1999 ANNUAL

RADIOACTIVE EFFLUENT RELEASE REPORT

Yankee Atomic Electric Company
Rowe, Massachusetts

NOTES:

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

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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 year. Table 4 summarizes the estimated radiological dose commitments from all radioactive liquid and gaseous effluents released during the year 1999

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) using historic meteorological data. For gaseous releases, five years of historic (1992-1996) quarterly meteorological data 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 operation/decommissioning of the plant and as such, is 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 3.4, Controls 4.1, 4.2, 2.0 (PCP), 7.2, and 7.3, respectively. Appendix I of this report provides supplemental information on effluent releases

for this reporting period and Appendix J provides information concerning the disposal of any sewage sludge which may have occurred during this reporting period.

2.0 METEOROLOGICAL DATA

Five years of historic meteorological data (1992-1996) collected from the site's 200-foot meteorological tower, located approximately 180 meters north of the vapor container, were used to model the atmospheric dispersion of airborne effluents. The tower instrumentation was designed to meet the requirements of Regulatory Guide 1.23 (Reference 2) for meteorological monitoring. A summary of the 1992-1996 meteorological data is provided in Table 5 of this report.

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 wind speed, as described in Regulatory Guide 1.111 (Reference 3).

Atmospheric diffusion was calculated using quarterly historical data along with the recorded quarterly effluent information. CHI/Q and D/Q values were derived for all receptor points 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 CHI/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 assumes a dilution based on the monthly average flow at the Sherman Dam.

The whole body and organ doses due to liquid effluents were determined by summing the contributions from all pathways. 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."

If noble gases are determined to be present in effluent discharge, the dose estimates are 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, are calculated at each of the above locations.

To determine the beta contribution to the skin dose, a semi-infinite cloud model is utilized. The whole body gamma dose is 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 is 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. No additional credit is taken for decay of radionuclides in transit to the receptor point.

The only release of noble gas occurred during the third quarter when Kr^{85}, a laboratory QC source, was released.

3.3 Doses From 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 tritium and radionuclides in particulate form with half-lives greater than 8 days 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 tritium and particulates in gaseous effluents will be kept "as low as is reasonably achievable." It should be noted that due to the permanent shutdown of the plant (last power operation was in October 1991), the Iodine-131 source term has decayed away and no longer has the potential to affect dose assessment.

Exposure pathways that could exist as a result of the release of particulates and tritium to the atmosphere include external irradiation from activity deposited onto the ground surface, inhalation, and ingestion of vegetables, meat, and milk. (Note that no milk animals were identified within 5 miles in this year's land use census and, therefore, this pathway is not included for this report period). 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 were

calculated for pathways that were determined by the field survey to actually exist. Conservatively, a vegetable garden is assumed to exist at each milk animal location when the milk pathway is included. Furthermore, the meat pathway is assumed to exist at each milk animal location (when milk is identified). Meat and milk animals are assumed to receive their entire intake from pasture during the second and third quarters. This assumption is conservative 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 tritium 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 tritium and particulates in gaseous effluents are well below the 10CFR Part 50, Appendix I dose criteria of Control 3.5.

4.0 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
(Sheet 1 of 2)

Yankee Atomic Electric Company, Rowe, Massachusetts
1999 Annual Radioactive Effluent Release Report
Gaseous Effluents – Summation of All Releases

	Unit	Quarter 1	Quarter 2	Est. Total Error, %
A. Fission and Activation Gases				
1. Total Release	Ci	ND	ND	±2.50E+01
2. Average Release Rate for Period	µCi/sec	ND	ND	
3. Percent of Control Limit[a]	%	0.00E+00	0.00E+00	
B. Iodines[b]				
C. Particulates				
1. Particluates with Half-lives > 8 days	Ci	4.52E-08	ND	±3.00E+01
2. Average Release Rate for Period	µCi/sec	5.81E-09	ND	
3. Percent of Control Limit[c]	%	4.00E-03	5.33E-03	
4. Gross Alpha Radioactivity	Ci	ND	ND	
D. Tritium				
1. Total Release	Ci	4.61E-02	5.49E-02	±3.00E+01
2. Average Release Rate for Period	µCi/sec	5.93E-03	6.98E-03	
3. Percent of Control Limit	%	(d)	(d)	

ND Not detected in gaseous effluents.
(a) ODCM Control 3.4.a for gamma-air dose. Percent values for ODCM Control 3.4.b for beta-air dose would be approximately the same.
(b) Iodine data have been deleted. These nuclides are no longer available for discharge.
(c) Per ODCM Control 3.5, the percentage of the limit is based on the combined dose contribution from iodines, tritium, and particulates with half lives greater than 8 days. Percent of limits are calculated using ODCM Method I dose equations.
(d) Per ODCM Control 3.5, percentage dose contribution from tritium is included in Part C.3.

TABLE 1A
(Sheet 2 of 2)

Yankee Atomic Electric Company, Rowe, Massachusetts
1999 Annual Radioactive Effluent Release Report
Gaseous Effluents – Summation of All Releases

	Unit	Quarter 3	Quarter 4	Est. Total Error, %
A. Fission and Activation Gases				
1. Total Release	Ci	1.37E-05	ND	±2.50E+01
2. Average Release Rate for Period	µCi/sec	1.74E-06	ND	
3. Percent of Control Limit[(a)]	%	1.72E-09	0.00E+01	
B. Iodines[(b)]				
C. Particulates				
1. Particluates with Half-lives > 8 days	Ci	3.08E-07	4.34E-08	±3.00E+01
2. Average Release Rate for Period	µCi/sec	3.92E-08	5.46E-09	
3. Percent of Control Limit[(c)]	%	8.00E-03	4.00E-03	
4. Gross Alpha Radioactivity	Ci	ND	ND	
D. Tritium				
1. Total Release	Ci	7.92E-02	3.96E-02	±3.00E+01
2. Average Release Rate for Period	µCi/sec	1.01E-02	4.98E-03	
3. Percent of Control Limit	%	(d)	(d)	

ND Not detected in gaseous effluents.
(a) ODCM Control 3.4.a for gamma-air dose. Percent values for ODCM Control 3.4.b for beta-air dose would be approximately the same.
(b) Iodine data have been deleted. These nuclides are no longer available for discharge.
(c) Per ODCM Control 3.5, the percentage of the limit is based on the combined dose contribution from iodines, tritium, and particulates with half lives greater than 8 days. Percent of limits are calculated using ODCM Method I dose equations.
(d) Per ODCM Control 3.5, percentage dose contribution from tritium is included in Part C.3.

TABLE 1B
(Sheet 1 of 2)

Yankee Atomic Electric Company, Rowe, Massachusetts
1999 Annual Radioactive Effluent Release Report
Gaseous Effluents – Elevated Releases

Nuclides Released	Unit	Continuous Mode		Batch Mode[a]	
		Quarter 1	Quarter 2	Quarter 1	Quarter 2
1. Fission Gases					
Krypton-85	Ci	ND	ND	-	-
Total for Period	Ci	ND	ND	-	-
2. Iodines[b]					
3. Particulates					
Strontium-89	Ci	ND	ND	-	-
Strontium-90	Ci	ND	ND	-	-
Cesium-134	Ci	ND	ND	-	-
Cesium-137	Ci	ND	ND	-	-
Zinc-65	Ci	ND	ND	-	-
Cobalt-58	Ci	ND	ND	-	-
Cobalt-60	Ci	4.52E-08	ND	-	-
Cerium-144	Ci	ND	ND	-	-
Manganese-54	Ci	ND	ND	-	-
Total for Period	Ci	4.52E-08	ND	-	-

ND Not detected in gaseous effluents.
(a) There are no longer any batch mode gaseous releases.
(b) Iodine-131, Iodine-133, and Iodine-135 activities have been deleted. These nuclides are no longer available for discharge.

TABLE 1B
(Sheet 2 of 2)

Yankee Atomic Electric Company, Rowe, Massachusetts
1999 Annual Radioactive Effluent Release Report
Gaseous Effluents – Elevated Releases

		Continuous Mode		Batch Mode[a]	
Nuclides Released	Unit	Quarter 3	Quarter 4	Quarter 3	Quarter 4
1. Fission Gases					
Krypton-85	Ci	ND	ND	-	-
Total for Period	Ci	ND	ND	-	-
2. Iodines[b]					
3. Particulates					
Strontium-89	Ci	ND	ND	-	-
Strontium-90	Ci	ND	ND	-	-
Cesium-134	Ci	ND	ND	-	-
Cesium-137	Ci	ND	4.34E-08	-	-
Zinc-65	Ci	ND	ND	-	-
Cobalt-58	Ci	ND	ND	-	-
Cobalt-60	Ci	3.08E-07	ND	-	-
Cerium-144	Ci	ND	ND	-	-
Manganese-54	Ci	ND	ND	-	-
Total for Period	Ci	3.08E-07	4.34E-08	-	-

ND Not detected in gaseous effluents.
(a) There are no longer any batch mode gaseous releases.
(b) Iodine-131, Iodine-133, and Iodine-135 activities have been deleted. These nuclides are no longer available for discharge.

TABLE 1C
(Sheet 1 of 2)

Yankee Atomic Electric Company, Rowe, Massachusetts
1999 Annual Radioactive Effluent Release Report
Gaseous Effluents – Ground Level Releases

		Continuous Mode[a]		Batch Mode[b]	
Nuclides Released	Unit	Quarter 1	Quarter 2	Quarter 1	Quarter 2
1. Fission Gases					
Krypton-85	Ci	-	-	-	-
Total for Period	Ci	-	-	-	-
2. Iodines[c]					
3. Particulates					
Strontium-89	Ci	-	-	-	-
Strontium-90	Ci	-	-	-	-
Cesium-134	Ci	-	-	-	-
Cesium-137	Ci	-	-	-	-
Zinc-65	Ci	-	-	-	-
Cobalt-58	Ci	-	-	-	-
Cobalt-60	Ci	-	-	-	-
Cerium-144	Ci	-	-	-	-
Manganese-54	Ci	-	-	-	-
Total for Period	Ci	-	-	-	-

ND Not detected in gaseous effluents.
(a) There were no ground level releases for the first and second quarters.
(b) There are no longer any batch mode gaseous releases.
(c) Iodine-131, Iodine-133, and Iodine-135 activities have been deleted. These nuclides are no longer available for discharge.

TABLE 1C
(Sheet 2 of 2)

Yankee Atomic Electric Company, Rowe, Massachusetts
1999 Annual Radioactive Effluent Release Report
Gaseous Effluents – Ground Level Releases

		Continuous Mode		Batch Mode[a]	
Nuclides Released	Unit	Quarter 3	Quarter 4	Quarter 3	Quarter 4
1. Fission Gases					
Krypton-85[b]	Ci	1.37E-05	-	-	-
Total for Period	Ci	1.37E-05	-	-	-
2. Iodines[c]					
3. Particulates					
Strontium-89	Ci	-	-	-	-
Strontium-90	Ci	-	-	-	-
Cesium-134	Ci	-	-	-	-
Cesium-137	Ci	-	-	-	-
Zinc-65	Ci	-	-	-	-
Cobalt-58	Ci	-	-	-	-
Cobalt-60	Ci	-	-	-	-
Cerium-144	Ci	-	-	-	-
Manganese-54	Ci	-	-	-	-
Total for Period	Ci	-	-	-	-

ND Not detected in gaseous effluents.
(a) There are no longer any batch mode gaseous releases.
(b) Krypton-85 laboratory QC gas source diffused over a 3-month period.
(c) Iodine-131, Iodine-133, and Iodine-135 activities have been deleted. These nuclides are no longer available for discharge.

TABLE 2A
(Sheet 1 of 2)

Yankee Atomic Electric Company, Rowe, Massachusetts
1999 Annual Radioactive Effluent Release Report
Liquid Effluents – Summation of All Releases

	Unit	Quarter 1	Quarter 2	Est. Total Error, %
A. Fission and Activation Products				
1. Total Release (not including tritium, gases, alpha)	Ci	ND	ND	±2.00E+01
2. Average Diluted Concentration During Period	µCi/ml	ND	ND	
3. Percent of Applicable Limit[(a)]	%	0.00E+00	0.00E+00	
B. Tritium				
1. Total Release	Ci	4.91E-04	3.46E-04	±1.00E+01
2. Average Diluted Concentration During Period	µCi/ml	5.50E-09	4.15E-09	
3. Percent of Applicable Limit[(a)]	%	1.83E-04	1.38E-04	
C. Dissolved and Entrained Gases				
1. Total Release	Ci	ND	ND	±2.00E+01
2. Average Diluted Concentration During Period	µCi/ml	ND	ND	
3. Percent of Applicable Limit[(b)]	%	0.00E+00	0.00E+00	
D. Gross Alpha Radioactivity				
1. Total Release	Ci	ND	ND	±3.50E+01
E. Volume of Waste Release (prior to dilution)	Liters	2.38E+04	4.62E+04	±1.00E+01
F. Volume of Dilution Water Used During Period	Liters	8.92E+07	8.33E+07	±1.50E+01

ND Not detected in liquid effluents.
(a) Concentration limits specified in Appendix B to 10CFR20.1-20.602, Table II, Column 2 (ODCM 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.
(b) Concentration limits for dissolved and entrained noble gases is 2.00E-04 µCi/ml (ODCM 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 2A
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Yankee Atomic Electric Company, Rowe, Massachusetts
1999 Annual Radioactive Effluent Release Report
Liquid Effluents – Summation of All Releases

	Unit	Quarter 3	Quarter 4	Est. Total Error, %
A. Fission and Activation Products				
1. Total Release (not including tritium, gases, alpha)	Ci	ND	2.18E-07	±2.00E+01
2. Average Diluted Concentration During Period	µCi/ml	ND	3.42E-12	
3. Percent of Applicable Limit[(a)]	%	0.00E+00	1.26E-05	
B. Tritium				
1. Total Release	Ci	1.66E-04	3.89E-04	±1.00E+01
2. Average Diluted Concentration During Period	µCi/ml	2.09E-09	6.11E-09	
3. Percent of Applicable Limit[(a)]	%	6.97E-05	2.04E-04	
C. Dissolved and Entrained Gases				
1. Total Release	Ci	ND	ND	±2.00E+01
2. Average Diluted Concentration During Period	µCi/ml	ND	ND	
3. Percent of Applicable Limit[(b)]	%	0.00E+00	0.00E+00	
D. Gross Alpha Radioactivity				
1. Total Release	Ci	ND	ND	±3.50E+01
E. Volume of Waste Release (prior to dilution)	Liters	3.29E+04	2.38E+06	±1.00E+01
F. Volume of Dilution Water Used During Period	Liters	7.94E+07	6.37E+07	±1.50E+01

ND Not detected in liquid effluents.
(a) Concentration limits specified in Appendix B to 10CFR20.1-20.602, Table II, Column 2 (ODCM 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.
(b) Concentration limits for dissolved and entrained noble gases is 2.00E-04 µCi/ml (ODCM 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
(Sheet 1 of 2)

Yankee Atomic Electric Company, Rowe, Massachusetts
1999 Annual Radioactive Effluent Release Report
Liquid Effluents – Routine Releases

		Continuous Mode		Batch Mode	
Nuclides Released	Unit	Quarter 1	Quarter 2	Quarter 1	Quarter 2
Strontium-89	Ci	ND	ND	ND	ND
Strontium-90	Ci	ND	ND	ND	ND
Cesium-134	Ci	ND	ND	ND	ND
Cesium-137	Ci	ND	ND	ND	ND
Cobalt-58	Ci	ND	ND	ND	ND
Cobalt-60	Ci	ND	ND	ND	ND
Zinc-65	Ci	ND	ND	ND	ND
Manganese-54	Ci	ND	ND	ND	ND
Cerium-144	Ci	ND	ND	ND	ND
Carbon-14	Ci	ND	ND	ND	ND
Iron-55	Ci	ND	ND	ND	ND
Unidentified	Ci	ND	ND	ND	ND
Total for Period (above)	Ci	ND	ND	ND	ND
Krypton-85	Ci	ND	ND	ND	ND

ND Not detected in liquid effluents.

TABLE 2B
(Sheet 2 of 2)

Yankee Atomic Electric Company, Rowe, Massachusetts
1999 Annual Radioactive Effluent Release Report
Liquid Effluents – Routine Releases

		Continuous Mode		Batch Mode	
Nuclides Released	Unit	Quarter 3	Quarter 4	Quarter 3	Quarter 4
Strontium-89	Ci	ND	ND	ND	ND
Strontium-90	Ci	ND	ND	ND	ND
Cesium-134	Ci	ND	ND	ND	ND
Cesium-137	Ci	ND	4.60E-08	ND	ND
Cobalt-58	Ci	ND	ND	ND	ND
Cobalt-60	Ci	ND	1.72E-07	ND	ND
Zinc-65	Ci	ND	ND	ND	ND
Manganese-54	Ci	ND	ND	ND	ND
Cerium-144	Ci	ND	ND	ND	ND
Carbon-14	Ci	ND	ND	ND	ND
Iron-55	Ci	ND	ND	ND	ND
Unidentified	Ci	ND	ND	ND	ND
Total for Period (above)	Ci	ND	2.18E-07	ND	ND
Krypton-85	Ci	ND	ND	ND	ND

ND Not detected in liquid effluents.

TABLE 3
(Sheet 1 of 3)

Yankee Atomic Electric Company, Rowe, Massachusetts
1999 Annual Radioactive Effluent Release Report
Solid Waste and Irradiated Fuel Shipments

I. First and Second Quarters

A. SOLID WASTE SHIPPED FOR BURIAL OR DISPOSAL (not irradiated fuel)

1. Type of Waste	Unit	6-month Period	Est. Total Error, %
a. Dry Active Waste: Class A	m^3	435	50
Containers: (a)	Ci (est.)	3.6E-02	
b. Evaporator Concentrates: Class A	m^3	8.9	30
Containers (314.2 ft^3 liner)	Ci (est.)	6.2E-02	

2. Estimate of Nuclide Composition > 1% (by type of waste)

a.	Iron-55	%	36.5
	Cobalt-60	%	20.3
	Nickel-63	%	37.2
	Strontium-90	%	1.4
	Cesium-137	%	3.5

b.	Tritium (H-3)	%	2.2
	Iron-55	%	41.4
	Cobalt-60	%	30.8
	Nickel-63	%	17.7
	Cesium-137	%	8.0

3. Solid Waste Disposition

Number of Shipments	Mode of Transporation	Destination
6(b)	Truck	Oak Ridge, TN
1	Truck	Barnwell, SC

B. IRRADIATED FUEL SHIPMENTS (Disposition): None

(a) Partial shipments by the processor to disposal.
(b) Waste shipments to processor.

TABLE 3
(Sheet 2 of 3)

Yankee Atomic Electric Company, Rowe, Massachusetts
1999 Annual Radioactive Effluent Release Report
Solid Waste and Irradiated Fuel Shipments

II. Third and Fourth Quarters

A. SOLID WASTE SHIPPED FOR BURIAL OR DISPOSAL (not irradiated fuel)

1. Type of Waste	Unit	6-month Period	Est. Total Error, %
a. Dry Active Waste: Class A	m^3	251.5	50
Containers: (a)	Ci (est.)	5.9E-02	
b. Evaporator Concentrates: Class A	m^3	8.9	30
Containers (314.2 ft^3 liner)	Ci (est.)	2.7E-03	
c. Soil/Asphalt/Concrete Rubble: Class A	m^3	305	30
Containers: metal boxes (approx. 100 ft^3)	Ci (est.)	1.2E+00	
d. Demolition Debris: Class A	m^3	540.9	30
Containers: Sealand (1,260 ft^3)	Ci (est.)	1.2E-01	

2. Estimate of Nuclide Composition > 1% (by type of waste)

a.	Iron-55	%	36.5
	Cobalt-60	%	20.3
	Nickel-63	%	37.2
	Strontium-90	%	1.4
	Cesium-137	%	3.5

b.	Tritium (H-3)	%	2.2
	Iron-55	%	41.4
	Cobalt-60	%	30.8
	Nickel-63	%	17.7
	Cesium-137	%	8.0

c.	Tritium (H-3)	%	6.3
	Iron-55	%	14.9
	Cobalt-60	%	19.1
	Nickel-63	%	24.2
	Strontium-90	%	5.3
	Cesium-134	%	1.0
	Cesium-137	%	39.3

(a) Partial shipments by the processor to disposal.

TABLE 3
(Sheet 3 of 3)

Yankee Atomic Electric Company, Rowe, Massachusetts
1999 Annual Radioactive Effluent Release Report
Solid Waste and Irradiated Fuel Shipments

II. Third and Fourth Quarters (continued)

A. SOLID WASTE SHIPPED FOR BURIAL OR DISPOSAL (not irradiated fuel) (continued)

2. Estimate of Nuclide Composition > 1% (by type of waste) (continued)

d.	Tritium (H-3)	%	2.6
	Iron-55	%	32.5
	Cobalt-60	%	19.0
	Nickel-63	%	33.4
	Cesium-137	%	11.1

3. Solid Waste Disposition

Number of Shipments	Mode of Transporation	Destination
41	Truck	Clive, UT
6(a)	Truck	Oak Ridge, TN
1	Truck	Barnwell, SC

B. IRRADIATED FUEL SHIPMENTS (Disposition): None

(a) Waste shipments to processor.

TABLE 4
(Sheet 1 of 1)

Yankee Atomic Electric Company, Rowe, Massachusetts
1999 Annual Radioactive Effluent Release Report
Maximum[a] Off-Site Doses and Dose Commitments to Members of the Public[b]

Source	Unit	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	Year[c]
1. Liquid Effluents						
Whole Body	mrem	1.61E-07[d]	3.31E-07[d]	1.21E-07[d]	3.42E-07[e]	9.55E-07
Critical Organ	mrem	1.61E-07[f]	3.31E-07[f]	1.21E-07[f]	6.06E-07[g]	1.22E-06
2. Airborne Effluents						
Tritium and Particulates	mrem	9.59E-05[h]	1.37E-04[i]	2.09E-04[j]	8.49E-05[k]	5.27E-04
Noble Gases (Beta Air)	mrad	0.00E+00[l]	0.00E+00[l]	1.18E-07[m]	0.00E+00[l]	1.18E-07
Noble Gases (Gamma Air)	mrad	0.00E+00[l]	0.00E+00[l]	1.38E-10[m]	0.00E+00[l]	1.38E-10

(a) "Maximum" means the largest fraction of corresponding 10 CFR Part 50, Appendix I, dose design objective.
(b) The numbered footnotes indicate the location of the dose receptor, age group, and organ, where appropriate.
(c) "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 within the limits of 10 CFR Part 50.
(d) Child
(e) Adult
(f) Liver, kidney, lung, GI-LII, and thyroid of a child
(g) Liver of a child
(h) SW, WSW, 1300 meters; lung and GI-LII of a child
(i) SW, WSW, 1300 meters; liver, kidney, lung, GI-LII, thyroid, and whole body of a child
(j) SW, WSW, 1300 meters; liver, lung, GI-LII, and whole body of a child
(k) SW, WSW, 1300 meters; liver of a child
(l) There were no noble gases released during the first, second, or fourth quarters of 1999.
(m) WSW, 126 meters

TABLE 5
(Sheet 1 of 8)

Yankee Atomic Electric Company, Rowe, Massachusetts
1999 Annual Radioactive Effluent Release Report
1992-1996 Meteorological Data Joint Frequency Distribution

1. 199.0 FT WIND DATA STABILITY CLASS A CLASS FREQUENCY (PERCENT) = .09

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	1	2	0	0	0	0	0	0	0	0	0	0	0	1	0	4
(1)	.00	.00	2.56	5.13	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	2.56	.00	10.26
(2)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.01
4-7	0	0	0	0	0	0	0	1	0	2	0	0	0	0	0	0	0	3
(1)	.00	.00	.00	.00	.00	.00	.00	2.56	.00	5.13	.00	.00	.00	.00	.00	.00	.00	7.69
(2)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.01
8-12	0	1	0	0	0	0	0	0	2	3	13	6	1	0	0	0	0	26
(1)	.00	2.56	.00	.00	.00	.00	.00	.00	5.13	7.69	33.33	15.38	2.56	.00	.00	.00	.00	66.67
(2)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.01	.03	.01	.00	.00	.00	.00	.00	.06
13-18	0	0	0	0	0	0	0	0	0	0	5	1	0	0	0	0	0	6
(1)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	12.82	2.56	.00	.00	.00	.00	.00	15.38
(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	1	1	2	0	0	0	1	2	5	18	7	1	0	0	1	0	39
(1)	.00	2.56	2.56	5.13	.00	.00	.00	2.56	5.13	12.82	46.15	17.95	2.56	.00	.00	2.56	.00	100.00
(2)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.01	.04	.02	.00	.00	.00	.00	.00	.09

(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 5
(Sheet 2 of 8)

Yankee Atomic Electric Company, Rowe, Massachusetts
1999 Annual Radioactive Effluent Release Report
1992-1996 Meteorological Data Joint Frequency Distribution

2. 199.0 FT WIND DATA STABILITY CLASS B CLASS FREQUENCY (PERCENT) = .36

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	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	5
(1)	.68	.68	.68	.68	.68	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	3.42
(2)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.01
4-7	1	0	0	0	0	0	0	2	11	5	6	3	1	0	0	0	0	29
(1)	.68	.00	.00	.00	.00	.00	.00	1.37	7.53	3.42	4.11	2.05	.68	.00	.00	.00	.00	19.86
(2)	.00	.00	.00	.00	.00	.00	.00	.00	.03	.01	.01	.01	.00	.00	.00	.00	.00	.07
8-12	0	1	0	0	0	0	0	3	6	14	49	20	0	0	0	0	0	93
(1)	.00	.68	.00	.00	.00	.00	.00	2.05	4.11	9.59	33.56	13.70	.00	.00	.00	.00	.00	63.70
(2)	.00	.00	.00	.00	.00	.00	.00	.01	.01	.03	.12	.05	.00	.00	.00	.00	.00	.23
13-18	0	1	0	0	0	0	0	0	0	0	12	6	0	0	0	0	0	19
(1)	.00	.68	.00	.00	.00	.00	.00	.00	.00	.00	8.22	4.11	.00	.00	.00	.00	.00	13.01
(2)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.03	.01	.00	.00	.00	.00	.00	.05
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	2	3	1	1	1	0	0	5	17	19	67	29	1	0	0	0	0	146
(1)	1.37	2.05	.68	.68	.68	.00	.00	3.42	11.64	13.01	45.89	19.86	.68	.00	.00	.00	.00	100.00
(2)	.00	.01	.00	.00	.00	.00	.00	.01	.04	.05	.16	.07	.00	.00	.00	.00	.00	.36

(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 5
(Sheet 3 of 8)

Yankee Atomic Electric Company, Rowe, Massachusetts
1999 Annual Radioactive Effluent Release Report
1992-1996 Meteorological Data Joint Frequency Distribution

3. 199.0 FT WIND DATA STABILITY CLASS C CLASS FREQUENCY (PERCENT) = 1.24

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	5	3	0	0	0	1	1	0	0	0	0	0	1	0	0	13
(1)	.20	.20	.98	.59	.00	.00	.00	.20	.20	.00	.00	.00	.00	.00	.20	.00	.00	2.55
(2)	.00	.00	.01	.01	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.03
4-7	0	3	2	0	1	3	2	17	24	21	22	16	6	3	1	0	0	121
(1)	.00	.59	.39	.00	.20	.59	.39	3.33	4.71	4.12	4.31	3.14	1.18	.59	.20	.00	.00	23.73
(2)	.00	.01	.00	.00	.00	.01	.00	.04	.06	.05	.05	.04	.01	.01	.00	.00	.00	.29
8-12	1	4	1	0	0	0	2	7	17	42	122	107	10	2	1	2	0	318
(1)	.20	.78	.20	.00	.00	.00	.39	1.37	3.33	8.24	23.92	20.98	1.96	.39	.20	.39	.00	62.35
(2)	.00	.01	.00	.00	.00	.00	.00	.02	.04	.10	.30	.26	.02	.00	.00	.00	.00	.77
13-18	2	2	0	0	0	0	0	0	1	4	20	27	2	0	0	0	0	58
(1)	.39	.39	.00	.00	.00	.00	.00	.00	.20	.78	3.92	5.29	.39	.00	.00	.00	.00	11.37
(2)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.01	.05	.07	.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	4	10	8	3	1	3	4	25	43	67	164	150	18	5	3	2	0	510
(1)	.78	1.96	1.57	.59	.20	.59	.78	4.90	8.43	13.14	32.16	29.41	3.53	.98	.59	.39	.00	100.00
(2)	.01	.02	.02	.01	.00	.01	.01	.06	.10	.16	.40	.36	.04	.01	.01	.00	.00	1.24

(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 5
(Sheet 4 of 8)

Yankee Atomic Electric Company, Rowe, Massachusetts
1999 Annual Radioactive Effluent Release Report
1992-1996 Meteorological Data Joint Frequency Distribution

4. 199.0 FT WIND DATA STABILITY CLASS D CLASS FREQUENCY (PERCENT) = 46.68

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	1	0	0	0	1
(1)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.01	.00	.00	.00	.01
(2)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
C-3	299	588	303	121	89	87	85	80	81	132	224	161	97	79	99	124	0	2649
(1)	1.56	3.07	1.58	.63	.46	.45	.44	.42	.42	.69	1.17	.84	.51	.41	.52	.65	.00	13.81
(2)	.73	1.43	.74	.29	.22	.21	.21	.19	.20	.32	.55	.39	.24	.19	.24	.30	.00	6.45
4-7	786	1407	437	174	174	183	237	322	561	795	1107	761	509	358	376	454	0	8641
(1)	4.10	7.33	2.28	.91	.91	.95	1.24	1.68	2.92	4.14	5.77	3.97	2.65	1.87	1.96	2.37	.00	45.05
(2)	1.91	3.42	1.06	.42	.42	.45	.58	.78	1.36	1.93	2.69	1.85	1.24	.87	.91	1.10	.00	21.02
8-12	935	1264	163	35	37	32	39	82	162	525	792	942	569	258	241	441	0	6517
(1)	4.87	6.59	.85	.18	.19	.17	.20	.43	.84	2.74	4.13	4.91	2.97	1.34	1.26	2.30	.00	33.97
(2)	2.27	3.08	.40	.09	.09	.08	.09	.20	.39	1.28	1.93	2.29	1.38	.63	.59	1.07	.00	15.86
13-18	216	446	19	3	0	2	1	1	11	39	172	265	68	13	11	47	0	1314
(1)	1.13	2.32	.10	.02	.00	.01	.01	.01	.06	.20	.90	1.38	.35	.07	.06	.25	.00	6.85
(2)	.53	1.09	.05	.01	.00	.00	.00	.00	.03	.09	.42	.64	.17	.03	.03	.11	.00	3.20
19-24	12	28	1	0	0	0	0	0	0	2	5	10	2	0	0	1	0	61
(1)	.06	.15	.01	.00	.00	.00	.00	.00	.00	.01	.03	.05	.01	.00	.00	.01	.00	.32
(2)	.03	.07	.00	.00	.00	.00	.00	.00	.00	.00	.01	.02	.00	.00	.00	.00	.00	.15
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	2248	3733	923	333	300	304	362	485	815	1493	2300	2139	1245	709	727	1067	0	19183
(1)	11.72	19.46	4.81	1.74	1.56	1.58	1.89	2.53	4.25	7.78	11.99	11.15	6.49	3.70	3.79	5.56	.00	100.00
(2)	5.47	9.08	2.25	.81	.73	.74	.88	1.18	1.98	3.63	5.60	5.20	3.03	1.73	1.77	2.60	.00	46.68

(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 5
(Sheet 5 of 8)

Yankee Atomic Electric Company, Rowe, Massachusetts
1999 Annual Radioactive Effluent Release Report
1992-1996 Meteorological Data Joint Frequency Distribution

5. 199.0 FT WIND DATA STABILITY CLASS E CLASS FREQUENCY (PERCENT) = 40.08

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	999	2950	1363	527	310	271	231	250	295	401	523	315	191	171	204	309	0	9310
(1)	6.06	17.91	8.27	3.20	1.88	1.65	1.40	1.52	1.79	2.43	3.17	1.91	1.16	1.04	1.24	1.88	.00	56.51
(2)	2.43	7.18	3.32	1.28	.75	.66	.56	.61	.72	.98	1.27	.77	.46	.42	.50	.75	.00	22.65
4-7	455	2014	392	83	66	59	74	168	242	501	730	340	172	92	151	164	0	5703
(1)	2.76	12.23	2.38	.50	.40	.36	.45	1.02	1.47	3.04	4.43	2.06	1.04	.56	.92	1.00	.00	34.62
(2)	1.11	4.90	.95	.20	.16	.14	.18	.41	.59	1.22	1.78	.83	.42	.22	.37	.40	.00	13.88
8-12	121	331	52	2	1	4	2	17	38	238	176	122	55	22	22	33	0	1236
(1)	.73	2.01	.32	.01	.01	.02	.01	.10	.23	1.44	1.07	.74	.33	.13	.13	.20	.00	7.50
(2)	.29	.81	.13	.00	.00	.01	.00	.04	.09	.58	.43	.30	.13	.05	.05	.08	.00	3.01
13-18	16	64	7	2	0	0	0	0	4	40	37	26	6	0	1	4	0	207
(1)	.10	.39	.04	.01	.00	.00	.00	.00	.02	.24	.22	.16	.04	.00	.01	.02	.00	1.26
(2)	.04	.16	.02	.00	.00	.00	.00	.00	.01	.10	.09	.06	.01	.00	.00	.01	.00	.50
19-24	0	7	0	0	0	0	0	0	0	0	9	2	0	0	0	0	0	18
(1)	.00	.04	.00	.00	.00	.00	.00	.00	.00	.00	.05	.01	.00	.00	.00	.00	.00	.11
(2)	.00	.02	.00	.00	.00	.00	.00	.00	.00	.00	.02	.00	.00	.00	.00	.00	.00	.04
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	1591	5366	1814	614	377	334	307	435	579	1180	1475	805	424	285	378	510	0	16474
(1)	9.66	32.57	11.01	3.73	2.29	2.03	1.86	2.64	3.51	7.16	8.95	4.89	2.57	1.73	2.29	3.10	.00	100.00
(2)	3.87	13.06	4.41	1.49	.92	.81	.75	1.06	1.41	2.87	3.59	1.96	1.03	.69	.92	1.24	.00	40.08

(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 5
(Sheet 6 of 8)

Yankee Atomic Electric Company, Rowe, Massachusetts
1999 Annual Radioactive Effluent Release Report
1992-1996 Meteorological Data Joint Frequency Distribution

6. 199.0 FT WIND DATA STABILITY CLASS F CLASS FREQUENCY (PERCENT) = 8.76

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	156	433	448	220	148	132	112	86	105	133	152	99	92	50	71	83	0	2520
(1)	4.33	12.02	12.44	6.11	4.11	3.67	3.11	2.39	2.92	3.69	4.22	2.75	2.55	1.39	1.97	2.30	.00	69.98
(2)	.38	1.05	1.09	.54	.36	.32	.27	.21	.26	.32	.37	.24	.22	.12	.17	.20	.00	6.13
4-7	69	257	83	27	17	10	25	39	54	100	144	68	38	32	34	26	0	1023
(1)	1.92	7.14	2.30	.75	.47	.28	.69	1.08	1.50	2.78	4.00	1.89	1.06	.89	.94	.72	.00	28.41
(2)	.17	.63	.20	.07	.04	.02	.06	.09	.13	.24	.35	.17	.09	.08	.08	.06	.00	2.49
8-12	4	13	0	0	0	0	0	0	2	6	14	7	4	1	0	0	0	51
(1)	.11	.36	.00	.00	.00	.00	.00	.00	.06	.17	.39	.19	.11	.03	.00	.00	.00	1.42
(2)	.01	.03	.00	.00	.00	.00	.00	.00	.00	.01	.03	.02	.01	.00	.00	.00	.00	.12
13-18	1	5	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	7
(1)	.03	.14	.00	.00	.00	.00	.00	.00	.00	.00	.03	.00	.00	.00	.00	.00	.00	.19
(2)	.00	.01	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.02
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	230	708	531	247	165	142	137	125	161	239	311	174	134	83	105	109	0	3601
(1)	6.39	19.66	14.75	6.86	4.58	3.94	3.80	3.47	4.47	6.64	8.64	4.83	3.72	2.30	2.92	3.03	.00	100.00
(2)	.56	1.72	1.29	.60	.40	.35	.33	.30	.39	.58	.76	.42	.33	.20	.26	.27	.00	8.76

(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 5
(Sheet 7 of 8)

Yankee Atomic Electric Company, Rowe, Massachusetts
1999 Annual Radioactive Effluent Release Report
1992-1996 Meteorological Data Joint Frequency Distribution

7. 199.0 FT WIND DATA STABILITY CLASS G CLASS FREQUENCY (PERCENT) = 2.79

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	30	88	83	54	60	41	47	46	44	41	52	31	15	13	16	16	0	677
(1)	2.62	7.68	7.24	4.71	5.24	3.58	4.10	4.01	3.84	3.58	4.54	2.71	1.31	1.13	1.40	1.40	.00	59.08
(2)	.07	.21	.20	.13	.15	.10	.11	.11	.11	.10	.13	.08	.04	.03	.04	.04	.00	1.65
4-7	14	54	27	16	12	9	18	38	26	73	86	29	14	10	10	4	0	440
(1)	1.22	4.71	2.36	1.40	1.05	.79	1.57	3.32	2.27	6.37	7.50	2.53	1.22	.87	.87	.35	.00	38.39
(2)	.03	.13	.07	.04	.03	.02	.04	.09	.06	.18	.21	.07	.03	.02	.02	.01	.00	1.07
8-12	0	3	0	0	0	0	0	0	3	8	8	4	2	0	0	0	0	28
(1)	.00	.26	.00	.00	.00	.00	.00	.00	.26	.70	.70	.35	.17	.00	.00	.00	.00	2.44
(2)	.00	.01	.00	.00	.00	.00	.00	.00	.01	.02	.02	.01	.00	.00	.00	.00	.00	.07
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	.09	.00	.00	.00	.00	.00	.00	.09
(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	44	145	110	70	72	50	65	84	73	122	147	64	31	23	26	20	0	1146
(1)	3.84	12.65	9.60	6.11	6.28	4.36	5.67	7.33	6.37	10.65	12.83	5.58	2.71	2.01	2.27	1.75	.00	100.00
(2)	.11	.35	.27	.17	.18	.12	.16	.20	.18	.30	.36	.16	.08	.06	.06	.05	.00	2.79

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

TABLE 5
(Sheet 8 of 8)

Yankee Atomic Electric Company, Rowe, Massachusetts
1999 Annual Radioactive Effluent Release Report
1992-1996 Meteorological Data Joint Frequency Distribution

8. 199.0 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	1	0	0	0	1
(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	1486	4061	2204	928	608	531	475	463	526	707	951	606	395	313	391	533	0	15178
(1)	3.62	9.88	5.36	2.26	1.48	1.29	1.16	1.13	1.28	1.72	2.31	1.47	.96	.76	.95	1.30	.00	36.93
(2)	3.62	9.88	5.36	2.26	1.48	1.29	1.16	1.13	1.28	1.72	2.31	1.47	.96	.76	.95	1.30	.00	36.93
4-7	1325	3735	941	300	270	264	356	587	918	1497	2095	1217	740	495	572	648	0	15960
(1)	3.22	9.09	2.29	.73	.66	.64	.87	1.43	2.23	3.64	5.10	2.96	1.80	1.20	1.39	1.58	.00	38.83
(2)	3.22	9.09	2.29	.73	.66	.64	.87	1.43	2.23	3.64	5.10	2.96	1.80	1.20	1.39	1.58	.00	38.83
8-12	1061	1617	216	37	38	36	43	109	230	836	1174	1208	641	283	264	476	0	8269
(1)	2.58	3.93	.53	.09	.09	.09	.10	.27	.56	2.03	2.86	2.94	1.56	.69	.64	1.16	.00	20.12
(2)	2.58	3.93	.53	.09	.09	.09	.10	.27	.56	2.03	2.86	2.94	1.56	.69	.64	1.16	.00	20.12
13-18	235	518	26	5	0	2	1	1	16	83	248	325	76	13	12	51	0	1612
(1)	.57	1.26	.06	.01	.00	.00	.00	.00	.04	.20	.60	.79	.18	.03	.03	.12	.00	3.92
(2)	.57	1.26	.06	.01	.00	.00	.00	.00	.04	.20	.60	.79	.18	.03	.03	.12	.00	3.92
19-24	12	35	1	0	0	0	0	0	0	2	14	12	2	0	0	1	0	79
(1)	.03	.09	.00	.00	.00	.00	.00	.00	.00	.00	.03	.03	.00	.00	.00	.00	.00	.19
(2)	.03	.09	.00	.00	.00	.00	.00	.00	.00	.00	.03	.03	.00	.00	.00	.00	.00	.19
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	4119	9966	3388	1270	916	833	875	1160	1690	3125	4482	3368	1854	1105	1239	1709	0	41099
(1)	10.02	24.25	8.24	3.09	2.23	2.03	2.13	2.82	4.11	7.60	10.91	8.19	4.51	2.69	3.01	4.16	.00	100.00
(2)	10.02	24.25	8.24	3.09	2.23	2.03	2.13	2.82	4.11	7.60	10.91	8.19	4.51	2.69	3.01	4.16	.00	100.00

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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 ODCM 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, ODCM Control 5.1 requires an explanation for the delay in correcting the inoperability in the next Annual Radioactive Effluent Release Report.

Response: The requirements of ODCM Control 5.1 governing the operability of radioactive liquid effluent monitoring instrumentation were met for this reporting period.

As a special note, during the report period the entire monitoring channel for the Liquid Radwaste Effluent Line/ Auxiliary Service Water Effluent line was replaced, calibrated and returned to service within the 30 day reporting requirement of ODCM Control 5.1. This equipment upgrade was undertaken to improve system reliability.

APPENDIX B

Radioactive Gaseous Effluent Monitoring Instrumentation

Requirement: Radioactive gaseous effluent monitoring instrumentation channels are required to be operable in accordance with ODCM 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, ODCM Control 5.2 requires an explanation for the delay in correcting the inoperability in the next Annual Radioactive Effluent Release Report.

Response: The requirements of ODCM 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 Annual Radioactive Effluent Release 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 ODCM Control 4.1. With the Radiological Environmental Monitoring Program not being conducted a specified in Table 4.1, ODCM Control 4.1 requires a description of the reasons for not conducting the program as required and the plans for preventing a recurrence be included in the next Annual Radioactive Effluent Report.

Response: The requirements of ODCM Control 4.1 governing the conduction of the REMP were met for this reporting period.

Requirement: With milk samples no longer available from one or more of the required sample locations, ODCM Control 4.1 requires the identification of the new location(s) for obtaining replacement sample(s) in the next Annual Radioactive Effluent Release Report and inclusion of revised Off-Site Dose Calculation Manual figure(s) and table(s) reflecting the new location(s).

Response: A total of two milk sampling locations are called for in the REMP; one indicator location and one control. However, the most recent Land Use Census found no locations within five miles from which milk samples can be collected. If future Land Use Census identifies an available sampling location within five miles, it will be included in the REMP.

APPENDIX E

Land Use Census

Requirement: A land use census is conducted in accordance with ODCM 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 ODCM Control 3.5, ODCM Control 4.2 requires the identification of the new location(s) in the next Annual Radioactive Effluent Release Report.

Response: The land use census for this reporting period did not identify any locations yielding at least 20 percent greater dose or dose commitment than the values currently being calculated in ODCM 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 ODCM Control 4.1, ODCM 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. If a new location is found, then it must be identified in the next Annual Radioactive Effluent Release Report.

Response: No new locations were added to the Radiological Environmental Monitoring Program as a result of the 1999 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 Annual Radioactive Effluent Release Report for the period in which the change(s) was made.

Response: There was one licensee-initiated revision to the PCP during this reporting period.

Revision No. 6 to the PCP removed reference to the previously described installed Liquid Waste Treatment and Solidification System. This installed equipment has been removed from service as part of the plant's decommissioning and dismantlement activities. In its place, reference has been added to the PCP to reflect new temporary liquid waste treatment equipment that has been brought on-site, and the use of off-site vendor services that convert liquid concentrate waste to a solid or stable form suitable for disposal.

Attached is a complete copy of the current PCP (Revision 6).

APPENDIX G

Off-Site Dose Calculation Manual (ODCM)

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

Response: The following licensee-initiated changes were made to the ODCM (Revision 13) during the report period:

(1) Elimination of Turbine Building Sump sampling and analysis requirements:

With the decommissioning of the plant, various systems have been taken out of service, thereby eliminating the need for certain surveillance requirements. On June 2, 1997, the Service Water Pump and associated Turbine Building Sump sampler system were secured from service. In addition, all drains in the Turbine Building were plugged to ensure that no inadvertent releases could occur. Also, the 115 kV power line from the plant electrical feed system was permanently isolated, resulting in loss of power to the service water pumps and the termination of water flow via this pathway (i.e., Turbine Building Sump).

Since the Turbine Building Sump sampler system has been completely secured from service, and there are no releases via the 002 pathway, there is no liquid effluent to be monitored. This justifies an ODCM amendment to remove the requirement of performing continuous composite sampling and periodic analysis of the Turbine Building Sump.

(2) Elimination of the indicator milk sampling location from the REMP:

Table 4.1 of the ODCM requires that milk samples from two locations (one indicator and one control station) be taken during each month as part of the Radiological Environmental Monitoring Program (REMP). The annual Land Use Census found that there are no longer any milk animals within 5 miles of the plant that could provide reliable sources of milk. The land use census found only one milk animal location within 5 miles. However, this location was not expected to be milking the animals year round and could not support the supply of milk needed for the REMP on reliable bases. This was confirmed after the land use census by plant staff who talked with the owner and found that they also had no desire to be part of the REMP even if milk volume was available at times. Since milk sampling is unavailable at location TM-13 with no replacement site within five miles, changes are made to Table 4.1 of the ODCM identifying the intent to collect an indicator milk sample within 5 miles only if a future land use census finds the existence of one that qualifies. Table 4-4 and Figure 4-2 are amended to remove milk sample location TM-13 (Whitingham, VT) which has curtailed its operations.

(3) Removal of reference to Service Water System discharge flow rate measurements:

As part of the decommissioning and dismantlement process, the 115kV line was permanently isolated on June 2, 1997, with the resultant loss of power to the Service Water Pumps. This terminated the Service Water flow and the elimination of the associated surveillance needs identified in the ODCM, Tables 5-1, and 5-2, where flow rate measurement devices (i.e., pump curves) were listed as being necessary. Cooling water flow for the Spent Fuel Pit is maintained via the Auxiliary Service Water (ASW) system. The surveillance and instrumentation requirements for the ASW are maintained in the ODCM. Therefore, there is no loss of monitoring or surveillance requirements for those effluent pathways that remain in service. ASW is now the remaining cooling water system for plant components. Administrative changes to the text to reflect the designation of Auxiliary SW are made where the Service Water System designation no longer applies.

(4) Clarification of Monitor Operability for Maintenance and Testing:

Table 5-1 indicates that the liquid radiation monitor, which provides continuous monitoring of the Auxiliary Service Water effluent line, has an "Applicability" requirement that is stated as "At All Times". This wording comes directly from NRC Standard Technical Specifications (NUREG-0472) which were used as a model for the ODCM requirements. Standard Tech Specs and the ODCM also require that the monitor be maintained, tested, and calibrated on a periodic basis. The "At All Times" requirement refers to the need to provide surveillance over the effluent stream on a continuous basis so that the release of radioactivity through that pathway to the environment would not go unmonitored. However, it was not intended to prevent the monitor from being maintained and tested, which would otherwise violate ODCM Table 5-2 requirements. This requirement for testing and calibration is also taken from standard Tech Specs (NUREG-1301). Currently the requirements to maintain, test and calibrate the monitor is satisfied by use of the ACTION statement on Table 5.1 which directs what remedial surveillance requirements are applied when the monitor itself can not meet its "Minimum Channels Operable" requirements. This dictates that either ASW grab samples are taken every 12 hours and analyzed for gross radioactivity, or the flow would be stopped by tripping the ASW pumps and shutting down the SFP non-contact heat exchanger(s). To avoid possible confusion on the operability requirements of the rad-monitor, a new footnote (4) has been added to Table 5-1 to clarify that preventive maintenance, testing, and calibration are permitted on the ASW and liquid radwaste effluent rad-monitor (same monitor) under the appropriate ACTION statement requirements that apply when the rad monitor is inoperable.

(5) Operation of the SFP Cooling System without the ASW Effluent Monitor:

The current ACTION Statement that applies to the ASW indicates that if the Auxiliary Service Water radiation monitor is out of service, the contaminated system being cooled through the heat exchanger shall be shutdown and the ASW flow isolated by shutting down the ASW Pump. This conservative

approach prevents the possible discharge of radioactivity without an immediate alarm if a leak into the ASW were to occur. However, the conservatism in this action does not recognize that extended isolation of the SFP cooling could allow the temperature in the pool to rise beyond normal levels. If the SFP water temperature were to increase towards normal operating limits, it would be prudent to restore SFP cooling even if the rad monitor on the ASW had not yet been returned to service. This continuation of ASW cooling is consistent with NRC guidance found in NUREG-1301 for standard Radiological Effluent Technical Specifications that permits continued operation of service water and component cooling systems with their associated rad monitors out of service, provided (in the ACTION Statement) that at least once per 12 hours a grab sample of the cooling water is collected and analyzed for radioactivity at an LLD of no more than 10^{-7} microcuries/ml. The revised ACTION Statement for use with the Auxiliary Service Water rad monitor inoperable implements the basic response called for by the NRC guidance. We have included additional clarification of when lab analysis must be completed by (i.e., 24 hours from collection) to aid the operator in being able to meet the analysis requirements.

(6) Updating Liquid Waste Block Diagram (Figure 6-1):

Figure 6-1 is corrected to reflect that the isolation valve on the Batch Effluent Tanks is down stream of the flow control valve as previously noted on the figure. In addition, updates to the figure include changing reference from Service Water to Auxiliary Service Water. Also, liquid waste inputs to the waste storage tank for processing through the waste evaporator have been modified to reflect that many of the previous sources of waste input have been eliminated as part of the decontamination and decommissioning of the plant.

A new reference is added to show that waste evaporator concentrates are routed to a High Integrity Container (HIC) since this figure is also referenced by the Process Control Program (PCP) for the handing of solid waste streams. The evaporator distillate stream has been labeled as going to the Batch Effluent Tanks.

(7) Change to an Annual Reporting Frequency for the Radioactive Effluent Release Report:

The NRC has issued Amendment No.151 to the plant's Possession Only License (Section 6.8.2 of the Technical Specifications) which changed the frequency of filing reports on Radioactive Effluent Releases from semiannual to annual. This change also carries a new report submittal date of before May 1 of each year. The added time granted to prepare and submit an annual report eliminates the need for a supplemental dose report to be filed separate from the annual effluent releases. This condition existed under the old schedule that required effluent data to be submitted to the NRC within 60 days of the end of the report period, plus an additional 30 days (90 days from January 1) to prepare and submit annual summation of projected doses to the public from plant effluents. The new submittal date of May 1, (120 Days from January 1) gives sufficient time to assemble all effluent information and

calculate projected doses to the public as part of the same report. The proposed changes in the ODCM remove all references to the semiannual report and replaces the frequency with annual.

(8) ODCM Figure 1-2: Elimination from Site Map of Structures that have been Dismantled:

Additional updates to the site area map on Figure 1-2 have been made to remove the Turbine Building Sump Discharge line pathway which has been isolated from building effluents, plus the removal of the plant transformer, TK-1, the tank farm behind radwaste, and temporary office trailers which were not part of the permanent facility. These changes are editorial in that they are made to reflect changes already made in plant configuration.

(9) Minor Editorial and Administrative Changes:

Minor editorial changes and clarifications in the text are made to improve overall readability. These include: (1) Changes in page numbers to reflect the addition of text that describes the scope of the changes contained in revision 13; (2) Recognition that tank moats for outdoor waste tanks have been removed from service with only the containment liner around the radioactive waste 20K tank remaining in-service. Text has also been added (page 2-7) to note that this normally radioactively "clean" water is analyzed to environmental LLD's before release, but would be treated as contaminated water before any release if plant related radioactivity is found; and (3) The dropping of requirement (a) to ACTION Statement 1 on page 5-5 since this is redundant to the requirements imposed by having the liquid effluent monitor out of service which automatically initiates remedial ACTION 4.

On ODCM Table 2.1, corrections are made to the indicated requirements for sampling and analyzing batch waste releases by removing the bar lines between the frequency "P", and "Each Batch" for tank releases. This is to clarify that the stated types of activity analyses and LLD requirements apply to all batch tank releases. In fact, the Chemistry Department has been performing the required analyses as indicated in the corrected table, and this formatting correction to the table is made to improve the readability of what the expectations are.

In addition, a reference is added to the text of Control 7-1 which directs the reader to Technical Specification 6.8.2.a. as the governing document that requires an Annual Radiological Environmental Operating Report be filed with the NRC each year. This is done to inform the reader where the requirements for this report are listed, and to make it consistent with the wording used for the Annual Radioactive Effluent Release Report in Control 7-2.

CONCLUSION

No new effluent release points have been added to the plant configuration, nor any increase in the quantity or distribution of radioactivity expected to be released to the environment. Changes to the surveillance requirements reflect either the elimination of an effluent release point with subsequent reduction in potential for release of radioactivity, or increase in flexibility of monitoring for potential effluents while maintaining an adequate level of remedial actions to ensure identification of potential changes in plant effluent radioactive content. No changes have been made to any dose or setpoint equations or calculation methods contained in the ODCM. As a result, the proposed changes to the ODCM will maintain the level of radioactive effluent control required by 10CFR20.106 (10CFR20.1301), 40CFR190, 10CFR50.36a, and Appendix I to 10CFR50 and not adversely impact the accuracy or reliability of effluent, dose, or setpoint calculations.

A copy of the resulting revised ODCM is attached to this report.

APPENDIX H

Radioactive Liquid, Gaseous, and Solid Waste Treatment Systems

Requirement: ODCM 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 Annual Radioactive Effluent Release Report for the period in which the evaluation was reviewed by the Plant Operation Review Committee.

Response: There were no licensee-initiated changes to the radioactive liquid, gaseous, or solid waste treatment systems during this reporting period.

APPENDIX I

Supplemental Information

1. Control Limits – Dose and Dose Rate

Control and Category	Limit
a. Noble Gases	
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. Iodine-131, Tritium, and Radionuclides in Particulate Form With Half-Lives Greater Than 8 Days	
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. Liquids	
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

Control and Category	Limit
a. Liquids	
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-4 μCi/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 as a support for the particulate filter during particulate collection. The sampling system continuously draws a sample from the primary vent stack through a filter and charcoal cartridge. The particulate filter is 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

First Quarter	Routine Batches
Number of batch releases	1
Total time period for batch releases (minutes)	1165
Maximum time period for a batch release (minutes)	1165
Average time period for batch releases (minutes)	1165
Minimum time period for a batch release (minutes)	1165
Average stream flow (Sherman Dam) during period (cfs)	937
Average discharge rate (gpm)	5.4

Second Quarter	Routine Batches
Number of batch releases	2
Total time period for batch releases (minutes)	2357
Maximum time period for a batch release (minutes)	1417
Average time period for batch releases (minutes)	1179
Minimum time period for a batch release (minutes)	940
Average stream flow (Sherman Dam) during period (cfs)	375
Average discharge rate (gpm)	5.2

Third Quarter	Routine Batches
Number of batch releases	1
Total time period for batch releases (minutes)	1740
Maximum time period for a batch release (minutes)	1740
Average time period for batch releases (minutes)	1740
Minimum time period for a batch release (minutes)	1740
Average stream flow (Sherman Dam) during period (cfs)	318
Average discharge rate (gpm)	5.0

Fourth Quarter	Routine Batches
Number of batch releases	1
Total time period for batch releases (minutes)	1481
Maximum time period for a batch release (minutes)	1481
Average time period for batch releases (minutes)	1481
Minimum time period for a batch release (minutes)	1481
Average stream flow (Sherman Dam) during period (cfs)	658
Average discharge rate (gpm)	5.5

b. Gases

There are no longer any batch-mode gaseous releases associated with plant systems.

5. Abnormal Releases

ODCM 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 non-routine liquid releases during the reporting period.

b. Gases

There were no non-routine 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 Annual Radioactive Effluent Release Report, the volume discharged, liquid and solid fractions, and total activity discharged.

Response: There was no septage disposal during this reporting period.

PROCESS CONTROL PROGRAM

YANKEE NUCLEAR POWER STATION

STAR ROUTE
ROWE, MASSACHUSETTS 01367

	PREPARED BY/DATE	REVIEWED BY/DATE	PORC MEETING NO./DATE
REVISION 5	Christine L. Albright August 19, 1992	Mark S. Strum August 19, 1992	Meeting No. 92-72 August 19, 1992
REVISION 6	Mark Strum 1-14-99	John J. Sheehan 1-21-99	Meeting No. 99-05 January 28, 1999

REVISION RECORD

Revision	Date	Description
5	08/19/92	a. Title page revised to include signature table. b. REVISION RECORD, LIST OF AFFECTED PAGES, and LIST OF CONTROLS pages added to document. c. The following changes were implemented in accordance with NRC Generic Letter 89-01, which provided guidance on the relocation of selected Radiological Effluent Technical Specifications to the PROCESS CONTROL PROGRAM: 1. Section 1.0, Definitions of PROCESS CONTROL PROGRAM and SOLIDIFICATION - SOLIDIFIED added to include definitions pertinent to the relocated Technical Specifications; 2. Technical Specification 3/4.11.3, now referred to as PCP Control 1.0, relocated to Section 1.0; 3. Corresponding Technical Specification 3/4.11.3 Bases relocated to Section 1.0; 4. Sections 4.2 and 4.3 created to contain reporting details for the Semiannual Effluent Release Reports for solid waste (PCP Control 2.0) and Major Changes to the Solid Radioactive Waste Treatment System (PCP Control 3.0), respectively. d. All pages renumbered.
6		Reference and use of the installed Liquid Waste Treatment and Solidification System, as previously stated in the PCP, have been removed as a result of plant decommissioning and dismantlement activities. Reference has been added to reflect new temporary liquid waste treatment equipment and off-site vendor services that convert liquid concentrate wastes to a solid or stable form suitable for disposal.

LIST OF AFFECTED PAGES

Changes, deletions, or additions in the most recent revision are indicated by a bar in the margin or by a dot near each page number if the entire page is affected.

Page	Revision
i to v	6
1-1 to 1-3	6
2-1 to 2-2	6
3-1 to 3-2	6
4-1 to 4-3	6
5-1	6
All Appendix A	6

TABLE OF CONTENTS

LIST OF CONTROLS

1.0 SOLID RADIOACTIVE WASTE

1.1 Definitions

The defined terms appear in capitalized type and are applicable throughout this document.

PROCESS CONTROL PROGRAM (PCP)

The PROCESS CONTROL PROGRAM contains the current formulas, sampling, analyses, test, and determinations to be made to ensure that on-site processing and packaging of wet solid radioactive wastes, based on demonstrated processing of actual or simulated wet solid wastes, will be accomplished in such a way as to assure compliance with 10CFR, Parts 20, 61, and 71, state regulations, burial ground requirements, and other requirements governing the disposal of solid radioactive waste.

SOLIDIFICATION - SOLIDIFIED

SOLIDIFICATION shall be the conversion of wet wastes into a form that meets shipping and burial ground requirements.

1.2 PROCESS CONTROL PROGRAM

PCP Control 1.0 The Liquid Radioactive Waste System shall be used in accordance with a PROCESS CONTROL PROGRAM to process wet radioactive waste to meet vendor service processing requirements that will provide for a final waste form acceptable for shipping and disposal.

Applicability

At all times.

Action

a. With the provisions of the PCP not satisfied, suspend shipments of defectively processed or defectively packaged SOLIDIFIED and/or wet radioactive wastes from the site.

Surveillance Requirement

PCP SR 1.0:

a. Each batch of wet waste processed by the plant liquid waste treatment system in preparation for additional off-site processing shall be sampled to demonstrate compliance with the waste acceptance criteria contained in Section 3.1 of this PCP.

b. For on-site vendor services, verification of SOLIDIFICATION of representative test specimens of wet waste shall be performed as required and in accordance with the vendor's PCP procedures and Section 3.2 herein.

Bases

PCP Control 1.0 implements the requirements of 10CFR50.36a and General Design Criterion 60 of Appendix A, 10CFR50. The process parameters included in establishing the PCP may include, but are not limited to waste type, waste pH, waste/liquid SOLIDIFICATION agent/catalyst ratios, waste oil content, waste principal of constituents, mixing, and curing times. The PCP addresses the handling of wet waste (evaporator concentrates) only.

1.3 Background

The Yankee Atomic Electric Company (YAEC) PCP describes the administrative and technical controls on the liquid radioactive waste processing to provide assurance that a waste form is produced that meets shipping and burial ground requirements, and that the operations are carried out in a controlled manner per plant procedure to keep personnel exposure "as low as reasonably achievable."

Disposable waste containers, shipping casks, and methods of packaging shall meet all applicable Federal Regulations (e.g., 10CFR71), and all radioactive waste will be shipped to licensed waste processing facilities and/or licensed burial sites in accordance with applicable State, NRC, and Department of Transportation (DOT) regulations, including burial site regulatory requirements.

The PCP addresses the processing of liquid waste (evaporator concentrates). SOLIDIFICATION/ stabilization of bead resins, spent cartridge filters, decontamination solutions and oily waste, are not specifically described in the PCP, but treated as special cases on an individual basis.

The disposal of bead resins occurs on an infrequent basis. Due to the infrequent nature of spent resin shipments, the most efficient method of handling is by sluicing spent resins into a disposable liner contained within a shielded cask, if necessary, and the subsequent dewatering. All spent resin dewatering operations are carried out under the vendor's PCP and/or procedures which have been reviewed and approved by the Radioactive Waste Coordinator and the Plant Operation Review Committee (PORC) prior to implementation. The review is to identify that there is sufficient supporting documentation of the vendor's PCP and/or procedures to give assurance that the final dewatered resin will meet all requirements for transport and burial, and that sufficient procedural controls exist to assure safe dewatering operations with resultant doses to personnel kept "as low as reasonably achievable" in all phases of the process handling. If SOLIDIFICATION of spent resins is required, a vendor will be utilized, and the vendor's PCP will be reviewed as above.

Oily waste above trace and incidental amounts (greater than 1% by volume) are to be treated as special situations. This method of segregating and handling oily waste on a case-by-case basis is possible since the volume of waste in this category has historically been small. Oily wastes can be shipped to a processor for incineration or other controlled burning.

Decontamination solutions which are not suitable to be processed as liquid waste in the temporary liquid waste evaporator due to chemical incompatibilities with equipment performance, or would produce a waste concentrate stream that would not meet the THERMEX waste input criteria (see Section 3.1), are handled on a case-by-case basis via the vendor service option for processing and disposal. As with other special case waste streams, review and approval of the proposed process by the Radwaste Coordinator and PORC must be obtained prior to implementation.

Spent cartridge filter elements which are Class A unstable may be encapsulated in nonradioactive cement in 55-gallon drums. The filters are centered axially in the drums and all remaining space filled with cement paste in accordance with a vendor supplied process approved by the Radwaste Coordinator and PORC. Filter cartridges may also be air dried and placed in HICs for stability requirements, as necessary to meet disposal facility acceptance criteria.

Normal liquid waste streams are processed via a temporary waste evaporator that operates on the same basic principal as the original installed liquid waste evaporator. The original plant evaporator has been permanently taken out-of-service as part of the plant's decommissioning activities.

The design and use of the temporary waste evaporator is described in EDCR 96-303, "Temporary Waste Water Processing Island." The original installed Cement Solidification System has also been permanently removed from service as part of plant's decommissioning and dismantlement actions and not replaced. Liquid concentrates from the evaporator are now stored in a High Integrity Container (HIC) until sufficient volume has been collected to ship to an off-site vendor for additional volume reduction and stabilization necessary to produce a final waste form acceptable for disposal at a licensed disposal facility. Waste concentrates generated by the on-site waste evaporator are controlled by plant procedure to produce a waste that is acceptable for further processing by the off-site vendor service.

The option to use a vendor service on-site to process waste is also available if the vendor PCP can demonstrate, via defined surveillance requirements, the generation of a suitable waste form (i.e., no freestanding liquid) for disposal.

2.0 PROCESS DESCRIPTION

2.1 Liquid Waste Evaporator Concentrate

Figure 6-1 of the Off-site Dose Calcaulation Manual (ODCM) illustrates the normal liquid radwaste collection, process, and effluent flow pathways associated with the shutdown configuration of the plant. The temporary Waste Water Evaporator System shown on ODCM Figure 6-1 is designed to process waste water generated at YNPS until the completion of decommissioning activities. Operation of the temporary Waste Processing System allows removal of the permanent plant Waste Water Evaporator System and the eventual dismantlement of the Waste Disposal Building (WDB).

Waste water generated at various sites in the RCA are (initially) fed from the Radioactive Lab Sump System by way of a new double wall pipe. The waste water is pumped to the 20,000 gallon storage tank then transferred to the 40 foot trailer for processing.

Housed in the 40 foot equipment trailer are pumps (feed, distillate, and bottoms), heat exchanger with pump for the 20,000 gallon tank heating system, SAMSCO Model 700 waste water evaporator, High Integrity Container (HIC), filter, and two ion exchange polishers. By batch feed, waster water feed is transferred from the storage tank to the evaporator and then boiled off at a rate of up to 1 gpm. The evaporative capacity is approximately 1400 gallons per day. The evaporation creates two streams; the bottoms which will be transferred to a HIC for later processing by an off-site disposal facility, the second stream is vapor that is condensed by a 60 ton chiller. The distillate is then collected into a 22 gallon tank with a level control to start/stop the air operated distillate pump. The condensed distillate is further purified by a filter and two ion exchange polishers. They are installed in series with the ability to bypass either ion exchange column in order to perform maintenance activities. After polishing the cleaned condensed water is transferred to the two 5,000 gallon tanks for sampling and discharge.

Concentrates from the evaporator are shipped by contract to the Chem-Nuclear CNCF THERMEX Facility in Barnwell, South Carolina to be thermally reduced to a dry final waste product that can be packaged in appropriate containers for disposal at the Barnwell Disposal Facility. The THERMEX process control and operating procedures have been reviewed and approved for use by the South Carolina Department of Health and Environmental Control (SC DHEC) as the controlling regulatory agency. Both the THERMEX Facility and Barnwell Disposal Facility have had their operating licenses amended by SC DHEC to authorize the acceptability of final waste form produced by this process for disposal, and are subject to their periodic inspections and audits. In contracting for the THERMEX service, YNPS has placed Chem-Nuclear on its Decommissioning Approved Vendor List (DVL) which includes periodic vendor audits to assure that products and services provided are adequate to meet our commitments to produce solid waste forms acceptable for disposal.

3.0 PROCESS CONTROL CRITERIA

3.1 Liquid Waste for Chem-Nuclear THERMEX Process

Liquid waste, after processing through the waste evaporator and prior to batching in a shipping container, will meet the following criteria necessary for the liquid concentrates to be acceptable for the CNSI THERMEX process at their Central Facility in Barnwell, South Carolina.

1. Chemistry Criteria	THERMEX Requirements
Boric Acid	<30% by weight (YR Admin. Limit; <17%)
pH	<12
Paraffin	None
Glutaraldehyde	None
Ammonia	None
Hazardous Chemicals	None (as described in 40CFR261)
Chelates	<0.1%
Total Solids	<7% (may be increased to 12% based on waste water scaling potential)
Oils	None
PCBs	None

2. Radionuclide Content

(a) All liquid radioactive waste shall be shipped within secondary containers inside a shipping cask.

(b) Any waste with radionuclide concentrations such that when concentrated by a factor of six (6) will exceed Class C waste limits is not acceptable at the Chem-Nuclear THERMEX processing facility without prior approval.

Note:

After transfer of waste evaporator concentrates to a shipping container, residual sludge contained in the waste evaporator concentrates collection tank can be manually removed, air dried, and placed in a Dry Active Wastes (DAW) container for off-site shipment and disposal. All handling of concentrate sludge shall conform to plant radiation protection ALARA procedures, with the final package conforming to all pertinent DAW waste shipping and disposal requirements.

3.2 On-Site Liquid Waste SOLIDIFICATION/Stabilization

The option of using a contract vendor service to process and SOLIDIFY liquid waste streams (including waste liquids, spent resins, filter cartridges, and decontamination solutions) on the Rowe site requires prior PORC review and approval of the vendor process, including their Process Control Program and/or operating procedures that demonstrate that the final waste form will be acceptable for disposal at a licensed disposal facility.

A vendor service Process Control Program and operating procedures shall identify critical operating factors, process formulas, test, sampling and analysis requirements, and determination necessary to demonstrate that the vendor process on actual or simulated wet solid wastes will be accomplished in such a way as to assure compliance with 10CFR Parts 20, 61, and 71, state regulations, disposal facility requirements, and any other requirements governing the disposal of solid radioactive waste that is subject to the vendor service.

4.0 ADMINISTRATIVE CONTROLS

4.1 Operating Procedures

Written procedures are used to implement the YAEC PCP. The station procedures address the following areas of implementation:

a. Step-by-step operation of the liquid radioactive waste evaporator,

b. Sampling and analysis of liquid waste streams,

c. Inspection of waste containers,

d. Quality assurance.

Station procedures which implement the YAEC PCP are listed in Appendix A.

4.2 Effluent Release Report (TS 6.8.2.b)

PCP Control 2.0

a. A Radioactive Effluent Release Report shall be submitted to the NRC as required by Technical Specification 6.8.2.b. The report shall contain a summary of the quantities of radioactive effluents, including solid wastes, released from the plant. The material provided in this report shall (in part) be (1) consistent with the objectives outlined in the PCP and (2) in conformance with 10CFR50.36a.

b. Each Effluent Release Report shall include the following information for each class of solid waste (as defined by 10CFR61) shipped off-site during the report period:

1. Container volume,

2. Total curie quantity (specify whether determined by measurement or estimate),

3. Principal radionuclides (specify whether determined by measurement or estimate),

4. Source waste and processing employed (e.g., dewatered spent resin, compacted dry waste, evaporator bottoms),

5. Type of container (e.g., Type A, Type B, Strong Tight) and

6. SOLIDIFICATION agent or absorbent (e.g., cement, asphalt, "Dow").

c. The Effluent Release Report also shall include any changes made to the PCP during the reporting period.

4.3 Major Changes to the Radioactive Waste Treatment System

PCP Control 3.0

Licensee initiated major changes to radioactive waste systems which prepare wet waste for off-site disposal or additional processing:

a. Shall be reported to the Commission in the Effluent Release Report required by T.S. 6.8.2.b for the period in which the evaluation was reviewed by PORC. The discussion of each change shall contain:

1. A summary of the evaluation that led to the determination that the change could be made in accordance with 10CFR50.59,

2. Sufficient detailed information to support the reason for the change without benefit of additional or supplemental information,

3. A detailed description of the equipment, components, and processes involved and the interfaces with other plant systems,

4. An evaluation of the change, which shows the quantity of waste that differs from that previously predicted in the license application and amendments thereto,

5. An evaluation of the change, which shows the expected maximum exposures to member(s) of the public at the site boundary and to the general population that differ from those previously estimated in the license application and amendments thereto,

6. A comparison of the predicted releases of radioactive materials in waste to the actual releases for the period prior to when the changes are to be made,

7. An estimate of the exposure to plant operating personnel as a result of the change, and

8. Documentation of the fact that the change was reviewed and found acceptable by PORC.

b. Shall become effective upon review and acceptance by PORC.

APPENDIX A

Station Procedures Which Implement the PCP

a. OP-2388 Operation of the Temporary Waste Water Processing Island

b. OP-9406 Primary Plant Liquid Sample Points

c. OP-9416 Chemistry Control of Liquid Waste Evaporator

d. OP-9600 Chemistry Laboratory Quality Control Program

e. OP-8301 Radioactive Material Shipment