

EFFLUENT AND WASTE DISPOSAL
SEMIANNUAL REPORT
FOR
THIRD AND FOURTH QUARTERS 1993
INCLUDING
ANNUAL RADIOLOGICAL IMPACT ON MAN
FOR 1993

Yankee Atomic Electric Company
Rowe, Massachusetts

ERRATA

The Effluent and Waste Disposal Semiannual Report for Third and Fourth Quarters 1993 was submitted sixty days following the end of 1993 with two errors. Thus, Yankee Atomic Electric Company provides the following corrections in the ninety-day Effluent and Waste Disposal Semiannual Report for the Third and Fourth Quarters 1993 Including Annual Radiological Impact on Man for 1993:

- (1) Table 1A, Gaseous Effluents - Summation of All Releases - Third and fourth quarter values listed under Item C.4, Gross Alpha Radioactivity, were previously recorded as $<3.09E-02$ and $<2.96E-02$, respectively, in terms of microCuries. Since the table lists units of Curies, the two values have been revised to $<3.09E-08$ and $<2.96E-08$.
- (2) Table 3, Solid Waste and Irradiated Fuel Shipments - The values listed under Item A.1.b2 omitted some shipments, which occurred at the end of 1993. The table is pending revision and will be submitted when available.

NOTES:

1. Yankee Nuclear Power Station's last day at any power level was October 1, 1991. The facility is permanently shut down for future decommissioning. Due to ceased operations, short-lived nuclides have been deleted from the gaseous and liquid effluent tables. Their activity concentrations in the fuel core inventory have decayed to zero values.

2. License Amendment No. 146 allowed the transfer of several technical specifications from the technical specification document into the Process Control Program and Off-Site Dose Calculation Manual. The transferred technical specifications are now designated as controls, and references to these technical specifications have been revised accordingly throughout the Effluent and Waste Disposal Semiannual Report. Details describing the changes were provided previously in Appendices F and G of the Effluent and Waste Disposal Semiannual Report for Third and Fourth Quarters 1992 Including Annual Radiological Impact on Man for 1992. Please note that the transfers did not involve any modifications to the technical specifications' contents or programmatic controls.

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YANKEE ATOMIC ELECTRIC COMPANY, ROWE, MASSACHUSETTS
EFFLUENT AND WASTE DISPOSAL SEMIANNUAL REPORT
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1.0 INTRODUCTION

Tables 1 through 3 list the recorded radioactive gaseous and liquid effluents and solid waste, respectively, with data summarized on a quarterly basis for the second six months of the year. Table 4 summarizes the estimated radiological dose commitments from all radioactive liquid and gaseous effluents released during the year 1993. Tables 5A through 5H report the cumulative joint frequency distributions of wind speed, wind direction, and atmospheric stability for 1993. Radioactive effluents reported in the Effluent and Waste Disposal Semiannual Report covering the first six months of the year were used to determine the off-site doses for the first half of 1993.

As required by Control 7.2.b, dose commitments resulting from the release of radioactive materials in liquids and gases were estimated in accordance with the Yankee Nuclear Power Station Off-Site Dose Calculation Manual (ODCM). These dose estimates were made using a Method II analysis as described in the ODCM. A Method II analysis incorporates the methodology of Regulatory Guide 1.109 (Reference 1) and actual measured meteorological data recorded during the reporting period. For batch gaseous releases, the meteorological conditions concurrent with the time of release of radioactive materials (as determined by sampling frequency and measurement) were used for determining the gaseous pathway doses. As required by Control 7.2.b, this report also shall include an assessment of the radiation doses from radioactive effluents to member(s) of the public due to allowed recreational activities inside the site boundary during the year. However, for this reporting period, no recreational activities inside the site boundary were permitted. As a result, recreational activities are not addressed. The limited use of the Information Center on-site is associated with educational activities as they pertain to the production of electricity and as such, are not included under Control 7.2.b. Assessment of radiation doses (including direct radiation) to the likely most exposed real member(s) of the public for the calendar year for the purposes of demonstrating conformance with 40CFR Part 190, "Environmental Radiation Protection Standards for Nuclear Power Operations," also are required to be included in this report, if conditions indicated in Control 3.2 have been exceeded during the year.

Since the conditions indicated in the action statement under Control 3.2.a were not entered into during the year, no additional radiation dose assessments are required.

All calculated dose estimates for this reporting period are well below the dose criteria of 10CFR Part 50, Appendix I.

Appendices A through H indicate the status of reportable items per the requirements of Controls 5.1, 5.2, Technical Specification 3.11.1.4, Controls 4.1, 4.2, 2.0 (PCP), 7.2, and 7.3, respectively.

2.0 METEOROLOGICAL DATA

Meteorological data was collected during the reporting period from the site's 200-foot meteorological tower, located approximately 180 meters north of the vapor container. The tower instrumentation is designed to meet the requirements of Regulatory Guide 1.23 (Reference 2) for meteorological monitoring.

The main release point for gases discharged from the plant is via the 150-foot primary vent stack, located between the vapor container and the primary auxiliary building. The primary vent stack is treated as a mixed mode elevated release point dependent upon windspeed, as described in Regulatory Guide 1.111 (Reference 3).

X/Q and D/Q values were derived for all receptor points from the site meteorological record using a straight line airflow model. All dispersion and deposition factors have been calculated employing appropriate source configuration considerations and removal mechanism (e.g., dry deposition) described in Regulatory Guide 1.111 (Reference 3). Terrain elevations, including downwind valley flow corrections for the surrounding area, were factored into the calculation of X/Q and D/Q values at each receptor location.

3.0 DOSE ASSESSMENT

3.1 Doses From Liquid Effluents

Control 3.1 limits total body (1.5 mrem per quarter and 3 mrem per year) and organ (5 mrem per quarter and 10 mrem per year) doses from liquid effluents to a member of the public to those specified in 10CFR Part 50, Appendix I. By implementing the requirements of 10CFR Part 50, Appendix I, Control 3.1 assures that the release of radioactive material in liquid effluents will be kept "as low as is reasonably achievable."

Exposure pathways that could exist as a result of liquid effluents are fish, direct exposure from river shoreline sedimentation, milk and meat via animal ingestion of the Deerfield River water, and meat, milk, and vegetable pathways via crop irrigation with water withdrawn from the Deerfield River. Drinking water and aquatic invertebrate pathways do not exist downriver of the Yankee plant at Rowe.

The dose analysis for the liquid pathways, given above, assumes a dilution based on the monthly average flow at the Sherman Dam. This results in conservative dose estimates.

The whole body and organ doses due to liquid effluents were determined by summing the contributions from all pathways at each location. The whole body and organ doses to a member of the public from liquid effluents are given in Table 4. The estimated quarterly and annual doses due to liquid effluents are well below the 10CFR Part 50, Appendix I dose criteria of Control 3.1.

3.2 Doses From Noble Gases

Control 3.4 limits the gamma air (5 mrad per quarter and 10 mrad per year) and beta air (10 mrad per quarter and 20 mrad per year) doses from noble gases released in gaseous effluents from the site to areas at and beyond the site boundary to those specified in 10CFR Part 50, Appendix I. By implementing the requirements of 10CFR Part 50, Appendix I, Control 3.4 assures that the release of radioactive noble gases in gaseous effluents will be kept "as low as is reasonably achievable."

Dose estimates due to the release of noble gases to the atmosphere were calculated at the site boundary, nearest resident, nearest vegetable garden, and

nearest milk animal in each of the sixteen principle compass directions, as well as the point of highest off-site ground level air concentrations of radioactive materials. Gamma and beta air doses, as well as whole body and skin doses, were calculated at each of the above locations.

To determine the beta contribution to the skin dose, a semi-infinite cloud model was utilized. The whole body gamma dose was calculated using a finite cloud sector average model with a Gaussian distribution of activity in the vertical plane. The gamma radiation received from the cloud at a point of interest was determined by integrating the contribution from a differential volume over the entire cloud, taking into account the geometry of the cloud, variation in concentration, attenuation by the interaction of photons with matter in the path between the source and receptor point, and scattering of radiation from material outside the direct path to the point of interest. For skin and whole body doses, an attenuation factor of 0.7 was applied to the dose calculations to account for the dose reduction due to shielding, which would be provided by a residential structure. No additional credit was taken for decay of radionuclides in transit to the receptor point.

The estimated quarterly and annual gamma and beta air doses at the point of highest off-site exposure are listed in Table 4. The estimated gamma and beta air doses due to noble gases released in gaseous effluents are well below the 10CFR Part 50, Appendix I dose criteria of Control 3.4.

3.3 Doses From Iodine-131, Tritium, and Radionuclides in Particulate Form With Half-Lives Greater Than 8 Days

Control 3.5 limits the organ doses to a member of the public from Iodine-131, tritium, and radionuclides in particulate form with half-lives greater than 8 days (hereafter called iodines and particulates) in gaseous effluents released from the site to areas at and beyond the site boundary to those specified in 10CFR Part 50, Appendix I (7.5 mrem per quarter and 15 mrem per year). By implementing the requirements of 10CFR Part 50, Appendix I, Control 3.5 assures that the releases of iodines and particulates in gaseous effluents will be kept "as low as is reasonably achievable."

Exposure pathways that could exist as a result of the release of iodines and particulates to the atmosphere include external irradiation from activity deposited onto the ground surface, inhalation, and ingestion of vegetables, meat, and milk.

Dose estimates were made at the site boundary, nearest resident, nearest vegetable garden, and nearest milk animal in each of the sixteen principle compass directions. The nearest resident, vegetable garden, and milk animal in each sector were identified by the most recent Land Use Census, as required by Control 4.2. Doses also were calculated at the point of maximum ground level air concentrations of radioactive materials in gaseous effluents. Doses were calculated for pathways which were determined by the field survey to actually exist. Conservatively, a vegetable garden was assumed to exist at each milk animal location. Furthermore, the meat pathway was assumed to exist at each milk animal location. Meat animals were assumed to receive their entire intake from pasture during the second and third quarters. Milk animals were assumed to receive 50 percent of their intake from pasture during this period. This assumption is realistic since most dairy operations utilize supplemental feeding of animals when on pasture or actually restrict animals to full time silage feeding throughout the entire year.

The organ doses were determined after adding the contributions from all pathways at each location. Doses were calculated for the whole body, GI-tract, bones, liver, kidneys, thyroid, lungs, and skin for adults, teenagers, children, and infants. The maximum estimated quarterly and annual organ doses due to iodines and particulates at any of the off-site receptor locations are reported in Table 4. The doses to all other organs at all other locations for all other age groups are less than the doses reported in Table 4. The estimated organ doses from iodines and particulates in gaseous effluents are well below the 10CFR Part 50, Appendix I dose criteria of Control 3.5.

REFERENCES

1. Regulatory Guide 1.109, "Calculation of Annual Doses to Man from Routine Release of Reactor Effluents for the Purpose of Evaluating Compliance With 10CFR Part 50, Appendix I," U.S. Nuclear Regulatory Commission, Office of Standards Development, Revision 1, October 1977.
2. Regulatory Guide 1.23, "On-Site Meteorological Programs (Safety Guide 23)," U.S. Nuclear Regulatory Commission, Office of Standards Development, February 1972.
3. Regulatory Guide 1.111, "Methods for Estimating Atmospheric Transport and Dispersion of Gaseous Effluents in Routine Releases from Light - Water - Cooled Reactors," U.S. Nuclear Regulatory Commission, Office of Standards Development, Revision 1, October 1977.

TABLE 1A

Yankee Atomic Electric Company, Rowe, Massachusetts
Effluent and Waste Disposal Semiannual Report
Third and Fourth Quarters 1993
Gaseous Effluents - Summation of All Releases

		Unit	Quarter 3	Quarter 4	Est. Total Error, %
A.	<u>Fission and Activation Gases</u>				
1.	Total Release	Ci	0.00E+00	0.00E+00	±2.50E+01
2.	Average Release Rate for Period	uCi/sec	0.00E+00	0.00E+00	
3.	Percent of Control Limit ⁽¹⁾	%	0.00E+00	0.00E+00	
B.	<u>Iodines⁽²⁾</u>				
C.	<u>Particulates</u>				
1.	Particulates with T-1/2 > 8 days	Ci	1.90E-07	1.84E-07	±3.00E+01
2.	Average Release Rate for Period	uCi/sec	2.42E-08	2.34E-08	
3.	Percent of Control Limit	%	3.73E-02	2.93E-02	
4.	Gross Alpha Radioactivity	Ci	<3.09E-08	<2.96E-08	
D.	<u>Tritium</u>				
1.	Total Release	Ci	3.80E-01	3.03E-01	±3.00E+01
2.	Average Release Rate for Period	uCi/sec	4.83E-02	3.85E-02	
3.	Percent of Control Limit ⁽³⁾	%			

(1) Control 3.4.a for gamma-air dose. Percent values for Control 3.4.b for beta-air dose are approximately the same.

(2) Iodine data have been deleted. These nuclides are no longer available for discharge.

(3) Per Control 3.5, percent dose contribution from tritium is included in Part C.

TABLE 18

Yankee Atomic Electric Company, Rowe, Massachusetts
 Effluent and Waste Disposal Semiannual Report
 Third and Fourth Quarters 1993
 Gaseous Effluents - Elevated Releases

Nuclides Released	Unit	Continuous Mode		Batch Mode ⁽¹⁾	
		Quarter 3	Quarter 4	Quarter 3	Quarter 4
1. <u>Fission Gases</u>					
Krypton-85	Ci	0.00E+00	0.00E+00		
Total for Period	Ci	0.00E+00	0.00E+00		
2. <u>Iodines⁽²⁾</u>					
3. <u>Particulates</u>					
Strontium-89	Ci	<4.52E-07	<4.79E-07		
Strontium-90	Ci	<1.23E-07	<1.94E-07		
Cesium-134	Ci	<2.35E-07	<2.29E-07		
Cesium-137	Ci	<2.92E-07	8.38E-08		
Barium-Lanthanum-140	Ci	<7.69E-07	<7.75E-07		
Zinc-65	Ci	<6.00E-07	<5.95E-07		
Cobalt-58	Ci	<2.67E-07	<2.74E-07		
Cobalt-60	Ci	1.90E-07	1.00E-07		
Iron-59	Ci	<5.29E-07	<5.42E-07		
Chromium-51	Ci	<1.58E-06	<1.56E-06		
Zirconium-Niobium-95	Ci	<4.51E-07	<4.43E-07		
Cerium-141	Ci	<1.99E-07	<1.97E-07		
Cerium-144	Ci	<8.45E-07	<8.43E-07		
Antimony-124	Ci	<2.27E-07	<2.24E-07		
Manganese-54	Ci	<2.68E-07	<2.73E-07		
Silver-110m	Ci	<2.34E-07	<2.29E-07		
Molybdenum-99	Ci	<1.72E-06	<1.71E-06		
Ruthenium-103	Ci	<2.01E-07	<2.04E-07		
Total for Period	Ci	1.90E-07	1.84E-07		

(1) There are no longer any batch mode gaseous releases.

(2) Iodine-131, Iodine-133, and Iodine-135 activities have been deleted. These nuclides are no longer available for discharge.

TABLE 1C

Yankee Atomic Electric Company, Rowe, Massachusetts
Effluent and Waste Disposal Semiannual Report
Third and Fourth Quarters 1993
Gaseous Effluents - Ground Level Releases

There were no routine measured ground level continuous or batch mode gaseous releases during the third or fourth quarters of 1993.

TABLE 2A

Yankee Atomic Electric Company, Rowe, Massachusetts
 Effluent and Waste Disposal Semiannual Report
 Third and Fourth Quarters 1993
 Liquid Effluents - Summation of All Releases

		Unit	Quarter 3	Quarter 4	Est. Total Error, %
A. <u>Fission and Activation Products</u>					
1.	Total Release (not including tritium, gases, alpha)	Ci	2.28E-05	3.16E-04	±2.00E+01
2.	Average Diluted Concentration During Period	uCi/ml	1.48E-09	3.19E-09	
3.	Percent of Applicable Limit ⁽¹⁾	%	7.61E-03	1.67E-03	
B. <u>Tritium</u>					
1.	Total Release	Ci	<2.47E-04	7.33E-02	±1.00E+01
2.	Average Diluted Concentration During Period	uCi/ml	<1.60E-08	7.39E-09	
3.	Percent of Applicable Limit ⁽¹⁾	%	<5.33E-04	2.46E-04	
C. <u>Dissolved and Entrained Gases</u>					
1.	Total Release	Ci	<1.22E-04	<1.53E-03	±2.00E+01
2.	Average Diluted Concentration During Period	uCi/ml	<7.92E-09	<1.54E-08	
3.	Percent of Applicable Limit ⁽²⁾	%	<3.96E-03	<7.70E-03	
D. <u>Gross Alpha Radioactivity</u>					
1.	Total Release	Ci	<2.16E-08	<1.45E-07	±3.50E+01
E. <u>Volume of Waste Released (prior to dilution)</u>					
		liters	5.96E+04	3.93E+05	±3.00E+01
F. <u>Volume of Dilution Water Used During Period</u>					
		liters	1.54E+07	9.92E+07	±1.50E+01

(1) Concentration limits specified in 10CFR20, Appendix B, Table II, Column 2 (Control 2.1). The percent of applicable limit reported is based on the average diluted concentration during the period. At no time did any release exceed the concentration limit.

(2) Concentration limits for dissolved and entrained noble gases is 2.00E-04 uCi/ml (Control 2.1). The percent of applicable limit reported is based on the average diluted concentration during the period. At no time did any release exceed the concentration limit.

TABLE 2B

Yankee Atomic Electric Company, Rowe, Massachusetts
 Effluent and Waste Disposal Semiannual Report
 Third and Fourth Quarters 1993
 Liquid Effluents - Routine Releases

Nuclides Released	Unit	Continuous Mode		Batch Mode	
		Quarter 3	Quarter 4	Quarter 3	Quarter 4
Strontium-89	Ci	<1.44E-06	<1.10E-06	<1.00E-06	<1.09E-05
Strontium-90	Ci	<7.57E-07	<6.19E-07	<6.30E-07	<9.80E-06
Cesium-134	Ci	<1.66E-07	<1.91E-07	5.07E-07	5.32E-07
Cesium-137	Ci	<2.24E-07	1.29E-07	2.23E-05	1.55E-05
Cobalt-58	Ci	<1.97E-07	<1.97E-07	<1.51E-07	<3.32E-06
Cobalt-60	Ci	<2.21E-07	2.02E-07	<1.64E-07	1.37E-05
Iron-59	Ci	<3.92E-07	<3.87E-07	<2.71E-07	<6.86E-06
Zinc-65	Ci	<4.20E-07	<4.34E-07	<3.47E-07	<8.57E-06
Manganese-54	Ci	<2.08E-07	3.78E-08	<1.37E-07	<3.41E-06
Chromium-51	Ci	<1.34E-06	<1.39E-06	<1.92E-06	<2.37E-05
Zirconium-Niobium-95	Ci	<3.26E-07	<3.41E-07	<2.34E-07	<5.89E-06
Molybdenum-99	Ci	<1.34E-06	<1.40E-06	<1.08E-06	<2.51E-05
Technetium-99m	Ci	<1.43E-07	<1.53E-07	<2.01E-07	<2.51E-06
Barium-Lanthanum-140	Ci	<6.37E-07	<6.52E-07	<8.28E-07	<1.12E-05
Cerium-141	Ci	<2.25E-07	<2.39E-07	<3.24E-07	<3.95E-06
Ruthenium-103	Ci	<1.64E-07	<1.73E-07	<2.54E-07	<3.12E-06
Cerium-144	Ci	<1.01E-06	<1.07E-06	<1.50E-06	<1.77E-05
Selenium-75	Ci	<1.82E-07	<1.94E-07	<2.68E-07	<3.25E-06
Silver-110m	Ci	<1.74E-07	<1.86E-07	<1.75E-07	<3.26E-06
Antimony-124	Ci	<1.66E-07	<1.85E-07	<2.10E-07	<3.47E-06
Carbon-14	Ci	-	-	-	2.86E-04
Iron-55	Ci	<9.98E-06	<9.29E-06	<6.80E-06	<1.32E-04
Antimony-125	Ci	<4.84E-07	<5.05E-07	<7.86E-07	<8.97E-06
Unidentified	Ci				
Total for Period (above)	Ci	<2.02E-05	3.69E-07	2.28E-05	3.16E-04
Krypton-85	Ci	<5.81E-05	<5.92E-05	<6.35E-05	<9.38E-04

TABLE 3

Yankee Atomic Electric Company, Rowe, Massachusetts
Effluent and Waste Disposal Semiannual Report
Third and Fourth Quarters 1993
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-Month Period	Est. Total Error, %
a.	Evaporator bottoms, Class A waste, LSA containers, 55-gallon drums ⁽¹⁾	m ³ Ci (Est.)	0.00E+00 0.00E+00	
b1.	Dry compressible waste, contaminated equipment, etc., Class A unstable waste, DOT 7A STC, 2560 ft ³⁽²⁾	m ³ Ci (Est.)	1.41E+01 1.07E-01	±1.00E+02
b2.	Dry compressible waste, contaminated equipment, etc., Class A unstable waste, DOT 7A STC, 2560 ft ³⁽²⁾⁽³⁾	m ³ Ci (Est.)	4.82E+01 2.24E-01	±1.00E+02
c.	Irradiated components, Class B waste, Type A, 126 ft ³	m ³ Ci (Est.)	1.43E+01 2.05E+02	±3.00E+01
d.	Coolant pump, Class A unstable waste, DOT 7A STC, 2560 ft ³	m ³ Ci (Est.)	1.47E+00 8.40E-01	±3.00E+01
e.	Steam generator, Class A stable waste, Type A, 1767 ft ³⁽⁴⁾	m ³ Ci (Est.)	2.00E+02 1.30E+03	±3.00E+01
f.	Pressurizer, Class A unstable waste, DOT 7A STC, 682 ft ³	m ³ Ci (Est.)	1.62E+01 3.01E+00	±3.00E+01

2. Estimate of Major Nuclide Composition (by type of waste)⁽⁵⁾

a.	Non-Applicable	
b1.	Iron-55	6.56E+01%
	Cobalt-60	1.29E+01%
	Nickel-63	1.02E+01%

(1) Solidification agent is cement.

(2) Disposal volume and activity by processor.

(3) Item A.1.b2 is pending revision and will be submitted when available.

(4) Stabilized with low density cement.

(5) Excluding radionuclides with half-lives less than 12.8 days.

TABLE 3
(Continued)

Yankee Atomic Electric Company, Rowe, Massachusetts
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Solid Waste and Irradiated Fuel Shipments

	Iron-59	4.51E+00%
	Manganese-54	1.67E+00%
	Plutonium-241	1.57E+00%
	Cerium-144	1.33E+00%
	Ruthenium-106	1.16E+00%
b2.	Iron-55	8.03E+01%
	Cobalt-60	1.01E+01%
	Nickel-63	6.84E+01%
	Manganese-54	2.79E+00%
c.	Cobalt-60	4.61E+01%
	Iron-55	4.48E+01%
	Nickel-63	8.34E+00%
d.	Nickel-63	6.58E+01%
	Cobalt-60	1.78E+01%
	Iron-55	1.51E+01%
	Nickel-59	1.32E+00%
e.	Iron-55	5.01E+01%
	Cobalt-60	2.22E+01%
	Nickel-63	2.53E+01%
	Manganese-54	1.30E+00%
f.	Iron-55	7.93E+01%
	Cobalt-60	1.04E+01%
	Nickel-63	7.47E+00%
	Manganese-54	2.08E+00%

3. Solid Waste Disposition

<u>Number of Shipments</u>	<u>Mode of Transportation</u>	<u>Destination</u>
2	Railroad	Barnwell, South Carolina
11	Truck	Barnwell, South Carolina
58 ⁽⁶⁾	Truck	Barnwell, South Carolina

B. Irradiated Fuel Shipments (Disposition): None

(6) Partial shipments from processor to waste disposal facility.

TABLE 4

Yankee Atomic Electric Company, Rowe, Massachusetts
 Effluent and Waste Disposal Semiannual Report
 1993

Maximum⁽¹⁾ Off-Site Doses and Dose Commitments to Members of the Public

Source	Dose (mrem) ⁽²⁾				
	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	Year ⁽³⁾
Liquid Effluents					
Whole Body ⁽⁴⁾	8.48E-06	2.18E-04	2.62E-04	1.10E-04	5.98E-04
Critical Organ	1.61E-05 ⁽⁵⁾	3.76E-04 ⁽⁶⁾	4.96E-04 ⁽⁵⁾	1.95E-04 ⁽⁶⁾	1.08E-03
Airborne Effluents					
Iodines and Particulates	7.26E-04 ⁽⁷⁾	8.40E-04 ⁽⁸⁾	9.87E-04 ⁽⁷⁾	5.90E-04 ⁽⁹⁾	3.14E-03
Noble Gases ⁽¹⁰⁾	Beta Air (mrad)	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Gamma Air (mrad)	0.00E+00	0.00E+00	0.00E+00	0.00E+00

(1) "Maximum" means the largest fraction of corresponding 10CFR Part 50, Appendix I, dose design objective.

(2) The numbered footnotes indicate location of the dose receptor, age group, and organ, where appropriate.

(3) "Maximum" dose for the year is the sum of the maximum doses for each quarter. This results in a conservative yearly dose estimate, but still well within the limits of 10CFR Part 50.

(4) Adult.

(5) Bone of child.

(6) Liver of child.

(7) SW, WSW, 1300 meters - lung, GI-LLI, whole body liver, kidney, and thyroid of child.

(8) SW, WSW, 1300 meters - lung, liver, and GI-LLI of child.

(9) SW, WSW, 1300 meters - lung of child.

(10) There were no noble gases released during the four quarters of 1993.

TABLE 5A

YANKEE ROWE JAN93-DEC93 METEOROLOGICAL DATA JOINT FREQUENCY DISTRIBUTION

196.0 FT WIND DATA STABILITY CLASS A CLASS FREQUENCY (PERCENT) = .14

WIND DIRECTION FROM

SPEED(MPH)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	VRBL	TOTAL
CALM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(1)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
(2)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
C-3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(1)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
(2)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
4-7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(1)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
(2)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
8-12	0	0	0	0	0	0	0	0	1	3	5	1	0	0	0	0	0	10
(1)	.00	.00	.00	.00	.00	.00	.00	.00	9.09	27.27	45.45	9.09	.00	.00	.00	.00	.00	90.91
(2)	.00	.00	.00	.00	.00	.00	.00	.00	.01	.04	.06	.01	.00	.00	.00	.00	.00	.13
13-18	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
(1)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	9.09	.00	.00	.00	.00	.00	.00	9.09
(2)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.01	.00	.00	.00	.00	.00	.00	.01
19-24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(1)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
(2)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
GT 24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(1)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
(2)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
ALL SPEEDS	0	0	0	0	0	0	0	0	1	3	6	1	0	0	0	0	0	11
(1)	.00	.00	.00	.00	.00	.00	.00	.00	9.09	27.27	54.55	9.09	.00	.00	.00	.00	.00	100.00
(2)	.00	.00	.00	.00	.00	.00	.00	.00	.01	.04	.08	.01	.00	.00	.00	.00	.00	.14

(1)=PERCENT OF ALL GOOD OBSERVATIONS FOR THIS PAGE
 (2)=PERCENT OF ALL GOOD OBSERVATIONS FOR THIS PERIOD
 C= CALM (WIND SPEED LESS THAN OR EQUAL TO .95 MPH)

TABLE 5B

YANKEE ROWE JAN93-DEC93 METEOROLOGICAL DATA JOINT FREQUENCY DISTRIBUTION

196.0 FT WIND DATA STABILITY CLASS B CLASS FREQUENCY (PERCENT) = .49

WIND DIRECTION FROM

SPEED(MPH)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	VRBL	TOTAL
CALM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(1)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
(2)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
C-3	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
(1)	2.63	2.63	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	5.26
(2)	.01	.01	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.03
4-7	0	0	0	0	0	0	0	1	0	2	3	1	0	0	0	0	0	7
(1)	.00	.00	.00	.00	.00	.00	.00	2.63	.00	5.26	7.89	2.63	.00	.00	.00	.00	.00	18.42
(2)	.00	.00	.00	.00	.00	.00	.00	.01	.00	.03	.04	.01	.00	.00	.00	.00	.00	.09
8-12	0	0	0	0	0	0	0	2	1	4	12	5	0	0	0	0	0	24
(1)	.00	.00	.00	.00	.00	.00	.00	5.26	2.63	10.53	31.58	13.16	.00	.00	.00	.00	.00	63.16
(2)	.00	.00	.00	.00	.00	.00	.00	.03	.01	.05	.15	.06	.00	.00	.00	.00	.00	.31
13-18	0	0	0	0	0	0	0	0	0	0	3	2	0	0	0	0	0	5
(1)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	7.89	5.26	.00	.00	.00	.00	.00	13.16
(2)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.04	.03	.00	.00	.00	.00	.00	.06
19-24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(1)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
(2)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
GT 24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(1)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
(2)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
ALL SPEEDS	1	1	0	0	0	0	0	3	1	6	18	8	0	0	0	0	0	38
(1)	2.63	2.63	.00	.00	.00	.00	.00	7.89	2.63	15.79	47.37	21.05	.00	.00	.00	.00	.00	100.00
(2)	.01	.01	.00	.00	.00	.00	.00	.04	.01	.08	.23	.10	.00	.00	.00	.00	.00	.49

(1)=PERCENT OF ALL GOOD OBSERVATIONS FOR THIS PAGE
 (2)=PERCENT OF ALL GOOD OBSERVATIONS FOR THIS PERIOD
 C= CALM (WIND SPEED LESS THAN OR EQUAL TO .95 MPH)

TABLE 5C

YANKEE ROWE JAN93-DEC93 METEOROLOGICAL DATA JOINT FREQUENCY DISTRIBUTION

196.0 FT WIND DATA STABILITY CLASS C CLASS FREQUENCY (PERCENT) = 1.26

WIND DIRECTION FROM

SPEED(MPH)	M	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	VRBL	TOTAL
CALM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(1)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
(2)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
C-3	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	2
(1)	.00	.00	1.02	.00	.00	.00	.00	.00	1.02	.00	.00	.00	.00	.00	.00	.00	.00	2.04
(2)	.00	.00	.01	.00	.00	.00	.00	.00	.01	.00	.00	.00	.00	.00	.00	.00	.00	.03
4-7	0	0	0	0	0	1	0	1	7	3	9	3	1	0	0	0	0	25
(1)	.00	.00	.00	.00	.00	1.02	.00	1.02	7.14	3.06	9.18	3.06	1.02	.00	.00	.00	.00	25.51
(2)	.00	.00	.00	.00	.00	.01	.00	.01	.09	.04	.12	.04	.01	.00	.00	.00	.00	.32
8-12	0	0	0	0	0	0	0	2	5	11	26	13	1	2	0	0	0	60
(1)	.00	.00	.00	.00	.00	.00	.00	2.04	5.10	11.22	26.53	13.27	1.02	2.04	.00	.00	.00	61.22
(2)	.00	.00	.00	.00	.00	.00	.00	.03	.06	.14	.33	.17	.01	.03	.00	.00	.00	.77
13-18	0	0	0	0	0	0	0	0	0	1	6	4	0	0	0	0	0	11
(1)	.00	.00	.00	.00	.00	.00	.00	.00	.00	1.02	6.12	4.08	.00	.00	.00	.00	.00	11.22
(2)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.01	.08	.05	.00	.00	.00	.00	.00	.14
19-24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(1)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
(2)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
GT 24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(1)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
(2)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
ALL SPEEDS	0	0	1	0	0	1	0	3	13	15	41	20	2	2	0	0	0	98
(1)	.00	.00	1.02	.00	.00	1.02	.00	3.06	13.27	15.31	41.84	20.41	2.04	2.04	.00	.00	.00	100.00
(2)	.00	.00	.01	.00	.00	.01	.00	.04	.17	.19	.53	.26	.03	.03	.00	.00	.00	1.26

(1)=PERCENT OF ALL GOOD OBSERVATIONS FOR THIS PAGE
 (2)=PERCENT OF ALL GOOD OBSERVATIONS FOR THIS PERIOD
 C= CALM (WIND SPEED LESS THAN OR EQUAL TO .95 MPH)

TABLE 5D

YANKEE ROWE JAN93-DEC93 METEOROLOGICAL DATA JOINT FREQUENCY DISTRIBUTION

196.0 FT WIND DATA STABILITY CLASS D CLASS FREQUENCY (PERCENT) = 34.94

WIND DIRECTION FROM

SPEED(MPH)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	VRBL	TOTAL
CALM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(1)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
(2)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
C-3	58	80	45	18	10	11	13	14	8	30	52	25	8	6	13	18	0	409
(1)	2.14	2.95	1.66	.66	.37	.41	.48	.52	.29	1.11	1.92	.92	.29	.22	.48	.66	.00	15.07
(2)	.75	1.03	.58	.23	.13	.14	.17	.18	.10	.39	.67	.32	.10	.08	.17	.23	.00	5.27
4-7	120	187	45	11	19	23	27	48	87	116	179	85	59	48	49	58	0	1161
(1)	4.42	6.89	1.66	.41	.70	.85	.99	1.77	3.21	4.27	6.60	3.13	2.17	1.77	1.81	2.14	.00	42.78
(2)	1.54	2.41	.58	.14	.24	.30	.35	.62	1.12	1.49	2.30	1.09	.76	.62	.63	.75	.00	14.95
8-12	143	158	17	0	1	2	3	15	31	80	115	140	61	41	38	73	0	918
(1)	5.27	5.82	.63	.00	.04	.07	.11	.55	1.14	2.95	4.24	5.16	2.25	1.51	1.40	2.69	.00	33.82
(2)	1.84	2.03	.22	.00	.01	.03	.04	.19	.40	1.03	1.48	1.80	.79	.53	.49	.94	.00	11.82
13-18	32	76	3	0	0	0	0	0	2	4	34	47	9	2	0	6	0	215
(1)	1.18	2.80	.11	.00	.00	.00	.00	.00	.07	.15	1.25	1.73	.33	.07	.00	.22	.00	7.92
(2)	.41	.98	.04	.00	.00	.00	.00	.00	.03	.05	.44	.61	.12	.03	.00	.08	.00	2.77
19-24	1	3	0	0	0	0	0	0	0	0	2	5	0	0	0	0	0	11
(1)	.04	.11	.00	.00	.00	.00	.00	.00	.00	.00	.07	.18	.00	.00	.00	.00	.00	.41
(2)	.01	.04	.00	.00	.00	.00	.00	.00	.00	.00	.03	.06	.00	.00	.00	.00	.00	.14
GT 24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(1)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
(2)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
ALL SPEEDS	354	504	110	29	30	36	43	77	128	230	382	302	137	97	100	155	0	2714
(1)	13.04	18.57	4.05	1.07	1.11	1.33	1.58	2.84	4.72	8.47	14.08	11.13	5.05	3.57	3.68	5.71	.00	100.00
(2)	4.56	6.49	1.42	.37	.39	.46	.55	.99	1.65	2.96	4.92	3.89	1.76	1.25	1.29	2.00	.00	34.94

(1)=PERCENT OF ALL GOOD OBSERVATIONS FOR THIS PAGE
 (2)=PERCENT OF ALL GOOD OBSERVATIONS FOR THIS PERIOD
 C= CALM (WIND SPEED LESS THAN OR EQUAL TO .95 MPH)

TABLE 5E

YANKEE ROWE JAN93-DEC93 METEOROLOGICAL DATA JOINT FREQUENCY DISTRIBUTION

196.0 FT WIND DATA

STABILITY CLASS E

CLASS FREQUENCY (PERCENT) = 49.54

WIND DIRECTION FROM

SPEED(MPH)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	VRBL	TOTAL
CALM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(1)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
(2)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
C-3	233	430	211	100	56	46	30	51	50	94	115	55	35	28	30	60	0	1624
(1)	6.06	11.17	5.48	2.60	1.46	1.20	.78	1.33	1.30	2.44	2.99	1.43	.91	.73	.78	1.56	.00	42.20
(2)	3.00	5.54	2.72	1.29	.72	.59	.39	.66	.64	1.21	1.48	.71	.45	.36	.39	.77	.00	20.91
4-7	175	434	86	19	15	23	34	48	86	138	211	83	53	39	41	68	0	1553
(1)	4.55	11.28	2.23	.49	.39	.60	.88	1.25	2.23	3.59	5.48	2.16	1.38	1.01	1.07	1.77	.00	40.36
(2)	2.25	5.59	1.11	.24	.19	.30	.44	.62	1.11	1.78	2.72	1.07	.68	.50	.53	.88	.00	19.99
8-12	72	195	17	1	0	0	0	5	19	82	57	65	29	10	14	12	0	578
(1)	1.87	5.07	.44	.03	.00	.00	.00	.13	.49	2.13	1.48	1.69	.75	.26	.36	.31	.00	15.02
(2)	.93	2.51	.22	.01	.00	.00	.00	.06	.24	1.06	.73	.84	.37	.13	.18	.15	.00	7.44
13-18	9	36	1	0	0	0	0	0	0	11	7	15	4	0	0	2	0	85
(1)	.23	.94	.03	.00	.00	.00	.00	.00	.00	.29	.18	.39	.10	.00	.00	.05	.00	2.21
(2)	.12	.46	.01	.00	.00	.00	.00	.00	.00	.14	.09	.19	.05	.00	.00	.03	.00	1.09
19-24	0	4	0	0	0	0	0	0	0	0	2	2	0	0	0	0	0	8
(1)	.00	.10	.00	.00	.00	.00	.00	.00	.00	.00	.05	.05	.00	.00	.00	.00	.00	.21
(2)	.00	.05	.00	.00	.00	.00	.00	.00	.00	.00	.03	.03	.00	.00	.00	.00	.00	.10
GT 24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(1)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
(2)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
ALL SPEEDS	489	1099	315	120	71	69	64	104	155	325	392	220	121	77	85	142	0	3848
(1)	12.71	28.56	8.19	3.12	1.85	1.79	1.66	2.70	4.03	8.45	10.19	5.72	3.14	2.00	2.21	3.69	.00	100.00
(2)	6.30	14.15	4.06	1.54	.91	.89	.82	1.34	2.00	4.18	5.05	2.83	1.56	.99	1.09	1.83	.00	49.54

(1)=PERCENT OF ALL GOOD OBSERVATIONS FOR THIS PAGE

(2)=PERCENT OF ALL GOOD OBSERVATIONS FOR THIS PERIOD

C= CALM (WIND SPEED LESS THAN OR EQUAL TO .95 MPH)

TABLE 5F

YANKEE ROWE JAN93-DEC93 METEOROLOGICAL DATA JOINT FREQUENCY DISTRIBUTION

196.0 FT WIND DATA

STABILITY CLASS F

CLASS FREQUENCY (PERCENT) = 10.17

WIND DIRECTION FROM

SPEED(MPH)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	VRBL	TOTAL
CALM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(1)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
(2)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
C-3	37	95	105	51	30	29	17	23	18	20	34	23	18	12	15	13	0	540
(1)	4.68	12.03	13.29	6.46	3.80	3.67	2.15	2.91	2.28	2.53	4.30	2.91	2.28	1.52	1.90	1.65	.00	68.35
(2)	.48	1.22	1.35	.66	.39	.37	.22	.30	.23	.26	.44	.30	.23	.15	.19	.17	.00	6.95
4-7	11	92	24	5	1	4	4	8	8	23	25	11	8	5	5	3	0	237
(1)	1.39	11.65	3.04	.63	.13	.51	.51	1.01	1.01	2.91	3.16	1.39	1.01	.63	.63	.38	.00	30.00
(2)	.14	1.18	.31	.06	.01	.05	.05	.10	.10	.30	.32	.14	.10	.06	.06	.04	.00	3.05
8-12	2	8	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	13
(1)	.25	1.01	.00	.00	.00	.00	.00	.00	.00	.00	.38	.00	.00	.00	.00	.00	.00	1.65
(2)	.03	.10	.00	.00	.00	.00	.00	.00	.00	.00	.04	.00	.00	.00	.00	.00	.00	.17
13-18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(1)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
(2)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
19-24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(1)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
(2)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
GT 24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(1)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
(2)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
ALL SPEEDS	50	195	129	56	31	33	21	31	26	43	62	34	26	17	20	16	0	790
(1)	6.33	24.68	16.33	7.09	3.92	4.18	2.66	3.92	3.29	5.44	7.85	4.30	3.29	2.15	2.53	2.03	.00	100.00
(2)	.64	2.51	1.66	.72	.40	.42	.27	.40	.33	.55	.80	.44	.33	.22	.26	.21	.00	10.17

(1)=PERCENT OF ALL GOOD OBSERVATIONS FOR THIS PAGE
 (2)=PERCENT OF ALL GOOD OBSERVATIONS FOR THIS PERIOD
 C= CALM (WIND SPEED LESS THAN OR EQUAL TO .95 MPH)

TABLE 5G

YANKEE ROWE JAN93-DEC93 METEOROLOGICAL DATA JOINT FREQUENCY DISTRIBUTION

196.0 FT WIND DATA

STABILITY CLASS G

CLASS FREQUENCY (PERCENT) = 3.45

WIND DIRECTION FROM

SPEED(MPH)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	VRBL	TOTAL
CALM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(1)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
(2)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
C-3	12	31	23	14	10	11	5	7	8	8	10	7	3	0	4	3	0	156
(1)	4.48	11.57	8.58	5.22	3.73	4.10	1.87	2.61	2.99	2.99	3.73	2.61	1.12	.00	1.49	1.12	.00	58.21
(2)	.15	.40	.30	.18	.13	.14	.06	.09	.10	.10	.13	.09	.04	.00	.05	.04	.00	2.01
4-7	5	28	7	2	1	1	4	6	5	14	18	7	4	2	1	0	0	105
(1)	1.87	10.45	2.61	.75	.37	.37	1.49	2.24	1.87	5.22	6.72	2.61	1.49	.75	.37	.00	.00	39.18
(2)	.06	.36	.09	.03	.01	.01	.05	.08	.06	.18	.23	.09	.05	.03	.01	.00	.00	1.35
8-12	0	2	0	0	0	0	0	0	0	2	2	1	0	0	0	0	0	7
(1)	.00	.75	.00	.00	.00	.00	.00	.00	.00	.75	.75	.37	.00	.00	.00	.00	.00	2.61
(2)	.00	.03	.00	.00	.00	.00	.00	.00	.00	.03	.03	.01	.00	.00	.00	.00	.00	.09
13-18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(1)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
(2)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
19-24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(1)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
(2)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
GT 24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(1)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
(2)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
ALL SPEEDS	17	61	30	16	11	12	9	13	13	24	30	15	7	2	5	3	0	268
(1)	6.34	22.76	11.19	5.97	4.10	4.48	3.36	4.85	4.85	8.96	11.19	5.60	2.61	.75	1.87	1.12	.00	100.00
(2)	.22	.79	.39	.21	.14	.15	.12	.17	.17	.31	.39	.19	.09	.03	.06	.04	.00	3.45

(1)=PERCENT OF ALL GOOD OBSERVATIONS FOR THIS PAGE

(2)=PERCENT OF ALL GOOD OBSERVATIONS FOR THIS PERIOD

C= CALM (WIND SPEED LESS THAN OR EQUAL TO .95 MPH)

TABLE 5H

YANKEE ROWE JAN93-DEC93 METEOROLOGICAL DATA JOINT FREQUENCY DISTRIBUTION

196.0 FT WIND DATA STABILITY CLASS ALL CLASS FREQUENCY (PERCENT) = 100.00

WIND DIRECTION FROM

SPEED(MPH)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	VRBL	TOTAL
CALM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(1)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
(2)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
C-3	341	637	385	183	106	97	65	95	85	152	211	110	64	46	62	94	0	2733
(1)	4.39	8.20	4.96	2.36	1.36	1.25	.84	1.22	1.09	1.96	2.72	1.42	.82	.59	.80	1.21	.00	35.19
(2)	4.39	8.20	4.96	2.36	1.36	1.25	.84	1.22	1.09	1.96	2.72	1.42	.82	.59	.80	1.21	.00	35.19
4-7	311	741	162	37	36	52	69	112	193	296	445	190	125	94	96	129	0	3088
(1)	4.00	9.54	2.09	.48	.46	.67	.89	1.44	2.48	3.81	5.73	2.45	1.61	1.21	1.24	1.66	.00	39.76
(2)	4.00	9.54	2.09	.48	.46	.67	.89	1.44	2.48	3.81	5.73	2.45	1.61	1.21	1.24	1.66	.00	39.76
8-12	217	363	34	1	1	2	3	24	57	182	220	225	91	53	52	85	0	1610
(1)	2.79	4.67	.44	.01	.01	.03	.04	.31	.73	2.34	2.83	2.90	1.17	.68	.67	1.09	.00	20.73
(2)	2.79	4.67	.44	.01	.01	.03	.04	.31	.73	2.34	2.83	2.90	1.17	.68	.67	1.09	.00	20.73
13-18	41	112	4	0	0	0	0	0	2	16	51	68	13	2	0	8	0	317
(1)	.53	1.44	.05	.00	.00	.00	.00	.00	.03	.21	.66	.88	.17	.03	.00	.10	.00	4.08
(2)	.53	1.44	.05	.00	.00	.00	.00	.00	.03	.21	.66	.88	.17	.03	.00	.10	.00	4.08
19-24	1	7	0	0	0	0	0	0	0	0	4	7	0	0	0	0	0	19
(1)	.01	.09	.00	.00	.00	.00	.00	.00	.00	.00	.05	.09	.00	.00	.00	.00	.00	.24
(2)	.01	.09	.00	.00	.00	.00	.00	.00	.00	.00	.05	.09	.00	.00	.00	.00	.00	.24
GT 24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(1)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
(2)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
ALL SPEEDS	911	1860	585	221	143	151	137	231	337	646	931	600	293	195	210	316	0	7767
(1)	11.73	23.95	7.53	2.85	1.84	1.94	1.76	2.97	4.34	8.32	11.99	7.72	3.77	2.51	2.70	4.07	.00	100.00
(2)	11.73	23.95	7.53	2.85	1.84	1.94	1.76	2.97	4.34	8.32	11.99	7.72	3.77	2.51	2.70	4.07	.00	100.00

(1)=PERCENT OF ALL GOOD OBSERVATIONS FOR THIS PAGE
 (2)=PERCENT OF ALL GOOD OBSERVATIONS FOR THIS PERIOD
 C= CALM (WIND SPEED LESS THAN OR EQUAL TO .95 MPH)

APPENDIX A

Radioactive Liquid Effluent Monitoring Instrumentation

Requirement: Radioactive liquid effluent monitoring instrumentation channels are required to be operable in accordance with Control 5.1. With less than the minimum number of channels operable and reasonable efforts to return the instrument(s) to operable status within 30 days being unsuccessful, Control 5.1 requires an explanation for the delay in correcting the inoperability in the next Effluent and Waste Disposal Semiannual Report.

Response: Steam Generator Effluent Monitor (Permanent Inoperability) - On October 26, 1993, the last liquid release occurred via the steam generator effluent flow path. Due to the removal of the steam generators, there is no longer a liquid release flow path through the steam generator effluent monitor. Thus, the monitor has been removed from operable status.

APPENDIX B

Radioactive Gaseous Effluent Monitoring Instrumentation

Requirement: Radioactive gaseous effluent monitoring instrumentation channels are required to be operable in accordance with Control 5.2. With less than the minimum number of channels operable and reasonable efforts to return the instrument(s) to operable status within 30 days being unsuccessful, Control 5.2 requires an explanation for the delay in correcting the inoperability in the next Effluent and Waste Disposal Semiannual Report.

Response: The requirements of Control 5.2 governing the operability of radioactive gaseous effluent monitoring instrumentation were met for this reporting period.

APPENDIX C

Liquid Holdup Tanks

Requirement: Defueled Technical Specification 3.4 limits the quantity of radioactive material contained in any outside temporary tank. With the quantity of radioactive material in any outside temporary tank exceeding the limits of Technical Specification 3.4, a description of the events leading to this condition is required in the next Effluent and Waste Disposal Semiannual Report.

Response: The limits of Technical Specification 3.4 were not exceeded during this reporting period.

APPENDIX D

Radiological Environmental Monitoring Program

Requirement: The Radiological Environmental Monitoring Program is conducted in accordance with Control 4.1. With milk or fresh leafy vegetation samples no longer available from one or more of the required sample locations, Control 4.1 requires the identification of the new location(s) for obtaining replacement sample(s) in the next Effluent and Waste Disposal Semiannual Report and inclusion of revised Off-Site Dose Calculation Manual figure(s) and table(s) reflecting the new location(s).

Response: No milk or fresh leafy vegetation samples were found to be unavailable during this reporting period.

APPENDIX E

Land Use Census

Requirement: A land use census is conducted in accordance with Control 4.2. With a land use census identifying a location(s) which yields at least a 20 percent greater dose or dose commitment than the values currently being calculated in Control 3.5, Control 4.2 requires the identification of the new location(s) in the next Effluent and Waste Disposal Semiannual Report.

Response: The land use census for this reporting period did not identify any locations yielding at least a 20 percent greater dose or dose commitment than the values currently being calculated in Control 3.5.

Requirement: With a land use census identifying a location(s) which yields a calculated dose or dose commitment (via the same exposure pathway) at least 20 percent greater than at a location from which samples are currently being obtained in accordance with Control 4.1, Control 4.2 requires that the new location(s) be added to the Radiological Environmental Monitoring Program if permission from the owner to collect samples can be obtained and sufficient sample volume is available. The identification of the new location(s) is required in the next Effluent and Waste Disposal Semiannual Report.

Response: No changes were made in the Radiological Environmental Monitoring Program as a result of the 1993 land use census.

APPENDIX F

Process Control Program (PCP)

Requirement: PCP Control 2.0 requires that licensee-initiated changes to the PCP be submitted to the Commission in the Effluent and Waste Disposal Semiannual Report for the period in which the change(s) was made.

Response: There were no licensee-initiated changes to the PCP during this reporting period.

APPENDIX G

Off-Site Dose Calculation Manual (ODCM)

Requirement: Control 7.2 requires that licensee-initiated changes to the ODCM be submitted to the Commission in the Effluent and Waste Disposal Semiannual Report for the period in which the change(s) was made effective.

Response: There were no licensee-initiated changes to the ODCM during this reporting period.

APPENDIX H

Radioactive Liquid, Gaseous, and Solid Waste Treatment Systems

Requirement: Control 7.3 requires that licensee-initiated major changes to the radioactive waste systems (liquid, gaseous, and solid) be reported to the Commission in the Effluent and Waste Disposal Semiannual Report for the period in which the evaluation was reviewed by the Plant Operation Review Committee.

Response: There were no licensee-initiated major changes to a radioactive waste system(s) during this reporting period.

APPENDIX I

Supplemental Information
Third and Fourth Quarters 1993

1. Control Limits - Dose and Dose Rate

	<u>Control and Category</u>	<u>Limit</u>
a.	<u>Noble Gases</u>	
	Control 3.3, Total body dose rate	500 mrem/year
	Control 3.3, Skin dose rate	3000 mrem/year
	Control 3.4, Gamma air dose	5 mrad/quarter
	Control 3.4, Gamma air dose	10 mrad/year
	Control 3.4, Beta air dose	10 mrad/quarter
	Control 3.4, Beta air dose	20 mrad/year
b.	<u>Iodine-131, Tritium, and Radionuclides in Particulate Form With Half-Lives Greater Than 8 Days</u>	
	Control 3.3, Organ dose rate	1500 mrem/year
	Control 3.5, Organ dose	7.5 mrem/quarter
	Control 3.5, Organ dose	15 mrem/year
c.	<u>Liquids</u>	
	Control 3.1, Total body dose	1.5 mrem/quarter
	Control 3.1, Total body dose	3 mrem/year
	Control 3.1, Organ dose	5 mrem/quarter
	Control 3.1, Organ dose	10 mrem/year

2. Control Limits - Concentration

<u>Control and Category</u>	<u>Limit</u>
a. <u>Liquids</u>	
Control 2.1. Total sum of the fraction of MPC (10CFR20, Appendix B, Table II, Column 2), excluding noble gases less than:	1.0
Control 2.1. Total noble gas concentration	2.00E-04 $\mu\text{Ci/cc}$

3. Measurements and Approximations of Total Radioactivity

a. Noble Gases, Krypton-85

Continuous discharges are determined by direct measurements. A primary vent stack gas sample is taken monthly and analyzed for Krypton-85. A review of the weekly primary vent stack noble gas integrator readings for any increase in values above the background level also is used as a reference. There are no longer any batch discharges. Errors associated with the above measurements are estimated to be ± 25 percent.

b. Iodines, Particulates

There are no longer any iodine isotopes available for discharge. The sampling system design requires the use of a charcoal cartridge for particulate collection. The sampling system continuously draws a sample from the primary vent stack through a filter and charcoal cartridge. Both the filter and charcoal cartridge are removed and analyzed weekly. The errors associated with the determination of particulate effluents are estimated to be ± 30 percent.

c. Liquid Effluents

A gamma isotopic analysis is performed on a representative sample using a Marinelli Beaker geometry for both a batch or continuous discharge. Composite samples for batch and continuous discharges are analyzed for strontium-89, strontium-90, iron-55, gross alpha activity, and carbon-14.

Tritium analysis is performed on composite samples for continuous discharges and on each batch discharge. The errors associated with these measurements are as follows: fission and activation products, ± 20 percent; tritium, ± 10 percent; dissolved fission gases, ± 20 percent; and alpha activity, ± 35 percent.

4. Batch Releases

a. Liquids

The batch release data is presented in two categories to provide accurate average discharge rate values.

<u>Third Quarter</u>	Outdoor	
	<u>Routine Batches</u>	<u>Tank Moats</u>
Number of batch releases:	2	0
Total time period for batch releases (minutes):	255	
Maximum time period for a batch release (minutes):	155	
Average time period for batch releases (minutes):	127	
Minimum time period for a batch release (minutes):	100	
Average stream flow (Sherman Dam) during period (cfs):	209	
Average discharge rate (gpm):	26	

<u>Fourth Quarter</u>	Outdoor	
	<u>Routine Batches</u>	<u>Tank Moats</u>
Number of batch releases:	10	4
Total time period for batch releases (minutes):	2441	7709
Maximum time period for a batch release (minutes):	440	2090
Average time period for batch releases (minutes):	244	1927
Minimum time period for a batch release (minutes):	93	1815
Average stream flow (Sherman Dam) during period (cfs):	652	652
Average discharge rate (gpm):	24	4.7

b. Gases

There are no longer any gaseous batch discharges.

5. Abnormal Releases

Control 7.2 requires the reporting of any unplanned releases from the site to the site boundary of radioactive material in gaseous and liquid effluents made during the reporting period.

a. Liquid

There were no nonroutine liquid releases during the reporting period.

b. Gases

There were no nonroutine gaseous releases during the reporting period.

APPENDIX J

Sewage Sludge Disposal

Requirement: For periods in which disposal of septage occurs, the licensee shall report in the Effluent and Waste Disposal Semiannual Report, the volume discharged, liquid and solid fractions, nuclide content in the liquid and solid fractions, and total activity discharged.

Response: The following information is provided for the disposal of sewage sludge during the reporting period:

Volume Discharged (gallons): 7000
Liquid Fraction of Waste: 9.08E-01
Solid Fraction of Waste: 9.15E-02
Nuclide Content in Liquid Fraction (uCi/g): ND⁽¹⁾

Nuclide Content in Solid Fraction (uCi/g):
Cesium-137 = 1.67E-07
Cobalt-60 = 3.14E-06
Manganese-54 = 5.10E-07

Total Activity Discharged (uCi):
Cesium-137 = 4.10E-01
Cobalt-60 = 7.61E+00
Manganese-54 = 1.24E+00
TOTAL 9.26E+00

(1) ND - Not Detectable