

EFFLUENT AND WASTE DISPOSAL  
S. MIANNUAL REPORT  
FOR  
FIRST AND SECOND QUARTERS, 1987

Yankee Atomic Electric Company  
Rowe, Massachusetts

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TABLE 1A

Yankee Atomic Electric Company, Rowe, Massachusetts

Effluent and Waste Disposal Semiannual Report

First and Second Quarters, 1987

Gaseous Effluents - Summation of All Releases

	Unit	Quarter 1	Quarter 2	Est. Total Error, %
A. Fission and Activation Gases				
1. Total release	Ci	1.09E+02	1.26E+02	±5.50E+01
2. Average release rate for period	uCi/sec	1.39E+01	1.60E+01	
3. Percent of Tech. Spec. limit (1)(4)	%	1.22E+00	9.50E-01	
B. Iodines				
1. Total Iodine-131	Ci	3.65E-08	2.86E-06	±2.50E+01
2. Average release rate for period	uCi/sec	4.64E-09	3.64E-07	
3. Percent of Tech. Spec. limit (2)(4)	%	9.87E-02	6.53E-02	
C. Particulates				
1. Particulates with T-1/2 > 8 days	Ci	4.22E-06	3.24E-06	±3.00E+01
2. Average release rate for period	uCi/sec	5.37E-07	4.12E-07	
3. Percent of Tech. Spec. limit	%	(3)	(3)	
4. Gross alpha radioactivity	Ci	<1.60E-08	<1.20E-07	
D. Tritium				
1. Total release	Ci	1.26E+00	8.10E+01	±3.00E+01
2. Average release rate for period	uCi/sec	1.60E-01	1.03E-01	
3. Percent of Tech. Spec. limit	%	(3)	(3)	

- (1) Technical Specification 3.11.2.2.a for gamma air dose. Percent values for Technical Specification 3.11.2.2.b for beta air dose are approximately the same.
- (2) Technical Specification 3.11.2.3.a for dose from I-131, Tritium, and radionuclides in particulate form.
- (3) Per Technical Specification 3.11.2.3, dose contributions from Tritium and particulates are included with I-131 above in Part B.
- (4) The first and second quarter percent of Technical Specification limits are based on conservative plant quarterly dose determinations.

TABLE 1B

Yankee Atomic Electric Company, Rowe, Massachusetts

## Effluent and Waste Disposal Semiannual Report

First and Second Quarters, 1987

## Gaseous Effluents - Elevated Release

Nuclides Released	Unit	Continuous Mode		Batch Mode	
		Quarter	Quarter	Quarter (1)	Quarter
		1	2	1	2
1. Fission Gases					
Krypton-85	Ci	4.80E-02	3.15E+00		4.49E+00
Krypton-85m	Ci	1.67E+00	6.98E-01		1.37E-01
Krypton-87	Ci	1.66E+00	7.68E-01		<2.06E-02
Krypton-88	Ci	3.47E+00	1.48E+00		1.09E-01
Xenon-133	Ci	5.56E+01	4.74E+01		4.20E+01
Xenon-135	Ci	2.04E+01	1.07E+01		2.40E+00
Xenon-135m	Ci	2.16E+01	6.89E-00		<1.01E-02
Xenon-138	Ci	1.00E+00	4.56E-01		<3.83E-02
Xenon-133m	Ci	1.30E+00	9.66E-01		6.60E-01
Argon-37	Ci	1.72E-02	3.11E-01		4.32E-01
Argon-41	Ci	3.76E-01	1.61E-01		<1.70E-02
Carbon-14	Ci	9.06E-03	5.43E-01		7.60E-01
Xenon-131m	Ci	1.40E+00	1.09E+00		8.27E-01
Unidentified	Ci	-	-		-
Total for period	Ci	1.09E+02	7.46E+01		5.19E+01
2. Iodines					
Iodine-131	Ci	3.65E-08	1.52E-06		1.34E-06
Iodine-133	Ci	<4.97E-06	<1.42E-06		<1.26E-06
Iodine-135	Ci	<3.00E-07	<1.71E-07		<1.52E-07
Total for period	Ci	3.65E-08	1.52E-06		1.34E-06
3. Particulates					
Strontium-89	Ci	<8.67E-08	<5.73E-08		<6.47E-08
Strontium-90	Ci	<1.73E-08	<1.27E-08		<1.44E-08
Cesium-134	Ci	4.10E-07	1.78E-07		1.58E-07
Cesium-137	Ci	8.75E-07	2.02E-07		1.79E-07
Barium-Lanthanum-140	Ci	<2.57E-06	<1.19E-06		<1.06E-06
Zinc-65	Ci	<1.95E-06	<8.85E-07		<7.85E-07
Cobalt-58	Ci	<8.21E-07	<4.07E-07		<3.61E-07
Cobalt-60	Ci	2.83E-06	1.29E-06		1.14E-06
Iron-59	Ci	<1.71E-06	<8.11E-07		<6.58E-07
Chromium-51	Ci	<5.38E-06	<2.61E-06		<2.31E-06
Zirconium-Niobium 95	Ci	<1.37E-06	<7.15E-07		<5.80E-07
Cerium-141	Ci	<6.96E-07	2.20E-08		1.95E-08
Cerium-144	Ci	<3.08E-06	<1.45E-06		<1.28E-06
Antimony-124	Ci	<8.22E-07	<3.87E-07		<3.43E-07
Manganese-54	Ci	1.01E-07	3.05E-08		2.70E-08
Silver-110M	Ci	<8.03E-07	<3.65E-07		<3.24E-07
Molybdenum-99	Ci	<5.88E-06	<2.72E-06		<2.41E-06
Ruthenium-103	Ci	<7.32E-07	<3.47E-07		<3.08E-07
Total for period	Ci	4.22E-06	1.72E-06		1.52E-06

(1) There were no batch gaseous releases for the first quarter.

TABLE 1C

Yankee Atomic Electric Company, Rowe, Massachusetts

Effluent and Waste Disposal Semiannual Report

First and Second Quarters 1987

Gaseous Effluents - Ground Level Releases

There were no routine measured ground level continuous or batch mode gaseous releases during the first or second quarters of 1987.



TABLE 2A

## Yankee Atomic Electric Company, Rowe, Massachusetts

## Effluent and Waste Disposal Semiannual Report

## First and Second Quarters, 1987

## 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	5.88E-03	4.14E-03	±2.00E+01
2. Average diluted concentration during period	uCi/ml	9.48E-11	1.75E-10	
3. Percent of applicable limit (1)	%	3.81E-03	5.30E-03	
B. Tritium				
1. Total release	Ci	9.90E+01	3.38E+01	±1.00E+01
2. Average diluted concentration during period	uCi/ml	1.60E-06	1.43E-06	
3. Percent of applicable limit (1)	%	5.33E-02	4.77E-02	
C. Dissolved and Entrained Gases				
1. Total release	Ci	1.30E-00	7.15E-02	±2.00E+01
2. Average diluted concentration during period	uCi/ml	2.10E-08	3.03E-09	
3. Percent of applicable limit (2)	%	1.05E-02	1.51E-03	
D. Gross Alpha Radioactivity				
1. Total release	Ci	<1.87E-06	<1.46E-06	±3.50E+01
E. Volume of liquid effluent released (prior to dilution)				
	liters	5.78E+06	3.88E+06	±3.00E+01
F. Volume of dilution water used during period				
	liters	6.20E+10	2.36E+10	±5.00E+00

- (1) Concentration limits specified in 10CFR, Part 20, Appendix B, Table II, Column 2 (Technical Specification 3.11.1.1). 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 2E-04 microcuries/ml (Technical Specification 3.11.1). 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

## First and Second Quarters, 1987

## Liquid Effluents

Nuclides Released	Unit	Continuous Mode		Batch Mode	
		Quarter 1	Quarter 2	Quarter 1	Quarter 2
Strontium-89	Ci	<2.62E-04	<1.36E-04	4.72E-06	3.04E-05
Strontium-90	Ci	<5.24E-05	<1.63E-05	1.19E-06	<6.96E-06
Cesium-134	Ci	1.39E-05	9.96E-06	1.12E-03	9.15E-04
Cesium-137	Ci	3.55E-05	1.78E-05	1.20E-03	1.04E-03
Iodine-131	Ci	4.21E-05	<1.28E-05	6.05E-04	3.23E-04
Cobalt-58	Ci	2.29E-07	<1.39E-05	<9.79E-06	5.52E-07
Cobalt-60	Ci	1.88E-05	1.18E-05	6.50E-05	9.36E-05
Iron-59	Ci	<6.65E-05	<2.71E-05	<1.57E-05	<2.74E-05
Zinc-65	Ci	<7.53E-05	<2.96E-05	<1.89E-05	<3.30E-05
Manganese-54	Ci	<3.41E-05	<1.38E-05	1.82E-05	1.02E-05
Chromium-51	Ci	<2.49E-04	<1.02E-04	<1.60E-04	<1.82E-04
Zirconium-Niobium-95	Ci	<5.48E-05	<2.28E-05	<1.93E-05	<3.04E-05
Molybdenum-99	Ci	<2.41E-04	<9.92E-05	<8.21E-05	<1.20E-04
Technetium-99m	Ci	1.11E-05	9.53E-06	<2.35E-05	2.30E-07
Barium-Lanthanum-140	Ci	<1.05E-04	<4.51E-05	<6.89E-05	2.81E-06
Cerium-141	Ci	<4.40E-05	<1.80E-05	<3.76E-05	<3.17E-05
Ruthenium-103	Ci	<3.09E-05	<1.25E-05	<1.91E-05	<2.32E-05
Cerium-144	Ci	<1.98E-04	<8.15E-05	<1.72E-04	<1.44E-04
Iodine-133	Ci	<3.22E-05	<1.28E-05	1.39E-05	3.98E-07
Selenium-75	Ci	<3.57E-05	<1.43E-05	<2.41E-05	<2.57E-05
Silver-110m	Ci	<3.24E-05	<1.37E-05	<1.27E-05	<1.94E-05
Antimony-124	Ci	<3.15E-05	<1.30E-05	<2.73E-05	<2.95E-05
Carbon-14	Ci	-	-	2.33E-03	1.28E-03
Iron-55	Ci	<5.24E-03	<2.73E-03	4.14E-04	3.90E-04
Cesium-136	Ci	<3.19E-05	<1.31E-05	<1.05E-05	<1.54E-05
Tellurium-132	Ci	<2.62E-05	<1.04E-05	<1.79E-05	5.32E-07
Total for period (above)	Ci	1.22E-04	4.91E-05	5.76E-03	4.09E-03
Xenon-133	Ci	1.04E-04	9.15E-06	1.21E+00	6.61E-02
Xenon-135	Ci	5.20E-05	<1.01E-05	3.48E-04	5.42E-05
Xenon-131m	Ci	<1.12E-03	<4.51E-04	2.47E-02	1.62E-03
Xenon-133m	Ci	<2.29E-04	<8.93E-05	4.95E-03	2.86E-04
Krypton-85	Ci	<1.02E-02	<4.22E-03	5.71E-02	3.48E-03

TABLE 3

## Yankee Atomic Electric Company, Rowe, Massachusetts

## Effluent and Waste Disposal Semiannual Report

First and Second Quarters, 1987

## Solid Waste and Irradiated Fuel Shipments

## A. Solid Waste Shipped Off-Site for Burial or Disposal (Not Irradiated Fuel)\*

	Unit	Six-Month Period	Est. Total Error, %
1. Type of Waste			
a. Spent resins, filter sludges, evaporator bottoms, etc. - LSA container**,+	m <sup>3</sup>	1.70E+01	
	Ci	4.00E+00	±3.00E+01
b. Dry compressible waste, contaminated equipment, etc. - LSA container++	m <sup>3</sup>		
	Ci		
c. Irradiated components, control rods, etc.	m <sup>3</sup>		
	Ci		
d.	m <sup>3</sup>		
	Ci		
e.	m <sup>3</sup>		
	Ci		

## 2. Estimate of Major Nuclide Composition (By Type of Waste)\*\*\*

a. Iron-55	4.01E+01	g/g
Hydrogen-3	3.41E+01	g/g
Cesium-137	7.30E+00	g/g
Cobalt-60	6.80E+00	g/g
Cesium-134	5.30E+00	g/g
Manganese-54	2.20E+00	g/g
Niobium-95	1.10E+00	g/g
		g/g
		g/g
		g/g
		g/g
		g/g

## 3. Solid Waste Disposition

Number of Shipments	Mode of Transportation	Destination
2	Truck	Barnwell, SC

## B. Irradiated Fuel Shipments (Disposition): None

- + Container volume equal to 55 gallons (drums).  
 ++ Container volume equal to 105 ft<sup>3</sup> (boxes).  
 \* Solid waste is Class A, as defined in 10CFR61.55.  
 \*\* Solidification agent is cement.  
 \*\*\* Excluding nuclides with half-lives less than 12.8 days.



## APPENDIX A

### Radioactive Liquid Effluent Monitoring Instrumentation

Requirement: Radioactive liquid effluent monitoring instrumentation channels are required to be operable in accordance with Technical Specification 3.3.3.6. 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, Technical Specification 3.3.6.b requires an explanation for the delay in correcting the inoperability in the next Semiannual Effluent Release Report.

Response: The flow rate measuring device for the steam generator blowdown tank effluent (Table 3.3-8) was installed during this reporting period, but has not yet been calibrated. ACTION Statement 17 of Table 3.3-8 is still in effect, until the flow rate measuring device for the steam generator blowdown tank effluent is calibrated, which is expected during the next reporting period.



## APPENDIX B

### Radioactive Gaseous Effluent Monitoring Instrumentation

Requirement: Radioactive gaseous effluent monitoring instrumentation channels are required to be operable in accordance with Technical Specification 3.3.3.7. 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, Technical Specification 3.3.3.7.b requires an explanation for the delay in correcting the inoperability in the next Semiannual Effluent Release Report.

Response: Since the requirements of Technical Specification 3.3.3.7 governing the operability of radioactive gaseous effluent monitoring instrumentation were met for this reporting period, no response is required.

## APPENDIX C

### Liquid Holdup Tanks

Requirement: Technical Specification 3.11.1.4 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 3.11.1.4, a description of the events leading to this condition is required in the next Semiannual Effluent Release Report.

Response: The limits of Technical Specification 3.11.1.4 were not exceeded during this reporting period.

## APPENDIX D

### Radiological Environmental Monitoring Program

Requirement: The radiological environmental monitoring program is conducted in accordance with Technical Specification 3.4.12.1. With milk or fresh leafy vegetation samples no longer available from one or more of the required sample locations, Technical Specification 3.12.1.c requires the identification of the new location(s) for obtaining replacement sample(s) in the next Semiannual Effluent Release Report and inclusion of revised Off-Site Dose Calculation Manual Figure(s) and Table(s) reflecting the new location(s).

Response: No new sampling locations were needed to be identified in accordance with the above requirement.



## APPENDIX E

### Land Use Census

Requirement: A land use census is conducted in accordance with Technical Specification 3.12.2. 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 Technical Specification 4.11.2.3, Technical Specification 3.12.2.a requires the identification of the new location(s) in the next Semiannual Effluent Release Report.

Response: The annual Land Use Census was not completed during this reporting period.

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 Technical Specification 3.12.1, technical Specification 3.12.2.b requires the identification of the new location(s) in the next Semiannual Effluent Release Report.

Response: The annual Land Use Census was not completed during this reporting period.

## APPENDIX F

### Process Control Program

Requirement: Technical Specification 6.14.1 requires that licensee initiated changes to the Process Control Program be submitted to the Commission in the Semiannual Radioactive Effluent Release Report for the period in which the change(s) was made.

Response: There was one licensee initiated amendment to the Process Control Program during this reporting period.

The following April 23, 1987 changes were made to the YNPS Process Control Program:

- a. Provided the option of drilling of cement solidified in 55-gallon drums to allow for inspection of selected drums for dryness, and
- b. Add to and modify Appendix B, "Station Procedures Which Implement the PCP."

The above changes did not reduce the overall conformance of the solidified waste product to existing criteria for solid wastes.

The changes have been reviewed and accepted by PORC, and are noted in the revised PCP.

APPENDIX G

Off-Site Dose Calculation Manual

Requirement: Technical Specification 6.15.2 requires that licensee initiated changes to the Off-Site Dose Calculation Manual be submitted to the Commission in the Semiannual Radioactive Effluent Release Report for the period in which the change(s) was made effective.

Response: There were no changes made to the ODCM during this reporting period.



## APPENDIX H

### Radioactive Liquid, Gaseous, and Solid Waste Treatment Systems

Requirement: Technical Specification 6.16.1 requires that licensee initiated major changes to the radioactive waste systems (liquid, gaseous, and solid) be reported to the Commission in the Semiannual 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 major changes to the radioactive waste systems (liquid, gaseous, and solid) during this reporting period.

## APPENDIX I

### Supplemental Information First and Second Quarters, 1987

#### 1. Technical Specification Limits - Dose and Dose Rate

<u>Technical Specification and Category</u>	<u>Limit</u>
a. <u>Noble Gases</u>	
3.11.2.1 Total body dose rate	500 mrem/yr
3.11.2.1 Skin dose rate	3000 mrem/yr
3.11.2.2 Gamma air dose	5 mrad in a quarter
3.11.2.2 Gamma air dose	10 mrad in a year
3.11.2.2 Beta air dose	10 mrad in a quarter
3.11.2.2 Beta air dose	20 mrad in a year
b. <u>Iodine-131, Tritium and Radionuclides</u> <u>in Particulate Form With Half-Lives</u> <u>Greater than 8 days</u>	
3.11.2.1 Organ dose rate	1500 mrem/yr
3.11.2.3 Organ dose	7.5 mrem in a quarter
3.11.2.3 Organ dose	15 mrem in a year
c. <u>Liquids</u>	
3.11.1.2 Total body dose	1.5 mrem in a quarter
3.11.1.2 Total body dose	3 mrem in a year
3.11.1.2 Organ dose	5 mrem in a quarter
3.11.1.2 Organ dose	10 mrem in a year

## 2. Technical Specification Limits - Concentration

<u>Technical Specification and Category</u>	<u>Limit</u>
a. <u>Noble Gases</u>	No MPC limits
b. <u>Iodine-131, Tritium and Radionuclides</u> <u>in Particulate Form With Half-Lives</u> <u>Greater than 8 days</u>	No MPC limits
c. <u>Liquids</u>	
3.11.1.1 Total sum of the fraction of MPC (10CFR20, Appendix B, Tables II, Column 2), excluding noble gases less than:	1.0
3.11.1.1 Total noble gas concentration	2E-04 uCi/cc

## 3. Measurements and Approximations of Total Radioactivity

### a. Noble Gases

"Continuous discharges" are determined by indirect measurement. Primary gas samples are taken periodically and analyzed. It is assumed that in primary to secondary leakage all gases are ejected through the air ejector. In primary coolant charging pump leakage all gases are ejected to the primary vent stack either during flashing or liquid waste processing. "Batch discharges" are determined by direct measurement. Errors associated with these measurements are estimated to be  $\pm 55$  percent.

### b. Iodines

Iodines are continuously monitored by drawing a sample from the primary vent stack through a particulate filter and charcoal cartridge. The filter and charcoal cartridge are removed and



analyzed weekly. The errors associated with these measurements are estimated to be  $\pm 25$  percent.

c. Particulates

The particulate filter described in (b) above is analyzed weekly. The errors associated with the determination of particulate effluents are estimated to be  $\pm 30$  percent.

d. Liquid Effluents

Liquid effluents are determined by direct measurement. In line composite samples are analyzed for strontium - 89, strontium - 90, gross alpha activity and carbon - 14. There is no compositing of samples for tritium or dissolved fission gas analysis. For continuous discharges composite samples are used for gamma isotopic analysis. A gamma isotopic analysis is performed on a representative sample for each batch release using the Marinelli Beaker geometry. The errors associated with these measurements are as follows: fission and activation products,  $\pm 20$  percent; tritium,  $\pm 10$  percent; dissolved fission gases,  $\pm 20$  percent; alpha activity,  $\pm 35$  percent.

4. Batch Releases

a. Liquids

First Quarter

Number of batch releases: 20

Total time period for batch releases: 7850 minutes

Maximum time period for a batch release: 1800 minutes

Average time period for batch releases: 392 minutes

Minimum time period for a batch release: 235 minutes

Average stream flow during period (Sherman Dam): 763 cfs

Average discharge rate: 18.0 gpm

## Second Quarter

Number of batch releases: 48

Total time period for batch releases: 15193 minutes

Maximum time period for a batch release: 1715 minutes

Average time period for batch releases: 316 minutes

Minimum time period for a batch release: 15 minutes

Average stream flow during period (Sherman Dam): 382 cfs

Average discharge rate: 20.0 gpm

### b. Gases

#### First Quarter

There were no batch releases during the first quarter.

#### Second Quarter

Number of batch releases: 7

Total time period for batch releases: 2725 minutes

Maximum time period for a batch release: 650 minutes

Average time period for batch releases: 389 minutes

Minimum time period for a batch release: 105 minutes

## 5. Abnormal Releases

### a. Liquid

There were no nonroutine liquid releases during the reporting period.

### b. Gases

There were no nonroutine gaseous releases during the reporting period.

# YANKEE ATOMIC ELECTRIC COMPANY



1671 Worcester Road, Framingham, Massachusetts 01701

August 28, 1987

FYR 87-92

United States Nuclear Regulatory Commission  
Document Control Desk  
Washington, DC 20555

References: (a) License No. DPR-3 (Docket No. 50-29)

Subject: Semiannual Effluent Release Report

Dear Sir:

Enclosed are the tables summarizing the quantities of radioactive liquid and gaseous effluents, and solid waste released from Yankee Nuclear Power Station at Rowe, Massachusetts for the first and second quarters of 1987. This information is submitted in accordance with Technical Specification 6.9.5.b.

We trust that this information is satisfactory; however, should you have any questions, please contact us.

Very truly yours,

YANKEE ATOMIC ELECTRIC COMPANY

George Papanic, Jr.  
Senior Project Engineer - Licensing

GP/25.114

cc: USNRC Region I  
USNRC Resident Inspector, YNPS

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