total Particulate Gross Beta-Gamma (Ci)	7.40 E-8	4.17 E-7	***	***
Total Particulate Gross Beta-Gamma Half-Lives >8 Days (Ci)	7.40 E-8	4.17 E-7	***	***
Total Tritium (Ci)	3.73 E-1	1.84 E-1	-	5.57 E-1
Total Particulate Gross Alpha (Ci)	2.20 E-8	1.09 E-7	1.44 E-6	1.57 E-6
Maximum Noble Gas Release Rate (uCi/Sec)	1.33 E+0	≤7.99 E-1	≤7.87 E-1	-

TABLE 2.3C
Semiannual Radioactive Effluent Report 1990
3rd Quarter Gaseous Release
Batch Mode Only

Noble Gases (Curies)

<u>Isotope</u>	<u>July</u>	<u>August</u>	<u>September</u>	<u>Total</u>
Kr-85	-	-	1.35 E-2	1.35 E-2
Xe-133	-	-	-	-
Xe-133m	-	-	-	-
Xe-135	-	-	-	-
Unidentified	-	-	-	-
Total	-	-	1.35 E-2	1.35 E-2

Particulates (Curies)

<u>Isotope</u>	<u>July</u>	<u>August</u>	<u>September</u>	<u>Total</u>
Co-60	-	-	-	-
Cs-137	-	-	-	-
Sr-89	-	-	-	-
Sr-90	-	-	-	-
Unidentified	2.22 E-4	3.67 E-4	5.41 E-4	1.13 E-3
Total	2.22 E-4	3.67 E-4	5.41 E-4	1.13 E-3

Halogens (Curies)

<u>Isotope</u>	<u>July</u>	<u>August</u>	<u>September</u>	<u>Total</u>
I-131	-	-	-	-
I-132	-	-	-	-
I-133	-	-	-	-
Total	-	-	-	-

TABLE 2.3C (con't)
 Semiannual Radioactive Effluent Report 1990
 3rd Quarter Gaseous Release
 Batch Mode Only

Summary

	<u>July</u>	<u>August</u>	<u>September</u>	<u>Total</u>
Total Noble Gases (Ci)	-	-	1.35 E-2	1.35 E-2
Total Halogens (Ci)	-	-	-	-
Total Particulate Gross Beta-Gamma (Ci)	2.22 E-4	3.67 E-4	5.41 E-4	1.13 E-3
Total Particulate Gross Beta-Gamma Half-Lives >8 Days (Ci)	-	-	-	-
Total Tritium (Ci)	-	-	2.03 E-5	2.03 E-5
Total Particulate Gross Alpha (Ci)	1.38 E-4	2.17 E-4	2.80 E-4	6.35 E-4
Maximum Noble Gas Release Rate (uCi/Sec)	$\leq 1.42 \text{ E-1}$	$\leq 1.66 \text{ E+1}$	8.09 E+0	-

TABLE 2.3C (con't)
 Semiannual Radioactive Effluent Report 1990
 4th Quarter Gaseous Release
 Batch Mode Only

Noble Gases (Curies)

<u>Isotope</u>	<u>October</u>	<u>November</u>	<u>December</u>	<u>Total</u>
Kr-85	-	-	-	-
Xe-133	-	-	-	-
Xe-133m	-	-	-	-
Xe-135	-	-	-	-
Unidentified	-	-	-	-
Total	-	-	-	-

Particulates (Curies)

<u>Isotope</u>	<u>October</u>	<u>November</u>	<u>December</u>	<u>Total</u>
Co-60	-	-	-	-
Cs-137	-	-	-	-
Sr-89	-	-	-	-
Sr-90	-	-	-	-
Unidentified	2.00 E-4	8.20 E-5	2.77 E-4	5.59 E-4
Total	2.00 E-4	8.20 E-5	2.77 E-4	5.59 E-4

Halogens (Curies)

<u>Isotope</u>	<u>October</u>	<u>November</u>	<u>December</u>	<u>Total</u>
I-131	-	-	-	-
I-132	-	-	-	-
I-133	-	-	-	-
Total	-	-	-	-

TABLE 2.3C (con't)
Semiannual Radioactive Effluent Report 1990
4th Quarter Gaseous Release
Batch Mode Only

Summary

	<u>October</u>	<u>November</u>	<u>December</u>	<u>Total</u>
Total Noble Gases (Ci)	-	-	-	-
Total Halogens (Ci)	-	-	-	-
Total Particulate Gross Beta-Gamma (Ci)	2.00 E-4	8.20 E-5	2.77 E-4	5.59 E-4
Total Particulate Gross Beta-Gamma Half-Lives >8 Days (Ci)	-	-	-	-
Total Tritium (Ci)	-	-	-	-
Total Particulate Gross Alpha (Ci)	1.08 E-4	4.50 E-5	1.40 E-4	2.93 E-4
Maximum Noble Gas Release Rate (uCi/Sec)	≤1.46 E-1	≤1.32 E-1	≤1.27 E-1	-

TABLE 2.4
Semiannual Radioactive Effluent Report 1990
Dose From Gaseous Effluents

The offsite dose limits from radioactive materials in gaseous effluents are specified in Section 7 of the Kewaunee Technical Specifications and can be summarized as follows:

	<u>Whole Body Gamma</u>	<u>Skin Beta</u>	<u>Organ</u>
Quarterly	5 mRad	10 mRad	7.5 mRem
Annual	10 mRad	20 mRad	15.0 mRem

The total release of gaseous effluents during the second six months of 1990 was well within Technical Specification limits. The following offsite doses were calculated using equations 2.7, 2.8 and 2.11 from the Kewaunee ODCM. Calculated offsite doses versus quarterly Technical Specification limits are shown below:

	<u>3rd Qtr</u>	<u>4th Qtr</u>
1. Gamma-Whole Body		
Specification (mRads)	5.00 E+0	5.00 E+0
Actual Dose (mRads)	2.65 E-8	4.69 E-6
% of Specification	5.30 E-7	9.38 E-5
2. Beta-Skin		
Specification (mRads)	1.00 E+1	1.00 E+1
Actual Dose (mRads)	3.00 E-6	2.02 E-5
% of Specification	3.00 E-5	2.02 E-4
3. Ingestion Pathways-Organ		
Specification (mRem)	7.50 E+0	7.50 E+0
Actual Dose (mRem)	4.09 E-5	1.24 E-4
% of Specification	5.45 E-4	1.65 E-3

TABLE 2.4 (cont.)
Semiannual Radioactive Effluent Report 1990
Dose From Gaseous Effluents

In addition, the cumulative annual offsite doses through the end of December versus the annual Technical Specification limits were:

	<u>Annual</u>
1. Gamma-Whole Body	
Specification (mRads)	1.00 E+1
Actual Dose (mRads)	1.01 E-3
% of Specification	1.01 E-2
2. Beta-Skin	
Specification (mRads)	2.00 E+1
Actual Dose (mRads)	5.28 E-4
% of Specification	2.64 E-3
3. Ingestion Pathways-Organ	
Specification (mRem)	1.50 E+1
Actual Dose (mRem)	1.44 E-3
% of Specification	9.60 E-3

3.0 LIQUID EFFLUENTS

3.1 Lower Limits of Detection (LLD) for Liquid Effluents

Liquid radioactive effluents are released as both batch releases and continuous releases. Each batch is sampled prior to release and analyzed for gamma emitters and tritium. A fraction of each sample is retained for a monthly proportional composite which is then analyzed for Gross Alpha, Strontium 89, Strontium 90 and Iron 55.

*** The December 1990 proportional composites for Gross Alpha, Strontium 89, Strontium 90 and Iron 55 were not available at the time that this report was written. When these values are available, applicable revisions shall be submitted.

The LLD's for liquid batch release radioanalyses, as listed in Table 8.3 of the Kewaunee Technical Specifications, are:

<u>Analysis</u>	<u>LLD (uCi/ml)</u>
Principal Gamma Emitters	1.00 E-06
Iodine 131	1.00 E-06
Tritium	1.00 E-05
Gross Alpha	5.00 E-07
Strontium 89, 90	5.00 E-08
Iron 55	1.00 E-06

The actual obtained "a priori" LLD values for batch releases are shown below.

<u>Isotope</u>	<u>a priori LLD (uCi/ml)</u>
Mn-54	1.17 E-7
Fe-59	1.82 E-7
Co-58	8.11 E-8
Co-60	1.20 E-7
Zn-65	2.05 E-7
Mo-99	7.10 E-8
Cs-134	1.32 E-7
Cs-137	1.40 E-7
Ce-141	1.43 E-7
Ce-144	4.26 E-7
I-131	7.48 E-8
H-3	3.79 E-6
Sr-89	2 E-8
Sr-90	1 E-8
Gross Alpha	3 E-9
Fe-55	5 E-8

Continuous liquid releases are grab sampled weekly and analyzed for principal gamma emitters. A fraction of each weekly sample is retained for a monthly proportional composite which is then analyzed for Tritium, Gross Alpha, Strontium 89, Strontium 90 and Iron 55.

The LLD's for liquid continuous release radioanalyses, as listed in Table 8.3 of the Kewaunee Technical Specifications, are:

<u>Analysis</u>	<u>LLD (uCi/ml)</u>
Principal Gamma Emitters	5.00 E-07
Iodine 131	1.00 E-06
Tritium	1.00 E-05
Gross Alpha	5.00 E-07
Strontium 89, 90	5.00 E-08
Iron 55	1.00 E-06

The actual obtained "a priori" LLD values for continuous releases are shown below.

<u>Isotope</u>	<u>a priori LLD (uCi/ml)</u>
Mn-54	3.08 E-8
Fe-59	6.78 E-8
Co-58	2.71 E-8
Co-60	4.46 E-8
Zn-65	5.91 E-8
Mo-99	2.21 E-8
Cs-134	3.47 E-8
Cs-137	3.00 E-8
Ce-141	3.60 E-8
Ce-144	1.69 E-7
I-131	3.07 E-8
H-3	3.79 E-6
Sr-89	1 E-8
Sr-90	1 E-8
Gross Alpha	3 E-8
Fe-55	3 E-8

3.2 Liquid Batch Release Statistics

The following is a summation of all liquid batch releases made during the second half of 1990.

Number of batch releases and gallonage:

Laundry	88	82,538.9 Gal.
Boron Recycle	13	79,374.6 Gal.
Miscellaneous Sources	11	94,090.5 Gal.

Total time for all batch releases 9904 Min.

Maximum time for one batch release 915 Min.

Minimum time for one batch release 19 Min.

Average time for a batch release 88.4 Min.

3.3 Liquid Effluent Data

The following Table 3.1 presents a quarterly summation of the total activity released and average concentration for all liquid effluents. It also presents the gross alpha activity released, volume of waste released and volume of dilution water used. Tables 3.2 and 3.3 are monthly summations of the same information in Table 3.1. Table 3.2 contains the quantity of the individual isotopes released to the unrestricted area for batch releases. Table 3.3 presents a monthly summation of gross radioactivity, tritium, gross alpha and isotopic activity for the secondary blowdown and leakage releases. It also presents the monthly total volume for these releases and dilution volumes. Table 3.4 presents the doses from liquid effluents for the 3rd and 4th quarter and the calculated doses this year from liquid effluents.

TABLE 3.1
Semiannual Radioactive Effluent Report 1990
Liquid Effluents - Summation of all Releases

	<u>3rd Qtr</u>	<u>4th Qtr</u>	<u>Total</u>
<u>Fission and Activation Products</u>			
Total Release (Excluding H ₃ and Dissolved Gases) (Ci)	1.36 E-2	***	***
Average Concentration (uCi/ml)	1.81 E-9	***	
<u>Tritium</u>			
Total Release (Ci)	7.67 E+1	1.32 E+2	2.09 E+2
Average Concentration (uCi/ml)	1.04 E-5	2.69 E-5	
Percent of Tech Spec Limit (3.0 E-3 uCi/ml) (%)	3.47 E-1	8.97 E-1	
<u>Dissolved Gases</u>			
Total Release (Ci)	-0-	-0-	-0-
Average Concentration (uCi/ml)	-0-	-0-	
Percent of Tech Spec Limit (2.0 E-4 uCi/ml) (%)	-0-	-0-	
<u>Gross Alpha Activity</u>			
Total Release (Ci)	<2.36 E-4	***	***
<u>Volume of Waste Released (Batch Releases)</u>			
(Liters)	4.48 E+5	5.21 E+5	9.69 E+5
<u>Volume of Dilution Water (Batch Releases)</u>			
(Liters)	7.37 E+9	4.90 E+9	1.23 E+10

TABLE 3.2A
Semiannual Radioactive Effluent Report 1990
Liquid Effluents - Batch Releases

<u>Liquid Releases</u>	<u>July</u>	<u>August</u>	<u>September</u>	<u>Total</u>
<u>Gross Radioactivity</u>				
Total Release (Excluding Tritium and Dissolved Gases) (Ci)	6.31 E-3	1.85 E-3	5.10 E-3	1.33 E-2
Average Concentration (uCi/ml)	1.61 E-9	2.03 E-9	2.00 E-9	
<u>Tritium</u>				
Total Release (Ci)	2.67 E+1	1.73 E+0	4.81 E+1	7.65 E+1
Average Concentration (uCi/ml)	6.83 E-6	1.89 E-6	1.89 E-5	
<u>Dissolved Noble Gases</u>				
Total Release (Ci)	-0-	-0-	-0-	-0-
Average Concentration (uCi/ml)	-0-	-0-	-0-	
<u>Gross Alpha Activity</u>				
Total Release (Ci)	<5.38 E-7	<2.58 E-7	<3.66 E-7	<1.16 E-6
Average Concentration (uCi/ml)	<1.38 E-13	<2.83 E-13	<1.44 E-13	
<u>Volume of Waste Released</u>				
(Liters)	1.79 E+5	8.60 E+4	1.83 E+5	4.48 E+5
<u>Volume of Dilution Water</u>				
(Liters)	3.91 E+9	9.13 E+8	2.55 E+9	7.37 E+9

TABLE 3.2A (con't)
Semiannual Radioactive Effluent Report 1990
Liquid Effluents - Batch Releases

	<u>July</u>	<u>August</u>	<u>September</u>	<u>Total</u>
<u>Isotopes Released</u>				
(Curies)				
Sr-89	-0-	-0-	-0-	-0-
Sr-90	-0-	-0-	-0-	-0-
Fe-55	4.48 E-4	1.85 E-4	1.07 E-3	1.70 E-3
Fe-59	3.81 E-5	-0-	-0-	3.81 E-5
Co-58	2.72 E-3	6.72 E-4	7.62 E-4	4.15 E-3
Co-60	1.50 E-3	4.22 E-4	1.80 E-3	3.72 E-3
Mn-54	8.59 E-5	-0-	9.95 E-5	1.85 E-4
Ag-110m	1.09 E-3	4.17 E-4	1.17 E-3	2.68 E-3
Sb-124	6.99 E-5	-0-	-0-	6.99 E-5
Sb-125	2.04 E-4	-0-	-0-	2.04 E-4
Nb-95	5.26 E-5	-0-	9.14 E-5	1.44 E-4
Sn-113	6.06 E-5	-0-	8.96 E-5	1.50 E-4
Zr-95	2.09 E-5	-0-	-0-	2.09 E-5
W-187	1.92 E-5	1.55 E-4	-0-	1.74 E-4
Zr-97	-0-	-0-	1.52 E-5	1.52 E-5

TABLE 3.2B
Semiannual Radioactive Effluent Report 1990
Liquid Effluents - Batch Releases

<u>Liquid Releases</u>	<u>October</u>	<u>November</u>	<u>December</u>	<u>Total</u>
<u>Gross Radioactivity</u>				
Total Release (Excluding Tritium and Dissolved Gases) (Ci)	1.65 E-3	1.11 E-2	***	***
Average Concentration (uCi/ml)	7.67 E-10	1.20 E-8	***	
<u>Tritium</u>				
Total Release (Ci)	6.18 E+1	7.15 E+0	6.26 E+1	1.32 E+2
Average Concentration (uCi/ml)	2.87 E-5	7.75 E-6	3.42 E-5	
<u>Dissolved Noble Gases</u>				
Total Release (Ci)	-0-	-0-	-0-	-0-
Average Concentration (uCi/ml)	-0-	-0-	-0-	
<u>Gross Alpha Activity</u>				
Total Release (Ci)	<3.89 E-7	<4.51 E-7	***	***
Average Concentration (uCi/ml)	<1.81 E-13	<4.89 E-13	***	
<u>Volume of Waste Released</u>				
(Liters)	1.94 E+5	1.13 E+5	2.14 E+5	5.21 E+5
<u>Volume of Dilution Water</u>				
(Liters)	2.15 E+9	9.23 E+8	1.83 E+9	4.90 E+9

TABLE 3.2B (con't)
Semiannual Radioactive Effluent Report 1990
Liquid Effluents - Batch Releases

	<u>October</u>	<u>November</u>	<u>December</u>	<u>Total</u>
<u>Isotopes Released</u>				
(Curies)				
Sr-89	-0-	-0-	***	***
Sr-90	-0-	-0-	***	***
Fe-55	1.44 E-4	1.55 E-3	***	***
Co-58	7.02 E-4	1.02 E-3	3.19 E-4	2.04 E-3
Co-60	5.28 E-4	4.53 E-3	9.86 E-4	6.04 E-3
Mn-54	2.06 E-5	2.35 E-4	4.04 E-5	2.96 E-4
Ag-110m	2.24 E-4	3.36 E-3	8.46 E-4	4.43 E-3
Sb-125	-0-	3.29 E-4	-0-	3.29 E-4
Nb-95	2.03 E-5	-0-	-0-	2.03 E-5
Sn-113	-0-	8.88 E-5	2.30 E-5	1.12 E-4
Zr-97	1.49 E-5	2.73 E-5	-0-	4.22 E-5

TABLE 3.3A
Semiannual Radioactive Effluent Report 1990
Liquid Effluents - Continuous Releases

<u>Liquid Releases</u>	<u>July</u>	<u>August</u>	<u>September</u>	<u>Total</u>
<u>Gross Radioactivity</u>				
Total Release (Excluding Tritium and Dissolved Gases) (Ci)	7.80 E-5	2.09 E-4	-0-	2.87 E-4
Average Concentration (uCi/ml)	1.16 E-12	3.10 E-12	-0-	
<u>Tritium</u>				
Total Release (Ci)	3.67 E-2	7.99 E-2	4.26 E-2	1.59 E-1
<u>Gross Alpha Activity</u>				
Total Release (Ci)	≤2.03 E-5	≤1.80 E-5	≤1.97 E-4	≤2.35 E-4
<u>Volume of Continuous Release</u>				
(Liters)	1.01 E+7	1.13 E+7	1.01 E+7	3.15 E+7
<u>Volume of Dilution Flow</u>				
(Liters)	6.75 E+10	6.75 E+10	6.53 E+10	2.00 E+11
<u>Isotopes Released</u>				
(Curies)				
Sr-89	-0-	-0-	-0-	-0-
Sr-90	-0-	-0-	-0-	-0-
Fe-55	-0-	2.09 E-4	-0-	2.09 E-4
Co-58	7.80 E-5	-0-	-0-	7.80 E-5

TABLE 3.3B
Semiannual Radioactive Effluent Report 1990
Liquid Effluents - Continuous Releases

<u>Liquid Releases</u>	<u>October</u>	<u>November</u>	<u>December</u>	<u>Total</u>
<u>Gross Radioactivity</u>				
Total Release (Excluding Tritium and Dissolved Gases) (Ci)	-0-	-0-	***	***
Average Concentration (uCi/ml)	-0-	-0-	***	
<u>Tritium</u>				
Total Release (Ci)	6.95 E-2	3.15 E-2	-0-	1.01 E-1
<u>Gross Alpha Activity</u>				
Total Release (Ci)	≤2.08 E-5	≤1.61 E-5	***	***
<u>Volume of Continuous Release</u>				
(Liters)	1.04 E+7	1.13 E+7	1.10 E+7	3.27 E+7
<u>Volume of Dilution Flow</u>				
(Liters)	5.33 E+10	4.57 E+10	3.37 E+10	1.33 E+11
<u>Isotopes Released</u>				
(Curies)				
Sr-89	-0-	-0-	***	***
Sr-90	-0-	-0-	***	***
Fe-55	-0-	-0-	***	***

TABLE 3.4
Semiannual Radioactive Effluent Report 1990
Dose From Liquid Effluents

The dose to a member of the public from total liquid radioactive release for each quarter was well below the Technical Specification limits of 1.5 mRems to the body and less than or equal to 5 mRems to any organ.

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 following offsite doses were calculated using equation 1.5 from the Kewaunee ODCM.

3rd Quarter Dose

	<u>Total Body</u>	<u>Bone</u>	<u>Liver</u>	<u>Thyroid</u>	<u>Kidney</u>	<u>Lung</u>	<u>GI LLI</u>
Dose Total (mRem)	3.14 E-4	1.77 E-6	3.04 E-4	2.79 E-4	2.82 E-4	2.79 E-4	3.16 E-3
Quarterly Dose Limit (mRem)	1.5	5.0	5.0	5.0	5.0	5.0	5.0
Percent of Quarterly Limit (%)	0.021	0.000	0.006	0.006	0.006	0.006	0.063

4th Quarter Dose

	<u>Total Body</u>	<u>Bone</u>	<u>Liver</u>	<u>Thyroid</u>	<u>Kidney</u>	<u>Lung</u>	<u>GI LLI</u>
Dose Total (mRem)	8.73 E-4	2.26 E-7	8.53 E-4	7.97 E-4	8.04 E-4	7.97 E-4	1.85 E-3
Quarterly Dose Limit (mRem)	1.5	5.0	5.0	5.0	5.0	5.0	5.0
Percent of Quarterly Limit (%)	0.058	0.000	0.017	0.016	0.016	0.016	0.037

TABLE 3.4 (con't)
Semiannual Radioactive Effluent Report 1990
Dose From Liquid Effluents

Calculated Doses This Year

	<u>Total Body</u>	<u>Bone</u>	<u>Liver</u>	<u>Thyroid</u>	<u>Kidney</u>	<u>Lung</u>	<u>GI LLI</u>
Dose Total (mRem)	1.86 E-2	1.23 E-2	2.41 E-2	2.19 E-3	9.31 E-3	4.55 E-3	1.92 E-1
Yearly Dose Limit (mRem)	3	10	10	10	10	10	10
Percent of Yearly Limit (%)	0.620	0.123	0.241	0.022	0.093	0.046	1.920

4.0 UNPLANNED RELEASES

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

5.0 METEOROLOGICAL DATA

Meteorological data for the second six months of 1990 is retained on file at the Kewaunee Nuclear Power Plant. The data on file includes a continuous strip chart recording and a 15-minute interval listing of wind speed, wind direction and atmospheric stability. This is more conservative than the requirements of Technical Specification 6.9.3.b (1)(b).

6.0 SOLID WASTE DISPOSAL

Table 6.1 is a summation of solid wastes shipped for the second half of 1990. Presented are the types of wastes, major nuclide composition, disposition of the wastes and shipping containers used.

The containers utilized have the following volumes:

High Integrity Container (HIC) 158 ft³

LSA Box (B-25) 98 ft³

DOT-17H Drum 7.5 ft³

A composite sample from the 1990 dewatered resin shipments was analyzed by a contractor for transuranic nuclides. The results showed an average transuranic concentration of 1.28 E-3 nanocuries/gram, well within the disposal site limit of 10 nanocuries/gram.

Table 6.1 contains the radionuclide content (curies) and percent abundance for each type of waste.

Isotopes denoted by an asterisk (*) in Table 6.1 are correlated values.

TABLE 6.1
Semiannual Radioactive Effluent Report 1990
Solid Waste and Irradiated Fuel Shipments

A. Solid Waste Shipped Off-Site for Burial or Disposal
(Not Irradiated Fuel - Cu.M is actual waste volume not burial volume)

1. Type of Waste	Unit	July - December
a. Dewatered resin Container: HIC	Cu.M Ci	8.95 E+0 1.92 E+2
b. Dry compressible contaminated waste Container: DOT 17H Drums	Cu.M Ci	2.23 E+1 3.77 E-1
c. Non-compressible contaminated scrap Container: LSA Boxes	Cu.M Ci	None None
d. Contaminated filter elements Container: HIC	Cu.M Ci	None None
e. Contaminated sludge	Cu.M Ci	None None

TABLE 6.1 (con't)
Semiannual Radioactive Effluent Report 1990
Solid Waste and Irradiated Fuel Shipments

2. Estimate of Major Nuclide by Composition
(By Type of Waste)

	%	Ci
a. Mn-54	2.17 E+0	4.16 E+0
Co-57	1.58 E-1	3.03 E-1
Co-58	9.79 E+0	1.88 E+1
Co-60	4.41 E+1	8.46 E+1
Cs-134	8.96 E+0	1.72 E+1
Cs-137	1.02 E+1	1.95 E+1
Sb-125	1.00 E+0	1.92 E+0
* Fe-55	3.86 E+0	7.40 E+0
* C-14	2.64 E-1	5.06 E-1
* Tc-99	8.54 E-5	1.64 E-4
Nb-94	2.48 E-2	4.75 E-2
* TRU	4.31 E-3	8.26 E-3
* Pu-241	8.49 E-3	1.63 E-2
* Ni-63	1.94 E+1	3.73 E+1
	%	Ci
b. Mn-54	8.30 E-1	3.12 E-3
Co-57	3.02 E-1	1.14 E-3
Co-58	5.46 E+1	2.06 E-1
Co-60	6.20 E+0	2.34 E-2
Zr-95	1.89 E+0	7.13 E-3
Nb-95	4.31 E+0	1.63 E-2
Sb-125	1.68 E+0	6.33 E-3
Sn-113	4.50 E-1	1.69 E-3
* Fe-55	1.89 E+1	7.13 E-2
* TRU	4.05 E-2	1.52 E-4
* Ni-63	8.80 E+0	3.32 E-2
* C-14	1.92 E+0	7.25 E-3
c. None	N/A	N/A
d. None	N/A	N/A
e. None	N/A	N/A

TABLE 6.1 (con't)
Semiannual Radioactive Effluent Report 1990
Solid Waste and Irradiated Fuel Shipments

3. Solid Waste Disposition

a. Date of Shipment	Mode of Transportation	Destination
08/30/90	CNSI 14-190H Cask	Barnwell, SC
11/01/90	CNSI Conventional Van	Barnwell, SC
12/17/90	CNSI 14-190H Cask	Barnwell, SC

b. Irradiated Fuel Shipments

No irradiated fuel shipments were made from the Kewaunee Nuclear Power Plant during the second six months of 1990.

7.0 PROGRAM REVISIONS

In accordance with Technical Specifications 6.9.3.b (1)(e), 6.17.2.a, 6.18.2.a and 6.19.1.a, the revisions to the Process Control Program, Offsite Dose Calculation Manual and radioactive waste systems are listed below.

7.1 Process Control Program

The Kewaunee Nuclear Power Plant Process Control Program has not been revised during this report period.

7.2 Offsite Dose Calculation Manual

The Offsite Dose Calculation Manual (ODCM) has not been revised during this report period.

7.3 Major Changes to the Radioactive Liquid, Gaseous and Solid Waste Treatment Systems

Major changes to the radioactive liquid, gaseous or solid waste systems are submitted in the annual Updated Final Safety Analysis Report consistent with Technical Specification 6.19.