

ALABAMA POWER COMPANY  
FARLEY NUCLEAR PLANT UNIT NO. ONE  
LICENSE NO. NPF-2  
AND  
FARLEY NUCLEAR PLANT UNIT NO. TWO  
LICENSE NO. NPF-8

SEMIANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT  
JANUARY 1, 1990 THROUGH JUNE 30, 1990

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CHAPTER 1  
INTRODUCTION

This semiannual radioactive release report, for the period January 1 through June 30, 1990, is submitted in accordance with Appendix A of License No.'s NPF-2 and NPF-8. Appendix A will hereinafter be referred to as the Technical Specifications or TS.

A single submittal is made for both units which combines those sections that are common. Separate tables of releases and release totals are included where separate processing systems exist.

All assessments of radiation doses are performed in accordance with the OFFSITE DOSE CALCULATION MANUAL (ODCM).



## CHAPTER 2

### SUPPLEMENTAL INFORMATION FOR EFFLUENT AND WASTE DISPOSAL

#### 2.1 REGULATORY LIMITS

##### 2.1.1 Fission And Activation Gases

- 1) The dose rate from the site at any time due to noble gases shall be less than or equal to 500 mrem/yr to the total body and 3000 mrem/yr to the skin.
- 2) The air dose from each reactor unit from the site during any calendar quarter due to noble gases shall be less than or equal to 5 mrad for gamma radiation and 10 mrad for beta radiation.
- 3) The air dose from each reactor unit from the site during any calendar year due to noble gases shall be less than or equal to 10 mrad for gamma radiation and 20 mrad for beta radiation.

##### 2.1.2 Iodines And Particulates

- 1) The dose rate from the site at any time due to iodines, particulates and radionuclides with half-lives greater than 8 days shall be less than or equal to 1500 mrem/yr to any organ.
- 2) The dose from each reactor unit from the site during any calendar quarter due to iodines, particulates and radionuclides with half-lives greater than 8 days shall be less than or equal to 7.5 mrem to any organ.
- 3) The dose from each reactor unit from the site during any calendar year due to iodines, particulates and radionuclides with half-lives greater than 8 days shall be less than or equal to 15 mrem to any organ.

## SUPPLEMENTAL INFORMATION FOR EFFLUENT AND WASTE DISPOSAL REGULATORY LIMITS

### 2.1.3 Liquid Effluents

1) The concentration of radioactive materials released in liquid effluents to unrestricted areas from all reactors at the site shall not exceed at any time the values specified in 10CFR Part 20, Appendix B, Table II, Column 2. The concentration of dissolved or entrained noble gases, released in liquid effluents to unrestricted areas from all reactors at the site, shall not exceed at any time  $2E-4$   $\mu\text{Ci/ml}$  in water.

2) The dose or dose commitment due to liquid effluents released from each reactor unit from the site during any calendar quarter shall be less than or equal to 1.5 mrem to the total body and 5 mrem to any organ.

3) The dose or dose commitment due to liquid effluents released from each reactor unit from the site during any calendar year shall be less than or equal to 3 mrem to the total body and 10 mrem to any organ.

### 2.2 MAXIMUM PERMISSIBLE CONCENTRATIONS

a) Airborne - The maximum permissible concentration of radioactive materials in gaseous effluents is limited by the dose rate restrictions of 10 CFR 20. In this case, the maximum permissible concentrations are actually determined by the dose factors in the ODCM.

b) Liquids - 10 CFR Part 20, Appendix B, Table II, Column 2. Note: The MPC chosen is the most conservative value of either the soluble or insoluble MPC for each isotope.

### 2.3 AVERAGE ENERGY

Not applicable for Farley's TS.

### 2.4 MEASUREMENTS AND APPROXIMATIONS OF TOTAL ACTIVITY

The following discussion details the methods used to measure and approximate total activity for the following:

- a. Fission and Activation Gases
- b. Iodines and Particulates
- c. Liquid Effluents

## SUPPLEMENTAL INFORMATION FOR EFFLUENT AND WASTE DISPOSAL MEASUREMENTS AND APPROXIMATIONS OF TOTAL ACTIVITY

Tables 4 and 5 give sampling frequencies and minimum detectable concentration requirements for the analysis of gaseous and liquid effluent streams, respectively.

Values in the attached tables given as zero do not mean that the nuclides were not present. A zero indicates that the nuclide was not present at levels greater than the sensitivity requirements shown in Tables 4 and 5. For some nuclides, lower detection limits than required may be readily achievable; when a nuclide is measured below its stated limit, it is reported.

### 2.4.1 Fission And Activation Gases

The following noble gases are considered in evaluating gaseous airborne discharge:

Kr-87	Xe-133
Kr-88	Xe-135
Xe-133m	Xe-138

Periodic grab samples from plant effluent streams are analyzed by a computerized pulse height analyzer system utilizing high resolution germanium detectors. (See Table 4 for sampling and analytical requirements). Isotopic values thus obtained are used for release rate calculations as specified in the ODCM. Only those nuclides that are detected are used in this computation. During the period between grab samples, the amount of radioactivity released is based on the effluent monitor readings.

The monitor meter response (cpm/uCi/ml) and the background (cpm) are used to adjust the activity released for variations in monitor readings, as described in the ODCM.

To ensure isotopic distributions do not change significantly during major operational occurrences, the frequency of grab sampling is increased to satisfy the requirements of footnotes (b) and (d) of TS Table 4.11-2, "Radioactive Gaseous Waste Sampling and Analysis Program".

### 2.4.2 Iodines And Particulates

The radioiodines and radioactive materials in particulate forms to be considered are:

Mn-54	I-131
Fe-59	I-133



**SUPPLEMENTAL INFORMATION FOR EFFLUENT AND WASTE DISPOSAL  
MEASUREMENTS AND APPROXIMATIONS OF TOTAL ACTIVITY**

Co-58	Cs-134
Co-60	Cs-137
Zn-65	Ce-141
Sr-89	Ce-144
Sr-90	*H-3
Mo-99	

Other nuclides with half-lives greater than 8 days which are identified and measured are also considered. The MDC's will vary and are not required to meet the MDC limits of those isotopes listed specifically.

- \* Tritium is considered in the gaseous or water vapor form.

**Continuous Releases:** Continuous sampling is performed on the continuous release points (i.e. the Plant Vent Stack, Containment Purge and the Turbine Building Vent). Particulate material is collected by filtration. Periodically these filters are removed and analyzed on the pulse height analyzer to identify and quantify radioactive materials collected on the filters. Particulate filters are then analyzed for gross alpha and strontium as required. Gross alpha determinations are made using a 2 pi gas flow proportional counter. Sr-89 and 90 values are obtained by chemical separation and subsequent analysis using 2 pi gas flow proportional counters.

**Batch Releases:** The processing of batch type releases (from Containment or Waste Gas Delay Tanks) is analogous to continuous releases, except that the release is not commenced until samples have been obtained and analyzed.

#### 2.4.3 Liquid Effluents

The radionuclides listed below are considered when evaluating liquid effluents:

Mn-54	I-131
Fe-59	Cs-134
Co-58	Cs-137
Co-60	Ce-141
Zn-65	Ce-144
Sr-89	Mo-99
Sr-90	Fe-55
	H-3

**Batch Releases:** Representative pre-release grab samples are obtained and analyzed per Table 5. Isotopic analyses are performed using the computerized pulse height analysis system



## SUPPLEMENTAL INFORMATION FOR EFFLUENT AND WASTE DISPOSAL MEASUREMENTS AND APPROXIMATIONS OF TOTAL ACTIVITY

previously described. Aliquots of each pre-release sample proportional to the waste volume released are composited in accordance with requirements in Table 5. Strontium determinations are made by performing a chemical separation and counting the isotope thus separated using a 2 pi gas flow proportional counter. Gross beta and gross alpha determinations are made using 2 pi gas flow proportional counters. Tritium and Iron 55 determinations are made using liquid scintillation techniques. Dissolved gases are determined employing grab sampling techniques and then counting on the pulse height analyzer.

Continuous Releases: Continuous releases (from the Steam Generator Blowdown) are analogous to that of the batch releases except that they are analyzed on a weekly composite basis per Table 5.

### 2.5 BATCH RELEASES AND ABNORMAL RELEASES

Batch releases and abnormal (non-routine) releases from units 1 and 2 are shown on the following pages.

**SUPPLEMENTAL INFORMATION FOR EFFLUENT AND WASTE DISPOSAL  
BATCH RELEASES AND ABNORMAL RELEASES**

**BATCH RELEASES - UNIT 1**

---

LIQUIDS	RELEASE(S):	QUARTER 1 ALL	QUARTER 2
Number of batch releases		130.	116.
Total time period for batch releases (min)		11344.	9739.
Maximum time period for a batch release (min)		113.	115.
Average time period for a batch release (min)		87.	84.
Minimum time period for a batch release (min)		66.	66.
Average stream flow during periods of release (cfs)		* 2.91E+04	* 9.03E+03
 GASES	 RELEASE(S): ALL		
Number of batch releases		6.	3.
Total time period for batch releases (min)		1763.	1141.
Maximum time period for a batch release (min)		476.	475.
Average time period for a batch release (min)		294.	380.
Minimum time period for a batch release (min)		98.	274.

\* Average River Flow Rate, taken at Walter F. George Lock and Dam,  
located 30.7 miles above Farley Nuclear Plant.

SUPPLEMENTAL INFORMATION FOR EFFLUENT AND WASTE DISPOSAL  
BATCH RELEASES AND ABNORMAL RELEASES

ABNORMAL RELEASES - UNIT 1

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	QUARTER 1	QUARTER 2
LIQUIDS		
Number of releases	0.	0.
Total activity released	0.00E+00	0.00E+00
GASES		
Number of releases	0.	0.
Total activity released	0.00E+00	0.00E+00

SUPPLEMENTAL INFORMATION FOR EFFLUENT AND WASTE DISPOSAL  
BATCH RELEASES AND ABNORMAL RELEASES

BATCH RELEASES - UNIT 2

---

LIQUIDS	RELEASE(S): ALL	QUARTER 1	QUARTER 2
Number of batch releases		66.	77.
Total time period for batch releases (min)		6327.	7078.
Maximum time period for a batch release (min)		150.	120.
Average time period for a batch release (min)		96.	92.
Minimum time period for a batch release (min)		85.	76.
Average stream flow during periods of release (cfs)	* 2.91E+04		* 9.03E+03
GASES	RELEASE(S): ALL		
Number of batch releases		0.	3.
Total time period for batch releases (min)		0.	1884.
Maximum time period for a batch release (min)		0.	847.
Average time period for a batch release (min)		0.	628.
Minimum time period for a batch release (min)		0.	255.

\* Average River Flow Rate, taken at Walter F. George Lock and Dam,  
located 30.7 miles above Farley Nuclear Plant.



SUPPLEMENTAL INFORMATION FOR EFFLUENT AND WASTE DISPOSAL  
BATCH RELEASES AND ABNORMAL RELEASES

ABNORMAL RELEASES - UNIT 2

---

	QUARTER 1	QUARTER 2
LIQUIDS		
Number of releases	0.	0.
Total activity released	0.00E+00	0.00E+00
GASES		
Number of releases	0.	0.
Total activity released	0.00E+00	0.00E+00

SUPPLEMENTAL INFORMATION FOR EFFLUENT AND WASTE DISPOSAL  
ESTIMATE OF TOTAL ERROR

2.6 ESTIMATE OF TOTAL ERROR

2.6.1 Liquid

1) The maximum error associated with volume and flow measurements, based upon plant calibration practice is estimated to be + or - 10%.

2) The average error associated with counting is estimated to be less than + or - 15%.

2.6.2 Gaseous

1) The maximum errors associated with monitor readings sample flow, vent flow, sample collection, monitor calibration and laboratory procedure are collectively estimated to be:

Fission and Activation Gases	Iodine	Particulates	Tritium
75%	60%	50%	45%

2) The average error associated with counting is estimated to be:

Fission and Activation Gases	Iodine	Particulates	Tritium
19%	28%	20%	8%

2.6.3 Solid Radwaste

The error involved in determining the contents of solid radwaste shipments is estimated to be less than + or - 1%

SUPPLEMENTAL INFORMATION FOR EFFLUENT AND WASTE DISPOSAL  
ESTIMATE OF TOTAL ERROR

UNIT 1  
1990

2.7 SOLID WASTE

See Table 3

2.8 RADIOLOGICAL IMPACT ON MAN

The doses from liquid and gaseous releases for units 1 and 2 are shown on the following pages.



SUPPLEMENTAL INFORMATION FOR EFFLUENT AND WASTE DISPOSAL  
RADIOLOGICAL IMPACT ON MAN

DOSES FROM LIQUID AND GASEOUS EFFLUENTS - UNIT 1

---

	QUARTER 1	QUARTER 2
LIQUIDS (mrem)	RELEASE(S): ALL	
Bone	1.84E-02	2.52E-02
Liver	2.78E-02	4.01E-02
Whole body	1.93E-02	2.84E-02
Thyroid	3.91E-04	1.21E-03
Kidney	6.00E-03	1.42E-02
Lung	3.46E-03	5.57E-03
GI - LLI	1.35E-02	1.43E-02

GASES RELEASE(S): ALL

NOBLE GASES (mRAD)

Whole body	3.67E-03	1.91E-03
Skin	3.00E-03	9.83E-04

PARTICULATE AND IODINE (mrem)

Bone	0.00E+00	0.00E+00
Liver	8.60E-04	2.36E-03
Whole body	8.60E-04	2.36E-03
Thyroid	8.60E-04	2.36E-03
Kidney	8.60E-04	2.36E-03
Lung	8.60E-04	2.36E-03
GI - LLI	8.60E-04	2.36E-03
Skin	0.00E+00	0.00E+00



SUPPLEMENTAL INFORMATION FOR EFFLUENT AND WASTE DISPOSAL  
RADIOLOGICAL IMPACT ON MAN

DOSES FROM LIQUID AND GASEOUS EFFLUENTS - UNIT 2

---

	QUARTER 1	QUARTER 2
LIQUIDS (mrem)	RELEASE(S): ALL	
Bone	1.04E-02	2.82E-02
Liver	1.62E-02	4.57E-02
Whole body	1.14E-02	3.26E-02
Thyroid	6.73E-04	1.17E-03
Kidney	5.88E-03	1.60E-02
Lung	2.43E-03	6.15E-03
GI - LLI	2.25E-03	9.95E-03

GASES                      RELEASE(S): ALL

NOBLE GASES (mRAD)

Whole body	2.82E-03	2.86E-03
Skin	9.98E-04	1.02E-03

PARTICULATE AND IODINE (mrem)

Bone	0.00E+00	0.00E+00
Liver	3.05E-03	3.13E-03
Whole body	3.05E-03	3.13E-03
Thyroid	3.05E-03	3.13E-03
Kidney	3.05E-03	3.13E-03
Lung	3.05E-03	3.13E-03
GI - LLI	3.05E-03	3.13E-03
Skin	0.00E+00	0.00E+00

SUPPLEMENTAL INFORMATION FOR EFFLUENT AND WASTE DISPOSAL  
MINIMUM DETECTABLE CONCENTRATION (MDC)

2.9 MINIMUM DETECTABLE CONCENTRATION (MDC)

Detectable limits for activity analyses are based upon the technical feasibility and on the potential significance in the environment of the quantities released. However, in practice, when an isotope's a posteriori MDC could not be met due to other nuclides being present in much greater concentrations, the a priori MDC as defined in the TS table 4.11-1 a. is relied upon.

2.10 DEVIATIONS FROM LIQUID WASTE RELEASE PROGRAM

There were no deviations from the Liquid Waste Release Program during the first half of 1990.

2.11 DEVIATIONS FROM GASEOUS WASTE RELEASE PROGRAM

A deviation from the Gaseous Waste Release Program occurred on Unit 1 during Quarter 1 in that a continuous sample was not obtained on the Unit 1 Containment Purge the week of January 22 due to the sample pump having been inadvertently unplugged.

# CHAPTER 3

## TABLE 1A-1

GASEOUS EFFLUENTS -- SUMMARY OF RELEASE(S): ALL - UNIT 1

	UNITS	QUARTER 1	QUARTER 2	
A. FISSION AND ACTIVATION GASES				
1. TOTAL RELEASE	Ci	3.64E+01	1.26E+01	
2. AVERAGE RELEASE RATE FOR PERIOD	uCi/SEC	4.68E+00	1.60E+00	
3. PERCENT OF TECHNICAL SPECIFICATION LIMIT	%	5.87E-03	3.06E-03	(T.BODY) *
4. PERCENT OF TECHNICAL SPECIFICATION LIMIT	%	8.00E-04	2.62E-04	(SKIN) **
B. IODINES				
1. TOTAL IODINE-131	Ci	0.00E+00	0.00E+00	
2. AVERAGE RELEASE RATE FOR PERIOD	uCi/SEC	0.00E+00	0.00E+00	
3. PERCENT OF TECHNICAL SPECIFICATION LIMIT	%	0.00E+00	0.00E+00	(ORGAN) ***

\*  $[(\text{Quarterly T. Body Dose} \times 4) / (250 \text{ mrem/yr limit})] \times 100$

\*\*  $[(\text{Quarterly Skin Dose} \times 4) / (1500 \text{ mrem/yr limit})] \times 100$

\*\*\*  $[(\text{Quarterly I-131 Dose} \times 4) / (750 \text{ mrem/yr limit})] \times 100$



TABLE 1A-1

## GASEOUS EFFLUENTS -- SUMMATION OF RELEASE(S): ALL - UNIT 1

	UNITS	QUARTER 1	QUARTER 2	
C. PARTICULATES				
1. PARTICULATES WITH HALF-LIVES >8 DAYS	Ci	0.00E+00	0.00E+00	
2. AVERAGE RELEASE RATE FOR PERIOD	uCi/SEC	0.00E+00	0.00E+00	
3. PERCENT OF TECHNICAL SPECIFICATION LIMIT	%	0.00E+00	0.00E+00	(ORGAN) *
4. GROSS ALPHA RADIOACTIVITY	Ci	1.05E-07	5.48E-08	

## D. TRITIUM

1. TOTAL RELEASE	Ci	4.37E+00	1.34E+01	
2. AVERAGE RELEASE RATE FOR PERIOD	uCi/SEC	6.26E-01	1.70E+00	
3. PERCENT OF TECHNICAL SPECIFICATION LIMIT	%	2.75E-03	7.55E-03	(ORGAN) **

\* [(Quarterly Particulate Dose x 4)/(750 mrem/yr limit)] x 100

\*\* [(Quarterly Tritium Dose x 4)/(750 mrem/yr limit)] x 100



# CHAPTER 4

## TABLE 1A-2

GASEOUS EFFLUENTS -- SUMMATION OF RELEASE(S): ALL - UNIT 2

	UNITS	QUARTER 1	QUARTER 2	
A. FISSION AND ACTIVATION GASES				
1. TOTAL RELEASE	Ci	8.95E+00	9.56E+00	
2. AVERAGE RELEASE RATE FOR PERIOD	uCi/SEC	1.15E+00	1.22E+00	
3. PERCENT OF TECHNICAL SPECIFICATION LIMIT	%	4.51E-03	4.58E-03	(T.BODY) *
4. PERCENT OF TECHNICAL SPECIFICATION LIMIT	%	2.66E-04	2.72E-04	(SKIN) **
B. IODINES				
1. TOTAL IODINE-131	Ci	0.00E+00	0.00E+00	
2. AVERAGE RELEASE RATE FOR PERIOD	uCi/SEC	0.00E+00	0.00E+00	
3. PERCENT OF TECHNICAL SPECIFICATION LIMIT	%	0.00E+00	0.00E+00	(ORGAN) ***

\*  $[(\text{Quarterly T. Body Dose} \times 4) / (250 \text{ mrem/yr limit})] \times 100$

\*\*  $[(\text{Quarterly Skin Dose} \times 4) / (1500 \text{ mrem/yr limit})] \times 100$

\*\*\*  $[(\text{Quarterly I-131 Dose} \times 4) / (750 \text{ mrem/yr limit})] \times 100$

TABLE 1A-2

## GASEOUS EFFLUENTS -- SUMMATION OF RELEASE(S): ALL - UNIT 2

	UNITS	QUARTER 1	QUARTER 2	
C. PARTICULATES				
1. PARTICULATES WITH HALF-LIVES >8 DAYS	Ci	0.00E+00	0.00E+00	
2. AVERAGE RELEASE RATE FOR PERIOD	uCi/SEC	0.00E+00	0.00E+00	
3. PERCENT OF TECHNICAL SPECIFICATION LIMIT	%	0.00E+00	0.00E+00	(ORGAN) *
4. GROSS ALPHA RADIOACTIVITY	Ci	1.55E-07	0.00E+00	
D. TRITIUM				
1. TOTAL RELEASE	Ci	1.72E+01	1.77E+01	
2. AVERAGE RELEASE RATE FOR PERIOD	uCi/SEC	2.21E+00	2.25E+00	
3. PERCENT OF TECHNICAL SPECIFICATION LIMIT	%	9.76E-03	1.00E-02	(ORGAN) **

\* [(Quarterly Particulate Dose x 4)/(750 mrem/yr limit)] x 100

\*\* [(Quarterly Tritium Dose x 4)/(750 mrem/yr limit)] x 100

# CHAPTER 5

## TABLE 1B-1

GASEOUS EFFLUENTS - Elevated Releases RELEASE(S): ALL - UNIT 1

CONTINUOUS MODE				BATCH MODE			
: NUCLIDES	: UNITS	: QUARTER	: QUARTER	: QUARTER	: QUARTER	:	:
: RELEASED	:	: 1	: 2	: 1	: 2	:	:

### 1. FISSION AND ACTIVATION GASES

AR-41	Ci	6.80E+00	5.38E+00	0.00E+00	0.00E+00
KR-85M	Ci	0.00E+00	0.00E+00	0.00E+00	1.59E-03
KR-85	Ci	0.00E+00	0.00E+00	2.56E-01	4.64E-01
KR-88	Ci	0.00E+00	0.00E+00	0.00E+00	7.36E-04
XE-131M	Ci	0.00E+00	0.00E+00	1.30E-02	1.09E-02
XE-133M	Ci	0.00E+00	0.00E+00	2.13E-03	2.64E-02
XE-133	Ci	1.36E+01	3.02E+00	8.67E-01	1.44E+00
XE-135	Ci	1.48E+01	2.11E+00	1.24E-04	9.42E-02

TOTAL FOR	:	:	:	:	:	:	:
PERIOD	:	Ci	: 3.52E+01	: 1.05E+01	: 1.14E+00	: 2.04E+00	:
(ABOVE)	:	:	:	:	:	:	:



TABLE 1B-1

GASEOUS EFFLUENTS - Elevated Releases RELEASE(S): ALL - UNIT 1

CONTINUOUS MODE				BATCH MODE	
NUCLIDES	UNITS	QUARTER	QUARTER	QUARTER	QUARTER
RELEASED		1	2	1	2

## 2. IODINES

TOTAL FOR					
PERIOD	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00
(ABOVE)					

TABLE 1B-1

GASEOUS EFFLUENTS - Elevated Releases RELEASE(S): ALL - UNIT 1

CONTINUOUS MODE				BATCH MODE	
NUCLIDES	UNITS	QUARTER	QUARTER	QUARTER	QUARTER
RELEASED		1	2	1	2

## 3. PARTICULATES

H-3	C1	4.86E+00	1.34E+01	0.00E+00	0.00E+00
G.ALPHA	C1	1.05E-07	5.48E-08	0.00E+00	0.00E+00

TOTAL FOR					
PERIOD	C1	4.86E+00	1.34E+01	0.00E+00	0.00E+00
(ABOVE)					

# CHAPTER 6

## TABLE 1B-2

GASEOUS EFFLUENTS - Elevated Releases RELEASE(S): ALL - UNIT 2

CONTINUOUS MODE				BATCH MODE			
NUCLIDES	UNITS	QUARTER	QUARTER	QUARTER	QUARTER		
RELEASED		1	2	1	2		

### 1. FISSION AND ACTIVATION GASES

AR-41	Ci	8.85E+00	8.98E+00	0.00E+00	0.00E+00
KR-85	Ci	0.00E+00	0.00E+00	0.00E+00	1.54E-02
XE-133M	Ci	0.00E+00	0.00E+00	0.00E+00	1.51E-03
XE-133	Ci	1.00E-01	2.70E-01	0.00E+00	2.94E-01

TOTAL FOR	:	:	:	:	:	:	:
PERIOD	:	Ci	:	8.95E+00	:	9.25E+00	:
(ABOVE)	:	:	:	:	:	0.00E+00	:
	:	:	:	:	:	3.11E-01	:



TABLE 1B-2

GASEOUS EFFLUENTS - Elevated Releases RELEASE(S): ALL - UNIT 2

CONTINUOUS MODE				BATCH MODE			
NUCLIDES	UNITS	QUARTER	QUARTER	QUARTER	QUARTER	QUARTER	QUARTER
RELEASED		1	2	1	2	1	2

2. IODINES

TOTAL FOR	:	:	:	:	:	:	:
PERIOD	:	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00	:
(ABOVE)	:	:	:	:	:	:	:

TABLE 1B-2

GASEOUS EFFLUENTS - Elevated Releases RELEASE(S): ALL - UNIT 2

CONTINUOUS MODE				BATCH MODE	
NUCLIDES	UNITS	QUARTER	QUARTER	QUARTER	QUARTER
RELEASED		1	2	1	2

## 3. PARTICULATES

H-3	C1	1.72E+01	1.77E+01	0.00E+00	0.00E+00
G.ALPHA	C1	1.55E-07	0.00E+00	0.00E+00	0.00E+00

TOTAL FOR	:	:	:	:	:	:
PERIOD	:	C1	:	:	:	:
(ABOVE)	:	:	:	:	:	:

# CHAPTER 7

## TABLE 1C-1

GASEOUS EFFLUENTS - Ground Level Releases

RELEASE(S): ALL - UNIT 1

CONTINUOUS MODE				BATCH MODE			
NUCLIDES	UNITS	QUARTER	QUARTER	QUARTER	QUARTER		
RELEASED		1	2	1	2		

### 1. FISSION AND ACTIVATION GASES

XE-135	Ci	1.22E-01	0.00E+00	0.00E+00	0.00E+00
--------	----	----------	----------	----------	----------

TOTAL FOR	:	:	:	:	:	:
PERIOD	:	Ci	:	1.22E-01	:	0.00E+00
(ABOVE)	:	:	:	:	:	0.00E+00



TABLE 1C-1

GASEOUS EFFLUENTS - Ground Level Releases

RELEASE(S): ALL - UNIT 1

CONTINUOUS MODE				BATCH MODE			
NUCLIDES	UNITS	QUARTER	QUARTER	QUARTER	QUARTER	QUARTER	QUARTER
RELEASED		1	2	1	2	1	2

2. IODINES

TOTAL FOR	:	:	:	:	:	:	:
PERIOD	:	C1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	:
(ABOVE)	:	:	:	:	:	:	:

TABLE 1C-1

GASEOUS EFFLUENTS - Ground Level Releases      RELEASE(S): ALL - UNIT 1

CONTINUOUS MODE				BATCH MODE			
NUCLIDES	UNITS	QUARTER	QUARTER	QUARTER	QUARTER		
RELEASED		1	2	1	2		

## 3. PARTICULATES

H-3	C1	9.10E-04	1.65E-03	0.00E+00	0.00E+00
-----	----	----------	----------	----------	----------

TOTAL FOR	:	:	:	:	:	:
PERIOD	:	C1	9.10E-04	1.65E-03	0.00E+00	0.00E+00
(ABOVE)	:	:	:	:	:	:

# CHAPTER 8

## TABLE 1C-2

GASEOUS EFFLUENTS - Ground Level Releases

RELEASE(S): ALL - UNIT 2

CONTINUOUS MODE				BATCH MODE			
NUCLIDES	UNITS	QUARTER	QUARTER	QUARTER	QUARTER		
RELEASED		1	2	1	2		

### 1. FISSION AND ACTIVATION GASES

TOTAL FOR	:		:		:		:
PERIOD	:	C1	:	0.00E+00	:	0.00E+00	:
(ABOVE)	:		:		:		:



TABLE 1C-2

GASEOUS EFFLUENTS - Ground Level Releases

RELEASE(S): ALL - UNIT 2

CONTINUOUS MODE				BATCH MODE			
NUCLIDES	UNITS	QUARTER	QUARTER	QUARTER	QUARTER	QUARTER	QUARTER
RELEASED		1	2	1	2	1	2
2. IODINES							

TOTAL FOR	:	:	:	:	:	:	:
PERIOD	:	C1	:	0.00E+00	:	0.00E+00	:
(ABOVE)	:	:	:	:	:	:	:

TABLE 1C-2

GASEOUS EFFLUENTS - Ground Level Releases      RELEASE(S): ALL - UNIT 2

CONTINUOUS MODE				BATCH MODE	
NUCLIDES	UNITS	QUARTER	QUARTER	QUARTER	QUARTER
RELEASED		1	2	1	2

## 3. PARTICULATES

H-3	Ci	7.13E-03	1.10E-03	0.00E+00	0.00E+00
-----	----	----------	----------	----------	----------

TOTAL FOR	:	Ci	:	7.13E-03	:	1.10E-03	:	0.00E+00	:	0.00E+00
PERIOD	:		:		:		:		:	
(ABOVE)	:		:		:		:		:	

# CHAPTER 9

## TABLE 2A-1

LIQUID EFFLUENTS -- SUMMATION OF RELEASE(S): ALL - UNIT 1

UNITS	QUARTER 1	QUARTER 2
-------	--------------	--------------

### A. FISSION AND ACTIVATION PRODUCTS

1. TOTAL RELEASE (EXCL. TRIT., GASES, ALPHA)	Ci	2.08E-02	1.62E-02	
2. AVERAGE DILUTED CONC. DURING PERIOD	uCi/ml	1.57E-09	1.20E-09	
3. PERCENT OF APPLICABLE LIMIT	%	2.85E-03	3.00E-03	*

### B. TRITIUM

1. TOTAL RELEASE	Ci	5.52E+01	1.89E+02	
2. AVERAGE DILUTED CONC. DURING PERIOD	uCi/ml	4.15E-06	1.41E-05	
3. PERCENT OF APPLICABLE LIMIT	%	1.37E-01	4.66E-01	**

\* (Summation of Fission and Activation Products C/MPC) x 100

\*\* (Tritium C/MPC) x 100



TABLE 2A-1

## LIQUID EFFLUENTS -- SUMMATION OF RELEASE(S): ALL - UNIT 1

UNITS	QUARTER 1	QUARTER 2
-------	--------------	--------------

## C. DISSOLVED AND ENTRAINED GASES

1. TOTAL RELEASE	Ci	2.08E-03	1.74E-03	
2. AVERAGE DILUTED CONC. DURING PERIOD	uCi/ml	1.56E-10	9.20E-11	
3. PERCENT OF APPLICABLE LIMIT	%	7.77E-05	4.57E-05	*

## D. GROSS ALPHA RADIOACTIVITY

1. TOTAL RELEASE	Ci	2.55E-05	7.31E-06	
------------------	----	----------	----------	--

E. VOLUME WASTE RELEASED (PRIOR TO DILUTION)	LITERS	8.95E+07	9.61E+07	
---	--------	----------	----------	--

F. VOLUME DILUTION WATER USED DURING PERIOD	LITERS	1.33E+10	1.34E+10	
--	--------	----------	----------	--

\* (Dissolved and Entrained Gas Concentration)/(2.00E-04) x 100

CHAPTER 10

TABLE 2A-2

LIQUID EFFLUENTS -- SUMMATION OF RELEASE(S): ALL - UNIT 2

UNITS	QUARTER 1	QUARTER 2
-------	--------------	--------------

A. FISSION AND ACTIVATION PRODUCTS

1. TOTAL RELEASE (EXCL. TRIT., GASES, ALPHA)	Ci	1.68E-02	1.61E-02	
2. AVERAGE DILUTED CONC. DURING PERIOD	uCi/ml	1.13E-09	1.08E-09	
3. PERCENT OF APPLICABLE LIMIT	%	1.43E-03	2.42E-03	*

B. TRITIUM

1. TOTAL RELEASE	Ci	1.09E+02	1.91E+02	
2. AVERAGE DILUTED CONC. DURING PERIOD	uCi/ml	7.28E-06	1.29E-05	
3. PERCENT OF APPLICABLE LIMIT	%	2.41E-01	4.26E-01	**

\* (Summation of Fission and Activation Products C/MPC) x 100

\*\* (Tritium C/MPC) x 100

TABLE 2A-2

## LIQUID EFFLUENTS -- SUMMATION OF RELEASE(S): ALL - UNIT 2

UNITS	QUARTER 1	QUARTER 2
-------	--------------	--------------

## C. DISSOLVED AND ENTRAINED GASES

1. TOTAL RELEASE	Ci	8.99E-04	1.90E-03	
2. AVERAGE DILUTED CONC. DURING PERIOD	uCi/ml	6.03E-11	1.28E-10	
3. PERCENT OF APPLICABLE LIMIT	%	2.99E-05	6.35E-05	*

## D. GROSS ALPHA RADIOACTIVITY

1. TOTAL RELEASE	Ci	3.96E-06	2.03E-06	
------------------	----	----------	----------	--

E. VOLUME WASTE RELEASED (PRIOR TO DILUTION)	LITERS	1.01E+08	1.11E+08	
---	--------	----------	----------	--

F. VOLUME DILUTION WATER USED DURING PERIOD	LITERS	1.49E+10	1.48E+10	
--	--------	----------	----------	--

\* (Dissolved and Entrained Gases Concentration)/(2.00E-04) x 100



## CHAPTER 11

TABLE 2B-1

LIQUID EFFLUENTS

RELEASE(S): ALL - UNIT 1

		CONTINUOUS MODE		BATCH MODE	
NUCLIDES	UNITS	QUARTER	QUARTER	QUARTER	QUARTER
RELEASED		1	2	1	2
H-3	Ci	2.80E-01	2.13E-03	5.49E+01	1.89E+02
CR-51	Ci	0.00E+00	0.00E+00	7.42E-05	3.65E-04
MN-54	Ci	0.00E+00	0.00E+00	4.00E-05	9.07E-05
FE-55	Ci	1.68E-03	2.88E-03	1.84E-03	1.22E-03
FE-59	Ci	0.00E+00	0.00E+00	6.23E-06	6.03E-04
CO-58	Ci	0.00E+00	0.00E+00	3.92E-03	2.63E-03
CO-60	Ci	0.00E+00	0.00E+00	2.71E-03	3.04E-03
ZN-65	Ci	0.00E+00	0.00E+00	0.00E+00	4.27E-06
RB-88	Ci	0.00E+00	0.00E+00	5.63E-05	0.00E+00
SR-90	Ci	0.00E+00	0.00E+00	9.99E-06	5.68E-06
SR-92	Ci	0.00E+00	0.00E+00	0.00E+00	2.05E-05
ZR-95	Ci	0.00E+00	0.00E+00	7.31E-05	9.65E-05
NB-95	Ci	0.00E+00	0.00E+00	2.64E-04	2.59E-04
TC-99M	Ci	0.00E+00	0.00E+00	1.13E-06	0.00E+00
RU-103	Ci	0.00E+00	0.00E+00	5.35E-06	1.28E-05
RU-105	Ci	0.00E+00	0.00E+00	0.00E+00	1.06E-05
RU-106	Ci	0.00E+00	0.00E+00	2.82E-05	1.59E-04
AG-110M	Ci	0.00E+00	0.00E+00	6.70E-04	1.31E-03
I-131	Ci	0.00E+00	0.00E+00	1.01E-06	2.08E-06
CS-134	Ci	0.00E+00	0.00E+00	2.62E-04	5.40E-04
CS-137	Ci	0.00E+00	0.00E+00	1.36E-03	1.93E-03
G.ALPHA	Ci	1.74E-05	4.06E-07	8.18E-06	6.91E-06

TABLE 2B-1

LIQUID EFFLUENTS

RELEASE(S): ALL - UNIT 1

CONTINUOUS MODE				BATCH MODE	
NUCLIDES	UNITS	QUARTER	QUARTER	QUARTER	QUARTER
RELEASED		1	2	1	2
SB-124	C1	0.00E+00	0.00E+00	1.40E-05	0.00E+00
-97	C1	0.00E+00	0.00E+00	4.13E-05	1.74E-05
SB-125	C1	0.00E+00	0.00E+00	7.78E-03	9.83E-04
CO-57	C1	0.00E+00	0.00E+00	0.00E+00	7.79E-07

TOTAL FOR	:	:	:	:	:	:	:
PERIOD	:	C1	:	2.82E-01	:	5.01E-03	:
(ABOVE)	:	:	:	:	:	5.49E+01	:
	:	:	:	:	:	1.89E+02	:

TABLE 2B-1

## LIQUID EFFLUENTS - DISSOLVED AND ENTRAINED GASES - UNIT 1

RELEASE(S): ALL						
CONTINUOUS MODE				BATCH MODE		
: NUCLIDES	: UNITS	: QUARTER	: QUARTER	: QUARTER	: QUARTER	:
: RELEASED	:	: 1	: 2	: 1	: 2	:
KR-85M	C1	0.00E+00	0.00E+00	1.93E-06	0.00E+00	
XE-133M	C1	0.00E+00	0.00E+00	0.00E+00	3.90E-06	
XE-133	C1	4.06E-04	0.00E+00	6.14E-04	1.23E-03	
XE-135	C1	1.01E-03	0.00E+00	4.25E-05	6.13E-06	

TOTAL FOR	:	:	:	:	:	:
PERIOD	:	C1	: 1.42E-03	: 0.00E+00	: 6.59E-04	: 1.24E-03
(ABOVE)	:	:	:	:	:	:



## CHAPTER 12

TABLE 2B-2

LIQUID EFFLUENTS

RELEASE(S): ALL - UNIT 2

		CONTINUOUS MODE		BATCH MODE	
NUCLIDES	UNITS	QUARTER	QUARTER	QUARTER	QUARTER
RELEASED		1	2	1	2
H-3	C1	2.97E+00	2.32E+00	1.06E+02	1.89E+02
CR-51	C1	0.00E+00	0.00E+00	5.01E-05	9.82E-04
MN-54	C1	0.00E+00	0.00E+00	1.41E-05	5.79E-05
FE-55	C1	1.41E-03	3.05E-03	2.48E-03	9.26E-04
FE-59	C1	0.00E+00	0.00E+00	7.22E-06	9.67E-04
CO-58	C1	0.00E+00	0.00E+00	6.12E-04	2.98E-03
CO-60	C1	0.00E+00	0.00E+00	8.33E-04	2.10E-03
RB-88	C1	0.00E+00	0.00E+00	0.00E+00	1.46E-05
SR-92	C1	0.00E+00	0.00E+00	1.07E-05	4.88E-06
ZR-95	C1	0.00E+00	0.00E+00	6.48E-06	7.33E-05
NB-95	C1	0.00E+00	0.00E+00	2.79E-05	1.58E-04
RU-103	C1	0.00E+00	0.00E+00	0.00E+00	4.24E-06
RU-106	C1	0.00E+00	0.00E+00	0.00E+00	4.84E-05
AG-110M	C1	0.00E+00	0.00E+00	4.10E-04	9.60E-04
CS-134	C1	0.00E+00	2.50E-04	1.71E-04	4.58E-04
CS-137	C1	0.00E+00	5.12E-04	8.56E-04	1.59E-03
ND-147	C1	0.00E+00	0.00E+00	0.00E+00	1.50E-06
C. ALPHA	C1	0.00E+00	0.00E+00	3.96E-06	2.03E-06

TABLE 2B-2

## LIQUID EFFLUENTS

RELEASE(S): ALL - UNIT 2

CONTINUOUS MODE				BATCH MODE	
NUCLIDES	UNITS	QUARTER	QUARTER	QUARTER	QUARTER
RELEASED		1	2	1	2
SB-124	Ci	0.00E+00	0.00E+00	8.13E-06	0.00E+00
NB-97	Ci	0.00E+00	0.00E+00	9.32E-05	5.67E-06
SB-125	Ci	0.00E+00	0.00E+00	9.81E-03	9.19E-04
CO-57	Ci	0.00E+00	0.00E+00	0.00E+00	9.78E-07

TOTAL FOR	:	:	:	:	:	:
PERIOD	:	Ci	:	:	:	:
(ABOVE)	:	:	:	:	:	:
		2.97E+00	2.32E+00	1.06E+02	1.89E+02	

TABLE 2B-2

## LIQUID EFFLUENTS - DISSOLVED AND ENTRAINED GASES - UNIT 2

RELEASE(S): ALL						
CONTINUOUS MODE				BATCH MODE		
NUCLIDES	UNITS	QUARTER	QUARTER	QUARTER	QUARTER	
RELEASED		1	2	1	2	
XE-133	C1	0.00E+00	0.00E+00	8.99E-04	1.89E-03	
XE-135	C1	0.00E+00	0.00E+00	0.00E+00	6.81E-06	

TOTAL FOR	:		:		:		:
PERIOD	:	C1	:	0.00E+00	:	0.00E+00	:
(ABOVE)	:		:		:	3.99E-04	:
	:		:		:	1.90E-03	:



# CHAPTER 13

## TABLE 3

### SOLID WASTE AND IRRADIATED FUEL SHIPMENTS

1st Half, 1990

#### SOLID WASTE SHIPPED OFFSITE FOR BURIAL OR DISPOSAL

(not irradiated fuel)

1. Type of Waste	UNITS	PERIOD Jan. 1 - June 30
a. Spent resins, filter sludges, evaporator bottoms, etc.	3 m Ci*	3.250E+00 6.592E+00
b. Dry compressible waste, contaminated equipment, etc.	3 m Ci*	2.477E+01 6.100E-01
c. Irradiated components, control rods, etc.	3 m Ci	NONE NONE
d. Other	3 m Ci	None None

\* Measured and/or estimated by correlations in accordance with 10 CFR 61.55.

TABLE 3

## 2. Estimate of major nuclide composition

	ISOTOPES	%
a.	Fe-55	50.2
	Co-60	31.9
	Ni-63	10.7
	C-14	2.2
	Pu-241	1.0
b.	Fe-55	37.2
	Co-58	29.6
	Co-60	8.0
	Ni-63	5.7
	Cr-51	5.2
	H-3	3.7
	Mn-54	2.9
	Nb-95	2.8
	Zr-95	1.5

TABLE 3

TABLE 3 (con't)

## SOLID WASTE AND IRRADIATED FUEL SHIPMENTS

1st Half, 1990

## 3. Solid Waste Disposition

a. Number of Shipments	12
b. Mode of Transportation	Highway
c. Destination	Chem-Nuclear Systems, Inc. Barnwell, South Carolina

## 4. Type of Containers

a. ( 1a )	High Integrity Containers.
b. ( 1b )	Strong Tight Containers.
c. ( 1c )	N/A

## 5. Solidification Agents

a. ( 1a )	No solidifications during this period. All items (spent resin and charcoal) that are categorized for item 1a were shipped dewatered.
b. ( 1b )	N/A

## B. IRRADIATED FUEL SHIPMENTS (Disposition)

1. Number of Shipments	None
2. Mode of Transportation	N/A
3. Destination	N/A



# CHAPTER 14

TABLE 4

TABLE 4

## RADIOACTIVE GASEOUS WASTE SAMPLING AND ANALYSIS PROGRAM FARLEY NUCLEAR PLANT - UNITS 1 & 2

Gaseous Release Type	Sampling Frequency	Minimum Analysis Frequency	Type of Activity Analysis	a,h Minimum Detectable Concentration (MDC) (uCi/ml)
A. Waste Gas Storage Tank	Each Tank Grab     b Sample P	Each Tank  P	Principle <sup>g,j</sup> Gamma Emitters	1E-04
B. Containment Purge	Each Purge Grab     b Sample P	Each Purge Grab     b Sample P	Principle <sup>g,j</sup> Gamma Emitters  H-3	1E-04  1E-06
C. Condenser Steam Jet Air Ejector Plant Vent Stack	M-b,c,e Grab Sample	b M	Principle <sup>g,j</sup> Gamma Emitters  H-3	1E-04  1E-06

TABLE 4

TABLE 4 (Continued)

				a,h
Gaseous Release Type	Sampling Frequency	Minimum Analysis Frequency	Type of Activity Analysis	Minimum Detectable Concentration (MDC) (uCi/ml)
D. Plant Vent Stack Containment Purge	f			
	Continuous	Charcoal Sample	I-131	1E-12
	Charcoal	d		
		W	I-133	1E-10
	f			
	Continuous	Particulate Sample	Principle g	
		d	Gamma Emitters	1E-11
		W	(I-131, Others)	
f				
Continuous	M	i	Gross Alpha	1E-11
		Composite Particulate Sample		
f				
Continuous	Q	i	Sr-89, Sr-90	1E-11
		Composite Particulate Sample		
f				
Continuous		Noble Gas Monitor	Noble Gases Gross Beta and Gamma	1E-06

TABLE 4

TABLE 4 (Continued)

## TABLE NOTATION

- a. The MDC is the smallest concentration of radioactive material in a sample that will be detected with 95% probability with 5% probability of falsely concluding that a blank observation represents a "real" signal.

For a particular measurement system (which may include radiochemical separation):

$$\text{MDC} = \frac{4.66 s_b}{E \cdot V \cdot 2.22 \times 10^6 \cdot Y \cdot \exp(-\lambda \Delta t)}$$

where:

MDC is the "a priori" lower limit of detection as defined above (as microcurie per unit mass or volume),

$s_b$  is the standard deviation of the background counting rate or of the counting rate of a blank sample as appropriate (as counts per minute),

E is the counting efficiency (as counts per transformation),

V is the sample size (in units mass or volume),

$2.22 \times 10^6$  is the number of transformations per minute per microcurie,

Y is the fractional radiochemical yield (when applicable),

$\lambda$  is the radioactive decay constant for the particular radionuclide, and

$\Delta t$  is the elapsed time between midpoint of sample collection and time of counting (for plant effluents, not environmental samples).

The value of  $s_b$  used in the calculation of the MDC for a detection system shall be based on the actual observed variance of the background counting rate or of the counting rate of the blank samples (as appropriate) rather than on an unverified theoretically predicted variance. Typical values of E, V, Y, and  $\Delta t$  shall be used in the calculation.



TABLE 4

TABLE 4 (Continued)

## TABLE NOTATION

- b. Analyses shall also be performed following shutdown from  $>$  or  $=$  15% RATED THERMAL POWER, startup to  $>$  or  $=$  15% RATED THERMAL POWER or a THERMAL POWER change exceeding 15% of the RATED THERMAL POWER within a one hour period.
- c. Tritium grab samples shall be taken from the plant vent stack at least once per 24 hours when the refueling canal is flooded.
- d. Samples shall be changed at least once per 7 days and analyses shall be completed within 48 hours after changing (or after removal from sampler). Sampling shall also be performed at least once per 24 hours for at least 2 days following each shutdown from  $>$  or  $=$  15% RATED THERMAL POWER, startup to  $>$  or  $=$  15% RATED THERMAL POWER or THERMAL POWER change exceeding 15% of RATED THERMAL POWER in one hour and analyses shall be completed within 48 hours of changing. When samples collected for 24 hours are analyzed, the corresponding MDC may be increased by a factor of 10.
- e. Tritium grab samples shall be taken at least once per 7 days from the ventilation exhaust from the spent fuel pool area, whenever spent fuel is in the spent fuel pool.
- f. The ratio of the sample flow rate to the sampled stream flow rate shall be known for the time period covered by each dose or dose rate calculation made in accordance with Specifications 3.11.2.1, 3.11.2.2 and 3.11.2.3.
- g. The principle gamma emitters for which the MDC specification applies exclusively are the following radionuclides: Mn-54, Fe-59, Co-58, Co-60, Zn-65, Mo-99, Cs-134, Cs-137, Ce-141 and Ce-144 for particulate emissions. This list does not mean that only these nuclides are to be detected and reported. Other which are measurable and identifiable, together with the above nuclides, shall also be identified and reported.
- h. Deviations from MDC requirements of Table 4.11-2 shall be reported per Specification 6.9.1.8 in lieu of any other report.
- i. A composite particulate sample is one in which the quantity of air sampled is proportional to the quantity of air discharged. Either a specimen which is representative of the air discharged may be accumulated and analyzed or the individual samples may be analyzed and weighted in proportion to their respective volume discharged.

## TABLE 4

### TABLE 4 (Continued)

- j. The principle gamma emitters for which the MDC specification applies exclusively are the following radionuclides: Kr-87, Kr-88, Xe-133, Xe-133m, Xe-135, and Xe-138 for gaseous emissions. This does not mean that only these nuclides are to be detected and reported. Other peaks which are measurable and identifiable together with the above nuclides, shall also be identified and reported.

TABLE 4

TABLE 4 (Continued)

TYPICAL GAS MDC'S FOR RCLS  
COUNTING SYSTEM

Nuclide -----	MDC ( uCi/ml ) -----	Nuclide -----	MDC ( uCi/ml ) -----
Mn-54	1.46E-14	Ce-144	5.08E-14
Fe-59	4.51E-14	Kr-87	3.44E-08
Co-58	1.55E-14	Kr-88	4.71E-08
Co-60	2.81E-14	Xe-133	6.37E-08
Zn-65	3.04E-14	Xe-133M	1.54E-07
Mo-99	1.02E-13	Xe-135	1.91E-08
Cs-134	4.08E-11	Xe-138	5.04E-08
Cs-137	1.31E-14	I-131	3.20E-14
Ce-141	1.13E-14	I-133	2.87E-14



# CHAPTER 15

## TABLE 5

### TABLE 5

#### RADIOACTIVE LIQUID WASTE SAMPLING AND ANALYSIS PROGRAM FARLEY NUCLEAR PLANT - UNITS 1 & 2

Liquid Release Type	Sampling Frequency	Minimum Analysis Frequency	Type of Activity Analysis	Minimum Detectable Concentration (MDC) (uCi/ml)
A. Batch Waste Release Tanks <sup>c</sup>	P Each Batch	P Each Batch	Principle <sup>e</sup> Gamma Emitters	5E-07
			I-131	1E-06
	One Batch/M	M	Dissolved & Entrained Gases (Gamma Emitters)	1E-05
	P Each Batch	b M Composite	H-3	1E-05
			Gross Alpha	1E-07

TABLE 5

TABLE 5 (Continued)

Liquid Release Type	Sampling Frequency	Minimum Analysis Frequency	Type of Activity Analysis	Minimum Detectable Concentration (MDC) (uCi/ml)
	P Each Batch	b Q Composite	Sr-89, Sr-90 Fe-55	5E-08 1E-06
B. Continuous Releases <sup>d,f</sup>	D Grab Sample	b W Composite	Principle <sup>e</sup> Gamma Emitters I-131	5E-07 1E-06
1. Steam Generator Blowdown	M Grab Sample	M	Dissolved & Entrained Gases (Gamma Emitters)	1E-05
	D Grab Sample	b M Composite	H-3 Gross Alpha	1E-05 1E-07
	D Grab Sample	b Q Composite	Sr-89, Sr-90 Fe-55	5E-08 1E-06
2. Turbine Building Sump	P Grab Sample	b W Composite	Principle <sup>e</sup> Gamma Emitters H-3	5E-07 1E-05

TABLE 5

TABLE 5 (Continued)

## TABLE NOTATION

- a. The MDC is the smallest concentration of radioactive material in a sample that will be detected with 95% probability with 5% probability of falsely concluding that a blank observation represents a "real" signal.

For a particular measurement system (which may include radiochemical separation):

$$\text{MDC} = \frac{4.66 s_b}{E \star V \star 2.22 \times 10^6 \star Y \star \exp(-\lambda \Delta t)}$$

where:

MDC is the "a priori" lower limit of detection as defined above (as microcurie per unit mass or volume),

$s_b$  is the standard deviation of the background counting rate or of the counting rate of a blank sample as appropriate (as counts per minute),

E is the counting efficiency (as counts per transformation),

V is the sample size (in units mass or volume),

$2.22 \times 10^6$  is the number of transformations per minute per microcurie,

Y is the fractional radiochemical yield (when applicable),

$\lambda$  is the radioactive decay constant for the particular radionuclide, and

$\Delta t$  is the elapsed time between midpoint of sample collection and time of counting (for plant effluents, not environmental samples).

The value of  $s_b$  used in the calculation of the MDC for a

detection system shall be based on the actual observed variance of the background counting rate or of the counting rate of the blank samples (as appropriate) rather than on an unverified theoretically predicted variance. Typical values of E, V, Y, and  $\Delta t$  shall be used in the calculation.



## TABLE 5

### TABLE 5 (Continued)

#### TABLE NOTATION

- b. A composite sample is one in which the quantity of liquid sampled is proportional to the quantity of liquid waste discharged and in which the method of sampling employed results in a specimen which is representative of the liquids released.
- c. A batch release is the discharge of liquid wastes of a discrete volume. Prior to sampling for analyses, each batch shall be isolated, and then thoroughly mixed, by a method described in the ODCM, to assure representative sampling.
- d. A continuous release is the discharge of liquid wastes of a nondiscrete volume; e.g., from a volume of system that has an input flow during the effluent release.
- e. The principle gamma emitters for which the MDC specification applies exclusively are the following radionuclides: Mn-54, Fe-59, Co-58, Co-60, Zn-65, Mo-99, Cs-134, Cs-137, Ce-141, and Ce-144. This list does not mean that only these nuclides are to be detected and reported. Other peaks which are measurable and identifiable, together with the above nuclides, shall also be identified and reported.
- f. Sampling will be performed only if the effluent will be discharged to the environment.
- g. Deviation from the MDC requirements of Table 4.11-1 of the TS shall be reported per Specification 6.9.1.8 in lieu of any other report.

TABLE 5

TABLE 5 (Continued)

TYPICAL LIQUID MDC'S FOR RCLS  
COUNTING SYSTEM

Nuclide -----	MDC ( uCi/ml ) -----	Nuclide -----	MDC ( uCi/ml ) -----
Mn-54	2.88E-08	I-131	2.13E-08
Co-58	2.15E-08	-134	1.75E-08
Fe-59	4.43E-08	Cs-137	2.67E-08
Co-60	3.86E-08	Ce-141	3.40E-08
Zn-65	7.94E-08	Ce-144	1.65E-07
Mo-99	1.88E-07		

CHAPTER 16

TABLE 6

TABLE 6

LIQUID DISCHARGES NOT MEETING SPECIFIED DETECTION LIMITS  
Farley Units 1 & 2 - 1st half, 1990

Batch #	N/A*
Date	N/A
Count Time in Seconds	N/A
Volume Discharged in Gallons	N/A
Dilution Water in Gallons	N/A
Total Isotopic Activity ( uCi/ml )	N/A
Isotope of Interest	N/A
MDC Measured	N/A
% of Total Isotopic Activity	N/A
% of Total Dose	N/A

\* No liquid discharges made that did not meet specified detection limits.



CHAPTER 17  
PROCESS CONTROL PROGRAM

There were no changes to the Process Control Program during the first half of 1990.