



MAR 22 2002

L-2002-056
10 CFR 50.36a(a)(2)

U. S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, D.C. 20555

Re: Turkey Point Units 3 and 4
Docket Nos. 50-250 and 50-251
Annual Radioactive Effluent Release Report

Attached is the Radioactive Effluent Release Report for the period of January 1, 2001, through December 31, 2001, for Turkey Point Units 3 and 4, as required by Technical Specification 6.9.1.4 and 10 CFR 50.36a (a)(2).

Should there be any questions or comments regarding this information, please contact Walter Parker at (305) 246-6632.

Very truly yours,

John P. McElwain
Vice President
Turkey Point Plant

JPM/DRL

Attachment

cc: NRC Regulatory Issue Summary 2001-05 waived the requirements that multiple copies of documents be submitted to the NRC.

TURKEY POINT PLANT
UNITS 3 AND 4

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT

Executive Summary

Liquid effluent releases at Turkey Point did not exceed the concentrations specified in 10 CFR 20, Appendix B, Table II, Column 2. The limits for dissolved and entrained noble gases were not exceeded.

The dose or dose commitment limits per reactor to a member of the public from liquid effluents were not exceeded.

Dose rate limits due to radioactive materials in the gaseous effluents were not exceeded.

The dose limits per reactor to a member of the public due to I-131, I-133, tritium, and particulates with half-lives greater than 8 days were not exceeded.

All liquid and airborne discharges to the environment were analyzed in accordance with the Technical Specifications and Regulatory Guide 1.21.

There were no unplanned liquid releases for either unit during this period.

There was one unplanned gas release reported for Unit 3 however, no limits were exceeded.

Visitor dose limits were calculated and included in this report for both adult and children at the Satellite School.

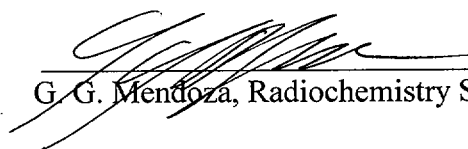
Turkey Point Plant
Units 3 and 4

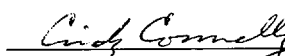
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT

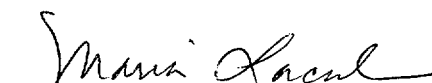
January 2001 through December 2001

Submitted by:

NUCLEAR CHEMISTRY DEPARTMENT
FLORIDA POWER AND LIGHT COMPANY


G. G. Mendoza, Radiochemistry Supervisor


Cindy Connelly, Chemistry Supervisor


M. D. Lacal, Operations Manager


T. O. Jones, Plant General Manager

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1.0 REGULATORY LIMITS

1.1 Liquid Effluent

- (a) The concentration of radioactive material released in liquid effluents to unrestricted areas shall not exceed ten times the concentration specified in 10CFR20 Appendix B, Table 2, Column 2 for radionuclides other than dissolved or entrained gases. For dissolved or entrained noble gases, the concentration shall not exceed 2.0E-04 micro-curies per milliliter total activity.
- (b) The dose or dose commitment per reactor to a member of the public from any radioactive materials in liquid effluents released to unrestricted areas shall be limited as follows:
 - During any calendar quarter, to less than or equal to 1.5 mrem to the total body and less than or equal to 5 mrem to any organ.
 - During any calendar year, to less than or equal to 3.0 mrem to the total body and less than or equal to 10 mrem to any organ.

1.2 Gaseous Effluent

- (a) The dose rate due to radioactive materials released in gaseous effluent from the site to areas at and beyond the site boundary shall be limited to the following:
 - Less than or equal to 500 mrem per year to the total body and less than or equal to 3000 mrem per year to the skin due to noble gases.
 - Less than or equal to 1500 mrem per year to any organ due to I-131, I-133, tritium, and for all radioactive materials in particulate form with half-lives greater than 8 days.
- (b) The air dose per reactor to areas at and beyond the site boundary due to noble gases released in gaseous effluents shall be limited to:
 - During any calendar quarter, to less than or equal to 5 mrad for gamma radiation and less than or equal to 10 mrad for beta radiation.
 - During any calendar year, to less than or equal to 10 mrad for gamma radiation and less than or equal to 20 mrad for beta radiation.
- (c) The dose per reactor to a member of the public, due to I-131, I-133, tritium, and all radionuclides in particulate form with half-lives greater than 8 days in gaseous effluent released to areas at and beyond the site boundary shall not exceed 7.5 mrem to any organ during any calendar quarter and shall not exceed 15 mrem to any organ during any calendar year.

2.0 EFFLUENT CONCENTRATION

Water : In accordance with 10CFR20, Appendix B, Table 2, Column 2, and for entrained or dissolved noble gases as described in 1.1.a of this report.

Air : Release concentrations are limited to dose rate limits described in 1.2.a of this report.

3.0 AVERAGE ENERGY

The average energy of fission and activation gases in effluents is not applicable.

4.0 MEASUREMENTS AND APPROXIMATIONS OF TOTAL ACTIVITY

All liquid and airborne discharges to the environment during this period were analyzed in accordance with Technical Specification requirements. The minimum frequency of analysis as required by Regulatory Guide 1.21 was met or exceeded.

When alpha, tritium and named nuclides are shown as "- -" curies on the following tables, this should be interpreted as 'no activity' was detected on the samples using the Plant Technical Specification analysis techniques to achieve the required Lower Limit of Detection ("LLD") sensitivity for radioactive effluents.

4.1 Liquid Effluents

Aliquots of representative pre-release samples, from the waste disposal system, were isotopically analyzed for gamma emitting isotopes on a multichannel analyzer.

Frequent periodic sampling and analysis were used to conservatively determine if any radioactivity was being released via the steam generator blowdown system and the storm drain system.

Monthly and quarterly composite samples for the waste disposal system were prepared to give proportional weight to each liquid release made during the designated period of accumulation. The monthly composite was analyzed for tritium and gross alpha radioactivity. Tritium was determined by use of liquid scintillation techniques, and gross alpha radioactivity was determined by use of a solid state scintillation system. The quarterly composite was analyzed for Sr-89, Sr-90, Ni-63, and Fe-55 by chemical separation.

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All radioactivity concentrations determined from sample analysis of a pre-release composite were multiplied by the total represented volume of the liquid waste released to determine the total quantity of each isotope and of gross alpha activity released during the compositing period.

Aliquots of representative samples from the waste disposal system were analyzed on a pre-release basis by gamma spectrum analysis. The resulting isotope concentrations were multiplied by the total volume released in order to estimate the total dissolved gases released.

The liquid waste treatment system is shared by both units at the site and generally all liquid releases are allocated on a 50/50 basis to each unit respectively.

There were no continuous liquid effluent releases above the lower limit of detection for either Unit 3 or Unit 4 during this reporting period and therefore these have been omitted from Table 2 of this report.

4.2 Gaseous Effluents

Airborne releases to the atmosphere occurred from the following sources:

- Gas Decay Tanks
- Containment Purges
- Releases incidental to operation of the plant.

The techniques employed in determining the radioactivity in airborne releases are:

- a) Gamma spectrum analysis for fission and activation gases,
- b) Removal of particulate material by filtration and subsequent gamma spectrum analysis, Sr-89, Sr-90 determination, and gross alpha determination,
- c) Absorption of halogen radionuclides on a charcoal filter and subsequent gamma spectral analysis, and
- d) Analysis of water vapor in a gas sample for tritium using liquid scintillation techniques.

All gaseous releases from the plant which were not accounted for by the above methods were conservatively estimated as curies of Xe-133 by use of the SPING-4 radiation monitors and the Plant Vent process monitor recorder chart using the current calibration curve for that process monitor.

Both units share portions of the gaseous waste treatment system and generally all gaseous releases from the shared system are allocated on a 50/50 basis to each unit.

Meteorological data for the period January 2001 through December 2001, in the form of Joint Frequency Distribution Tables, are maintained on site.

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4.3 Estimation of Errors

a) Sampling Error

The error associated with volume measurement devices, flow measuring devices, etc., based on calibration data and design tolerances has been conservatively estimated to be collectively less than $\pm 10\%$.

b) Analytical Error

Our quarterly Q.C. Cross-Check Program involves counting unknown samples provided by an independent external lab. The errors associated with our analysis of these unknown samples, reported to us by the independent lab, were used as the basis for deriving the following analytical error terms:

<u>NUCLIDE TYPE</u>	<u>AVERAGE ERROR</u>	<u>MAXIMUM ERROR</u>
Liquid	$\pm 5.9\%$	$\pm 11.0\%$
Gaseous	$\pm 2.7\%$	$\pm 11.0\%$

5.0 BATCH RELEASES

5.1 LIQUID

	<u>Unit 3</u>	<u>Unit 4</u>
a) Number of releases	9.00E+01	9.00E+01
b) Total time period of batch releases, minutes	8.70E+03	8.70E+03
c) Maximum time period for a batch release, minutes	1.35E+02	1.35E+02
d) Average time period for a batch release, minutes	9.67E+01	9.67E+01
e) Minimum time for a batch release, minutes	4.50E+01	4.50E+01
f) Average stream flow during period of release of effluent into a flowing stream, liters-per-minute	5.91E+06	5.91E+06

5.1 GASEOUS

	<u>Unit 3</u>	<u>Unit 4</u>
a) Number of releases	1.80E+01	1.80E+01
b) Total time period of batch releases, minutes	6.60E+02	6.60E+02
c) Maximum time period for a batch release, minutes	1.89E+01	1.89E+01
d) Average time period for a batch release, minutes	3.80E+01	3.80E+01
e) Minimum time for a batch release, minutes	1.50E+01	1.50E+01

6.0 UNPLANNED RELEASES

6.1 Liquid

There were no unplanned liquid releases this period for either Unit 3 or Unit 4.

6.2 Gaseous

There was one unplanned released during this reporting period. On 10/19/2001 The "C" Gas Decay Tank (GDT) was released through the Unit 3 Reactor Coolant Drain Tank (RCDT) into the containment building. The "C" GDT was sampled, a permit was prepared and no limits were exceeded.

7.0 REACTOR COOLANT ACTIVITY

7.1 Unit 3

Reactor coolant activity limits of 100/E-Bar and 1.0 uCi/gram Dose Equivalent I-131 were not exceeded.

7.2 Unit 4

Reactor coolant activity limits of 100/E-Bar and 1.0 uCi/gram Dose Equivalent I-131 were not exceeded.

8.0 SITE RADIATION DOSE

The assessment of radiation dose from radioactive effluents to the general public due to their activities inside the site boundary assumes a visitor was at the child development center/fitness center for ten hours a day, five days each week for fifty weeks of the year, receiving exposure from both Unit 3 and Unit 4 at Turkey Point. The child development center/fitness center is located approximately 1.75 miles WNW of the plant. Specific activities used in these calculations are the sum of the activities listed in Unit 3 Table 3 and Unit 4 Table 3. The following dose calculations were made using historical, meteorological data :

	Adult Inhalation	Child Inhalation
Bone (mrem)	1.45E-10	2.61E-10
Liver (mrem)	2.85E-06	2.00E-06
Thyroid (mrem)	2.92E-06	2.09E-06
Kidney (mrem)	2.85E-06	1.32E-06
Lung (mrem)	2.85E-06	2.00E-06
GI-LLI (mrem)	2.85E-06	2.00E-06
Total Body (mrem)	2.85E-06	2.00E-06

Gamma Air Dose (mrad)	2.58E-06
Beta Air Dose (mrad)	5.24E-06

9.0 OFFSITE DOSE CALCULATION MANUAL (ODCM) REVISIONS

The ODCM was revised once during this reporting period. The changes are included in Appendix A.

10.0 SOLID WASTE AND IRRADIATED FUEL SHIPMENTS

No irradiated fuel shipments were made from the site. Common solid waste from Turkey Point Units 3 and 4 was shipped jointly. A summation of these shipments is given in Table 6 of this report.

11.0 PROCESS CONTROL PROGRAM REVISIONS

There were no revisions to the process control program during this reporting period

12.0 INOPERABLE EFFLUENT MONITORING INSTRUMENTATION

There was no inoperable effluent monitoring instrumentation requiring reportability during this period.

TURKEY POINT UNITS 3 AND 4
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LIQUID EFFLUENTS SUMMARY

**UNIT 3
TABLE 1**

A. FISSION AND ACTIVATION PRODUCTS

	UNITS	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Est. Error (%)
1. Total Release (not including tritium,gases, alpha)	Ci	7.66E-04	2.57E-03	1.37E-02	2.63E-02	3.44
2. Average diluted concentration during the period	uCi/ml	1.10E-10	4.72E-10	5.35E-10	1.95E-09	
3. Percent of applicable limit	%	1.04E-02	3.17E-02	2.65E-02	9.08E-02	

B. TRITIUM

	UNITS	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Est. Error (%)
1. Total Release	Ci	1.18E+02	1.34E+02	2.62E+02	6.34E+01	2.50
2. Average diluted concentration during the period	uCi/ml	1.70E-05	2.45E-05	1.03E-05	4.70E-06	
3. Percent of applicable limit	%	1.70E+00	2.45E+00	1.03E+00	4.70E-01	

C. DISSOLVED AND ENTRAINED GASES

	UNITS	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Est. Error (%)
1. Total Release	Ci	1.89E-05	0.00E+00	3.63E-04	1.16E-04	3.44
2. Average diluted concentration during the period	uCi/ml	2.72E-12	0.00E+00	1.42E-11	8.58E-12	
3. Percent of applicable limit	%	1.36E-06	0.00E+00	7.10E-06	4.29E-06	

D. GROSS ALPHA RADIOACTIVITY

	UNITS	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Est. Error (%)
1. Total Release	Ci	--	--	--	--	

E. LIQUID VOLUMES

	UNITS	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Est. Error (%)
1. Batch waste released, prior to dilution	LITERS	2.94E+05	2.90E+05	1.04E+06	6.43E+05	10.00
2. Continuous waste released, prior to dilution	LITERS	--	--	--	--	
3. Dilution water used during period	LITERS	6.95E+09	5.45E+09	2.56E+10	1.35E+10	

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JANUARY 2001 THROUGH DECEMBER 2001

LIQUID EFFLUENTS SUMMARY

**UNIT 3
TABLE 2**

NUCLIDES RELEASED	UNITS	BATCH MODE			
		Qtr 1	Qtr 2	Qtr 3	Qtr 4
Fe-55	Ci	2.85E-04	1.23E-04	4.17E-04	2.13E-03
Ni-63	Ci	--	3.31E-04	5.06E-03	1.78E-02
Sr-89	Ci	--	--	--	--
Sr-90	Ci	--	--	--	--
Na-24	Ci	--	--	--	--
Cr-51	Ci	--	1.68E-05	1.26E-04	1.47E-05
Mn-54	Ci	8.75E-07	1.01E-06	1.73E-04	6.46E-04
Co-57	Ci	--	--	4.47E-06	3.66E-05
Co-58	Ci	1.43E-04	1.44E-04	3.43E-04	1.33E-03
Fe-59	Ci	--	--	--	--
Co-60	Ci	1.01E-04	2.48E-04	7.86E-04	1.84E-03
Zn-65	Ci	--	--	--	--
Nb-95	Ci	2.38E-06	1.35E-06	--	2.04E-06
Zr-95	Ci	--	--	--	--
Mo-99	Ci	--	--	--	--
Ru-106	Ci	--	--	--	--
Ag-110	Ci	2.04E-05	9.37E-05	5.59E-05	2.14E-05
Sn-113	Ci	--	--	--	--
Sn-117	Ci	--	--	--	8.43E-06
Sb-124	Ci	--	2.02E-06	8.00E-06	1.57E-06
Sb-125	Ci	1.94E-04	1.60E-03	6.59E-03	2.19E-03
I-131	Ci	--	--	--	--
I-133	Ci	--	--	--	--
I-134	Ci	--	--	7.15E-07	8.05E-07
Cs-134	Ci	--	--	1.14E-05	3.90E-06
I-135	Ci	--	--	--	--
Cs-137	Ci	1.85E-05	9.36E-06	9.52E-05	2.42E-04
La-140	Ci	--	--	--	--
Ce-141	Ci	--	--	--	--
Ce-144	Ci	--	--	--	--
W-187	Ci	--	--	--	--
Np-239	Ci	--	--	--	--
TOTAL FOR PERIOD	Ci	7.66E-04	2.57E-03	1.37E-02	2.63E-02

LIQUID EFFLUENTS - DISSOLVED GAS SUMMARY

NUCLIDES RELEASED	UNITS	BATCH MODE			
		Qtr 1	Qtr 2	Qtr 3	Qtr 4
Ar-41	Ci	--	--	--	--
Kr-85m	Ci	--	--	--	--
Kr-85	Ci	--	--	1.46E-04	--
Xe-133	Ci	1.89E-05	--	2.17E-04	1.16E-04
Xe-133m	Ci	--	--	--	--
Xe-135	Ci	--	--	--	--
Xe-138	Ci	--	--	--	--
TOTAL FOR PERIOD	Ci	1.89E-05	0.00E+00	3.63E-04	1.16E-04

LIQUID EFFLUENTS - DOSE SUMMATION

Age group : Teenager Location : Cooling Canal		
Shoreline Deposition	Dose (mrem)	% of Annual Limit
TOTAL BODY	1.84E-04	6.13E-03

TURKEY POINT UNITS 3 AND 4
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GASEOUS EFFLUENTS SUMMARY

**UNIT 3
TABLE 3**

A. FISSION AND ACTIVATION PRODUCTS

	UNITS	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Est. Error (%)
1. Total Release	Ci	1.86E-01	3.64E-02	2.10E-01	1.16E-01	2.79
2. Average release rate for the period	uCi/sec	2.40E-02	4.63E-03	2.64E-02	1.50E-02	
3. Percent of Technical Specification Limit	%	3.10E-13	2.96E-14	9.82E-12	3.81E-13	

B. IODINES

	UNITS	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Est. Error (%)
1. Total Release	Ci	--	--	--	--	3.44
2. Average release rate for the period	uCi/sec	--	--	--	--	
3. Percent of Technical Specification Limit	%	--	--	--	--	

C. PARTICULATES

	UNITS	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Est. Error (%)
1. Particulates with half-life >8 days	Ci	--	--	--	--	2.50
2. Average release rate for the period	uCi/sec	--	--	--	--	
3. Percent of Technical Specification Limit	%	--	--	--	--	
4. Gross Alpha Radioactivity	Ci	--	--	--	--	

D. TRITIUM

	UNITS	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Est. Error (%)
1. Total Release	Ci	--	--	2.61E-01	7.28E-01	2.50
2. Average release rate for the period	uCi/sec	--	--	3.28E-02	9.36E-02	
3. Percent of Technical Specification Limit	%	--	--	1.96E-06	5.47E-06	

TURKEY POINT UNITS 3 AND 4
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GASEOUS EFFLUENTS SUMMARY

**UNIT 3
TABLE 4**

A. FISSION GASES

NUCLIDES RELEASED	UNITS	BATCH MODE			
		Qtr 1	Qtr 2	Qtr 3	Qtr 4
Ar-41	Ci	--	--	7.29E-02	--
Kr-85	Ci	1.24E-01	3.20E-02	7.00E-02	3.33E-02
Kr-85m	Ci	1.44E-05	--	7.50E-05	--
Xe-131m	Ci	5.51E-04	--	7.97E-05	5.80E-04
Xe-133	Ci	6.05E-02	4.29E-03	6.49E-02	8.11E-02
Xe-133m	Ci	5.37E-04	4.25E-05	5.28E-04	1.07E-03
Xe-135	Ci	6.27E-04	1.29E-04	1.26E-03	--
TOTAL FOR PERIOD	Ci	1.86E-01	3.64E-02	2.10E-01	1.16E-01

NUCLIDES RELEASED	UNITS	CONTINUOUS MODE			
		Qtr 1	Qtr 2	Qtr 3	Qtr 4
Ar-41	Ci	--	--	--	--
Kr-85	Ci	--	--	--	--
Kr-85m	Ci	--	--	--	--
Kr-87	Ci	--	--	--	--
Kr-88	Ci	--	--	--	--
Xe-131m	Ci	--	--	--	--
Xe-133	Ci	--	--	--	--
Xe-133m	Ci	--	--	--	--
Xe-135	Ci	--	--	--	--
Xe-135m	Ci	--	--	--	--
Xe-138	Ci	--	--	--	--
TOTAL FOR PERIOD	Ci	--	--	--	--

B. IODINES

NUCLIDES RELEASED	UNITS	CONTINUOUS MODE			
		Qtr 1	Qtr 2	Qtr 3	Qtr 4
Br-82	Ci	--	--	--	--
I-131	Ci	--	--	--	2.13E-06
I-133	Ci	--	--	--	--
TOTAL FOR PERIOD	Ci	--	--	--	2.13E-06

C. PARTICULATES

NUCLIDES RELEASED	UNITS	CONTINUOUS MODE			
		Qtr 1	Qtr 2	Qtr 3	Qtr 4
Co-58	Ci	--	--	--	--
Co-60	Ci	--	--	--	--
Mn-54	Ci	--	--	--	--
Cr-51	Ci	--	--	--	--
TOTAL FOR PERIOD	Ci	--	--	--	--

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DOSES DUE TO IODINE, TRITIUM, AND PARTICULATES

**UNIT 3
TABLE 5**

PATHWAY	BONE	LIVER	THYROID	KIDNEY	LUNG	GI-LLI	SKIN	TOTAL BODY
Cow milk - Infant (mrem)	8.77E-08	7.53E-06	4.11E-05	3.29E-06	7.43E-06	7.43E-06	--	7.49E-06
Fruit & Veg Fresh (mrem)	4.20E-09	7.79E-07	2.17E-06	5.14E-07	7.74E-07	7.75E-07	--	7.78E-07
Ground Plane (mrem)	5.83E-10	5.83E-10	5.83E-10	5.83E-10	5.83E-10	5.83E-10	7.08E-10	5.83E-10
Inhalation - Adult (mrem)	1.70E-10	3.35E-06	3.43E-06	3.36E-06	3.35E-06	3.35E-06	--	3.35E-06
TOTAL (mrem)	9.27E-08	1.17E-05	4.67E-05	7.16E-06	1.16E-05	1.16E-05	7.08E-10	1.16E-05
% of Annual Limit	6.18E-07	7.78E-05	3.11E-04	4.77E-05	7.71E-05	7.71E-05	4.72E-09	7.75E-05

DOSE DUE TO NOBLE GASES

	mrad	% of Annual Limit
Gamma Air Dose	1.38E-05	1.38E-04
Beta Air Dose	1.78E-05	8.89E-05

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LIQUID EFFLUENTS SUMMARY

**UNIT 4
TABLE 1**

A. FISSION AND ACTIVATION PRODUCTS

	UNITS	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Est. Error (%)
1. Total Release (not including tritium,gases, alpha)	Ci	7.66E-04	2.57E-03	1.37E-02	2.63E-02	3.44
2. Average diluted concentration during the period	uCi/ml	1.10E-10	4.72E-10	5.35E-10	1.95E-09	
3. Percent of applicable limit	%	1.04E-02	3.17E-02	2.65E-02	9.08E-02	

B. TRITIUM

	UNITS	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Est. Error (%)
1. Total Release	Ci	1.18E+02	1.34E+02	2.62E+02	6.34E+01	2.50
2. Average diluted concentration during the period	uCi/ml	1.70E-05	2.45E-05	1.03E-05	4.70E-06	
3. Percent of applicable limit	%	1.70E+00	2.45E+00	1.03E+00	4.70E-01	

C. DISSOLVED AND ENTRAINED GASES

	UNITS	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Est. Error (%)
1. Total Release	Ci	1.89E-05	--	3.63E-04	1.16E-04	3.44
2. Average diluted concentration during the period	uCi/ml	2.72E-12	--	1.42E-11	8.58E-12	
3. Percent of applicable limit	%	1.36E-06	--	7.10E-06	4.29E-06	

D. GROSS ALPHA RADIOACTIVITY

	UNITS	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Est. Error (%)
1. Total Release	Ci	--	--	--	--	

E. LIQUID VOLUMES

		Qtr 1	Qtr 2	Qtr 3	Qtr 4	Est. Error (%)
1. Batch waste released, prior to dilution	LITERS	2.94E+05	2.90E+05	1.04E+06	6.43E+05	10.00
2. Continuous waste released, prior to dilution	LITERS	--	--	--	--	
3. Dilution water used during period	LITERS	6.95E+09	5.45E+09	2.56E+10	1.35E+10	

TURKEY POINT UNITS 3 AND 4
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT
JANUARY 2001 THROUGH DECEMBER 2001

LIQUID EFFLUENTS SUMMARY

**UNIT 4
TABLE 2**

NUCLIDES RELEASED	UNITS	BATCH MODE			
		Qtr 1	Qtr 2	Qtr 3	Qtr 4
Fe-55	Ci	2.85E-04	1.23E-04	4.17E-04	2.13E-03
Ni-63	Ci	--	3.31E-04	5.06E-03	1.78E-02
Sr-89	Ci	--	--	--	--
Sr-90	Ci	--	--	--	--
Na-24	Ci	--	--	--	--
Cr-51	Ci	--	1.68E-05	1.26E-04	1.47E-05
Mn-54	Ci	8.75E-07	1.01E-06	1.73E-04	6.46E-04
Co-57	Ci	--	--	4.47E-06	3.66E-05
Co-58	Ci	1.43E-04	1.44E-04	3.43E-04	1.33E-03
Fe-59	Ci	--	--	--	--
Co-60	Ci	1.01E-04	2.48E-04	7.86E-04	1.84E-03
Zn-65	Ci	--	--	--	--
Nb-95	Ci	2.38E-06	1.35E-06	--	2.04E-06
Zr-95	Ci	--	--	--	--
Mo-99	Ci	--	--	--	--
Ru-106	Ci	--	--	--	--
Ag-110	Ci	2.04E-05	9.37E-05	5.59E-05	2.14E-05
Sn-113	Ci	--	--	--	--
Sn-117	Ci	--	--	--	8.43E-06
Sb-124	Ci	--	2.02E-06	8.00E-06	1.57E-06
Sb-125	Ci	1.94E-04	1.60E-03	6.59E-03	2.19E-03
I-131	Ci	--	--	--	--
I-133	Ci	--	--	--	--
I-134	Ci	--	--	7.15E-07	8.05E-07
Cs-134	Ci	--	--	1.14E-05	3.90E-06
I-135	Ci	--	--	--	--
Cs-137	Ci	1.85E-05	9.36E-06	9.52E-05	2.42E-04
La-140	Ci	--	--	--	--
Ce-141	Ci	--	--	--	--
Ce-144	Ci	--	--	--	--
W-187	Ci	--	--	--	--
Np-239	Ci	--	--	--	--
TOTAL FOR PERIOD	Ci	7.66E-04	2.57E-03	1.37E-02	2.63E-02

LIQUID EFFLUENTS - DISSOLVED GAS SUMMARY

NUCLIDES RELEASED	UNITS	BATCH MODE			
		Qtr 1	Qtr 2	Qtr 3	Qtr 4
Ar-41	Ci	--	--	--	--
Kr-85m	Ci	--	--	--	--
Kr-85	Ci	--	--	1.46E-04	--
Xe-131m	Ci	--	--	--	--
Xe-133	Ci	1.89E-05	--	2.17E-04	1.16E-04
Xe-133m	Ci	--	--	--	--
Xe-135	Ci	--	--	--	--
Xe-138	Ci	--	--	--	--
TOTAL FOR PERIOD	Ci	1.89E-05	--	3.63E-04	1.16E-04

LIQUID EFFLUENTS - DOSE SUMMATION

Age group : Teenager		
Location : Cooling Canal		
Shoreline Deposition	Dose (mrem)	% of Annual Limit
TOTAL BODY	1.84E-04	6.13E-03

TURKEY POINT UNITS 3 AND 4
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT
JANUARY 2001 THROUGH DECEMBER 2001

GASEOUS EFFLUENTS SUMMARY

**UNIT 4
TABLE 3**

A. FISSION AND ACTIVATION PRODUCTS

	UNITS	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Est. Error (%)
1. Total Release	Ci	1.91E-01	3.64E-02	1.14E-01	1.16E-01	2.79
2. Average release rate for the period	uCi/sec	2.46E-02	4.63E-03	1.44E-02	1.50E-02	
3. Percent of Technical Specification Limit	%	3.31E-13	2.96E-14	2.61E-13	3.81E-13	

B. IODINES

	UNITS	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Est. Error (%)
1. Total Release	Ci	--	--	--	--	3.44
2. Average release rate for the period	uCi/sec	--	--	--	--	
3. Percent of Technical Specification Limit	%	--	--	--	--	

C. PARTICULATES

	UNITS	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Est. Error (%)
1. Particulates with half-life >8 days	Ci	--	--	--	--	2.50
2. Average release rate for the period	uCi/sec	--	--	--	--	
3. Percent of Technical Specification Limit	%	--	--	--	--	
4. Gross Alpha Radioactivity	Ci	--	--	--	--	

D. TRITIUM

	UNITS	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Est. Error (%)
1. Total Release	Ci	--	--	--	--	2.50
2. Average release rate for the period	uCi/sec	--	--	--	--	
3. Percent of Technical Specification Limit	%	--	--	--	--	

TURKEY POINT UNITS 3 AND 4
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT
JANUARY 2001 THROUGH DECEMBER 2001

GASEOUS EFFLUENTS SUMMARY

**UNIT 4
TABLE 4**

A. FISSION GASES

NUCLIDES RELEASED	UNITS	BATCH MODE			
		Qtr 1	Qtr 2	Qtr 3	Qtr 4
Ar-41	Ci	--	--	6.93E-05	--
Kr-85	Ci	1.24E-01	3.20E-02	7.00E-02	3.33E-02
Kr-85m	Ci	1.44E-05	--	7.50E-05	--
Xe-131m	Ci	5.51E-04	--	3.38E-04	5.80E-04
Xe-133	Ci	6.53E-02	4.29E-03	4.18E-02	8.11E-02
Xe-133m	Ci	5.37E-04	4.25E-05	5.28E-04	1.07E-03
Xe-135	Ci	6.27E-04	1.29E-04	1.26E-03	--
Xe-135m	Ci	--	--	--	3.96E-04
TOTAL FOR PERIOD	Ci	1.91E-01	3.64E-02	1.14E-01	1.16E-01

NUCLIDES RELEASED	UNITS	CONTINUOUS MODE			
		Qtr 1	Qtr 2	Qtr 3	Qtr 4
Ar-41	Ci	--	--	--	--
Kr-85	Ci	--	--	--	--
Kr-85m	Ci	--	--	--	--
Kr-87	Ci	--	--	--	--
Kr-88	Ci	--	--	--	--
Xe-131m	Ci	--	--	--	--
Xe-133	Ci	--	--	--	--
Xe-133m	Ci	--	--	--	--
Xe-135	Ci	--	--	--	--
Xe-135m	Ci	--	--	--	--
Xe-138	Ci	--	--	--	--
TOTAL FOR PERIOD	Ci	--	--	--	--

B. IODINES

NUCLIDES RELEASED	UNITS	CONTINUOUS MODE			
		Qtr 1	Qtr 2	Qtr 3	Qtr 4
Br-82	Ci	--	--	--	--
I-131	Ci	--	--	--	--
I-133	Ci	--	--	--	--
TOTAL FOR PERIOD	Ci	--	--	--	--

C. PARTICULATES

NUCLIDES RELEASED	UNITS	CONTINUOUS MODE			
		Qtr 1	Qtr 2	Qtr 3	Qtr 4
Co-58	Ci	--	--	--	--
Co-60	Ci	--	--	--	--
Mn-54	Ci	--	--	--	--
Cr-51	Ci	--	--	--	--
TOTAL FOR PERIOD	Ci	--	--	--	--

TURKEY POINT UNITS 3 AND 4
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT
JANUARY 2001 THROUGH DECEMBER 2001

DOSES DUE TO IODINE, TRITIUM, AND PARTICULATES

**UNIT 4
TABLE 5**

PATHWAY	BONE	LIVER	THYROID	KIDNEY	LUNG	GI-LLI	SKIN	TOTAL BODY
Cow milk - Infant (mrem)	--	--	--	--	--	--	--	--
Fruit & Veg Fresh (mrem)	--	--	--	--	--	--	--	--
Ground Plane (mrem)	--	--	--	--	--	--	--	--
Inhalation - Adult (mrem)	--	--	--	--	--	--	--	--
TOTAL (mrem)	--	--	--	--	--	--	--	--
% of Annual Limit	--	--	--	--	--	--	--	--

DOSES DUE TO NOBLE GASES

	mrad	% of Annual Limit
Gamma Air Dose	1.46E-06	1.46E-05
Beta Air Dose	1.32E-05	6.61E-05

TURKEY POINT UNITS 3 AND 4
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT
JANUARY 2001 THROUGH DECEMBER 2001

DOSES DUE TO IODINE, TRITIUM, AND PARTICULATES

Summation
Table 5

PATHWAY	BONE	LIVER	THYROID	KIDNEY	LUNG	GI-LLI	SKIN	TOTAL BODY
Cow milk - Infant	8.77E-08	7.53E-06	4.11E-05	3.29E-06	7.43E-06	7.43E-06	--	7.49E-06
Fruit & Veg Fresh	4.20E-09	7.79E-07	2.17E-06	5.14E-07	7.74E-07	7.75E-07	--	7.78E-07
Ground Plane	5.83E-10	5.83E-10	5.83E-10	5.83E-10	5.83E-10	5.83E-10	7.08E-10	5.83E-10
Inhalation - Adult	1.70E-10	3.35E-06	3.43E-06	3.36E-06	3.35E-06	3.35E-06	--	3.35E-06
TOTAL (mrem)	9.27E-08	1.17E-05	4.67E-05	7.16E-06	1.16E-05	1.16E-05	7.08E-10	1.16E-05
% of Annual Limit	6.18E-07	7.78E-05	3.11E-04	4.77E-05	7.71E-05	7.71E-05	4.72E-09	7.75E-05

DOSES DUE TO NOBLE GASES

	mrad	% of Annual Limit
Gamma Air Dose	1.53E-05	1.53E-04
Beta Air Dose	3.10E-05	1.55E-04

TURKEY POINT UNITS 3 AND 4
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT
JANUARY 2001 THROUGH DECEMBER 2001

TABLE 6

SOLID WASTE AND IRRADIATED FUEL SHIPMENTS

A. SOLID WASTE SHIPPED OFFSITE FOR BURIAL OR DISPOSAL

1.	<u>TYPE OF WASTE</u>	<u>UNITS</u>	<u>12 MONTH PERIOD</u>	<u>% ERROR</u>
a.	Spent resin, filters, sludge, evaporator bottoms, etc.	m ³ Ci	9.23E+00 5.66E+01	2.00E+00
b.	Dry compressible waste (Note 1)	m ³ Ci	2.44E+01 3.00E+00	2.00E+00
c.	Irradiated components, control rods, etc.	m ³ Ci	(None shipped)	
d.	Other: (non-compressible waste)	m ³ Ci	(None shipped)	2.00E+00

2. ESTIMATE OF MAJOR NUCLIDE COMPOSITION (by type of waste)

a.	<u>NUCLIDE</u>	<u>UNITS</u>	<u>VALUE</u>
	Cr-51	%	7.00E+00
	Mn-54	%	3.00E+00
	Fe-55	%	2.40E+01
	Co-58	%	3.00E+01
	Co-60	%	1.00E+01
	Ni-63	%	2.40E+01
	Nb-95	%	2.00E+00
b.	<u>NUCLIDE</u>	<u>UNITS</u>	<u>VALUE</u>
	C-14	%	1.00E+00
	Cr-51	%	4.00E+00
	Mn-54	%	1.00E+00
	Fe-55	%	4.50E+01
	Co-58	%	2.60E+01
	Co-60	%	7.00E+00
	Ni-63	%	8.00E+00
	Nb-95	%	4.00E+00
	Zr-95	%	2.00E+00
	Ag-110m	%	1.00E+00
	Sb-125	%	1.00E+00

TURKEY POINT UNITS 3 AND 4
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT
JANUARY 2001 THROUGH DECEMBER 2001

TABLE 6

c. (None shipped)

d. (None shipped)

3. SOLID WASTE DISPOSITION

<u>Number of Shipments</u>	<u>Mode of Transportation</u>	<u>Destination</u>
3 (Note 2)	Sole use truck	Oak Ridge, TN
3 (Note 2)	Sole use truck	Barnwell, SC

B. IRRADIATED FUEL SHIPMENTS (Disposition)

None

TURKEY POINT UNITS 3 AND 4
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT
JANUARY 2001 THROUGH DECEMBER 2001

TABLE 6

SOLID WASTE SHIPMENTS

Waste Classification	Total Volume Cubic Feet	(Note 3) Total Curies	(Note 4) Principal Radionuclides	(Note 5) Type of Waste	R.G. 1.21 Category	(Note 6) Type of Container
Class A	5.80E+03	3.00E+00	None	Compressible Waste	1.b.	Strong Tight
Class B	1.20E+02	4.02E+01	None	Dewatered Resin	1.a.	Cask
Class A	2.06E+02	1.64E+01	None	Dewatered Filters	1.a.	Cask

No solidification or absorbing agents were used or needed in the shipment of these waste types

TURKEY POINT UNITS 3 AND 4
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT
JANUARY 2001 THROUGH DECEMBER 2001

TABLE 6

- NOTE 1: Dry compressible waste volume indicates volume shipped to a burial site following reduction by a waste processing facility was 1.86E+01 Cubic Meters.
- NOTE 2: Material transported to Oak Ridge Tennessee was consigned to licensed processing facilities for volume reduction and decontamination activities. The material remaining after processing was transported by the processor to Barnwell South Carolina or Clive Utah in accordance with the appropriate burial license activity limits. The material shipped directly to Barnwell was processed by CNSI / Duratek Inc. and buried.
- NOTE 3: The total curie quantity and radionuclide composition of solid waste shipped from the Turkey Point Plant Units 3 and 4 are determined using a combination of qualitative and quantitative techniques. The Turkey Point Plant follows the guidelines in the Low Level Waste Licensing Branch Technical Position on Radioactive Waste Classification (5/11/83) for these determinations.
- The most frequently used techniques for determining the total activity in a package are the dose to curie method and inference from specific activity and mass or activity concentration and volume. Activation analysis may be applied when it is appropriate. The total activity determination by any of these methods is considered to be an estimate.
- The composition of radionuclides in the waste is determined by periodic off-site analysis for difficult to measure isotopes. Off-site analysis are used to establish scaling factors or other estimates for difficult to measure isotopes and principle Gamma emitters.
- NOTE 4: Principle radionuclide refers to those radionuclides contained in the waste in concentrations greater than 0.01 times the concentration of the nuclide listed in Table 1 or 0.01 times the smallest concentration of the nuclide listed in Table 2 of 10 CFR 61.55.
- NOTE 5: Type of waste is specified as described in NUREG 0782, Draft Environment Impact Statement on 10 CFR 61 "Licensing Requirements for Land Disposal of Radioactive Waste".
- NOTE 6: Type of container refers to the transport package.

APPENDIX A
ODCM CHANGES 2001

APPENDIX A

REVISION OF TURKEY POINT ODCM 2001

Chapter 1

1. Offsite Dose Calculation Manual front page:

Change: Revision "8" to "9" and change date will be the Plant General Manager approval date.

Bases: Control 1.1, ODCM review and approval, Section 1.1.1 Responsibility for Review; requires an annual review of the ODCM.

2. List of affective Pages:

Change: Revision dates for the entire ODCM, not only for the pages that have been revised, will change to the date the review is approved by the Plant General Manager.

Bases: The clerical responsibilities for changes to the ODCM have been transferred to Document Control. Changing the revision date to the entire document will mark this date. Previously, the Chemistry Department performed this function. From this day forward, changes to the ODCM will follow the same process as any other procedure.

APPENDIX A

REVISION OF TURKEY POINT ODCM 2001

Chapter 2

No changes

APPENDIX A

REVISION OF TURKEY POINT ODCM 2001

Chapter 3

1. Page 3-25 Dated 02/14/96, Example Calculation:

Change: Table 3.1-5 to Table 3.1-3

Bases: The table was incorrectly referenced.

2. Page 3-54 Dated 02/14/96, description of Q_{ik} :

Change: INSERT "a single analysis, K, μCi "

Bases: The definition of Q_{ik} was incomplete.

APPENDIX A

REVISION OF TURKEY POINT ODCM 2001

Chapter 4

No Changes

APPENDIX A

REVISION OF TURKEY POINT ODCM 2001

Chapter 5

1. Page 5-6 Dated 02/14/96 Table 5.1-2 (Reporting Levels), Column header for "Fish":

Change: Units of measure current pCi/kg, dry, change to "pCi/kg, wet"

Bases: Prior versions of the ODCM, NUREG-0472, and the reported results by the State Lab the units are pCi/kg, wet.

2. Page 5-7 Dated 02/14/96 Table 5.1-3, In the 'Airborne Particulate' column:

Change: DELETE the "0.01" from the "H-3" row and INSERT "0.01" in the "Gross Beta" row.

Basis: This is an administrative change. The "0.01" dose apply to Gross Beta; H-3 analysis is not required or performed on air particulate filters. The "0.01" was a typographical error during one of the revisions and was not found / corrected during proofreading.

3. Page 5-9 Dated 02/14/96 1st paragraph of METHOD 5.1:

Change: DELETE ".. and Rehabilitative Services" and INSERT "of Health (DOH)"

Basis: HRS was reorganized a few years ago. The department within the State that performs the REMP is now named Department of Health, (DOH).

4. Page 5-12 Dated 02/14/96 1st row of table:

Change: "Location" column CHANGE "SW-1" to "SSE-1". "Description" CHANGE to On site South East side of cooling canals at "Turtle Point". "Direction Sector" column, CHANGE "SW" to "SSE".

Bases: During a prior revision, location SW-1 was duplicated in the table, (page 5-11), and location SSE-1 was left out; this was missed during proofreading.

5. Page 5-13 Dated 02/14/96, location description for Airborne site T-57:

Change: DELETE "Tree nursery 316th Street" INSERT "Siren pole 27, intersection of SW 112th Ave and SW 304th St.

Bases: The sample site was relocated 5-19-99. The existing site became unusable; access became hindered by degrading path (not even a road) conditions, continued molestation, and wild dogs. The new site, about 3/4 mile away from the prior site, continues to comply with the NUREG-0472, Rev 3 guidance for location (e.g. in the direction of a major population center and most conservative X/Q considering reasonable access).

APPENDIX A

REVISION OF TURKEY POINT ODCM 2001

Chapter 5 (continued)

6. Page 5-15 Dated 02/14/96, Location for Broad leaf vegetation sample T40:

Change: INSERT "WNW" to the Direction Sector to read "W / WNW"

Bases: The State used a GPS during one of their sample collection runs and they reported the actual sector to be WNW, the ODCM states "W." Adding the adjacent sector will satisfy the correctness of the location and still allow operational flexibility. If the sample is taken one hundred feet further south, then the sample sector would be W.

7. Page 5A-1 Dated 02/14/96, Turkey Point Supplemental REMP Sampling:

Change: DELETE "Department of Health and Rehabilitative Services." INSERT "Department of Health".

Bases: HRS was reorganized a few years ago. The department within the State that performs the REMP is now named Department of Health, (DOH).

8. Page 5A-4 Dated 02/14/96, Pathway: Ingestion, milk:

Change: T99: DELETE ">" from the Distance and change description to read "183rd block of SW 262nd St." Alt: Change Distance to 10 and Description to read "134th block of SW 224th St."

Bases: This is a supplemental sampling matrix that is not required by ODCM. The locations will vary as supplies of milk change. These new locations appear to be viable for the next few years.

OFFSITE DOSE CALCULATION MANUAL
FOR
GASEOUS AND LIQUID EFFLUENTS
FROM THE
TURKEY POINT PLANT UNITS 3 AND 4

REVISION 9

CHANGE DATED 03/26/01

Florida Power and Light Company

TURKEY POINT UNIT 3 & 4 OFFSITE DOSE CALCULATION MANUAL

LIST OF EFFECTIVE PAGES

Offsite Dose Calculation Manual

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ii	3/26/01	2-14	2/14/96	3-16	2/14/96
iii	3/26/01	2-15	2/14/96	3-17	2/14/96
iv	3/26/01	2-16	2/14/96	3-18	2/14/96
v	3/26/01	2-17	2/14/96	3-19	2/14/96
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1-5	2/14/96	2-25	2/14/96	3-26	2/14/96
1-6	2/14/96	2-26	2/14/96	3-28	2/14/96
1-7	2/14/96	2-27	2/14/96	3-29	2/14/96
1-8	2/14/96	2-28	1/30/98	3-30	2/14/96
1-9	2/14/96	2-29	2/14/96	3-31	2/14/96
1-10	2/14/96	2-30	2/14/96	3-32	2/14/96
1-11	2/14/96	2-31	2/14/96	3-33	2/14/96
1-12	2/14/96	2-32	2/14/96	3-34	2/14/96
1-13	2/14/96	2-33	2/14/96	3-35	2/14/96
1-14	2/14/96	2-34	2/14/96	3-36	2/14/96
1-15	2/14/96	3-1	2/14/96	3-37	2/14/96
1-16	2/14/96	3-2	1/30/98	3-38	2/14/96
2-1	2/14/96	3-3	2/14/96	3-39	2/14/96
2-2	2/14/96	3-4	2/14/96	3-40	2/14/96
2-3	2/14/96	3-5	2/14/96	3-41	2/14/96
2-4	2/14/96	3-6	2/14/96	3-42	2/14/96
2-5	2/14/96	3-7	2/14/96	3-43	2/14/96
2-6	2/14/96	3-8	2/14/96	3-44	2/14/96
2-7	1/30/98	3-9	2/14/96	3-45	2/14/96
2-8	2/14/96	3-10	2/14/96	3-46	2/14/96
2-9	2/14/96	3-11	2/14/96	3-47	2/14/96
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TURKEY POINT UNIT 3 & 4 OFFSITE DOSE CALCULATION MANUAL

LIST OF EFFECTIVE PAGES

Offsite Dose Calculation Manual

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TURKEY POINT UNIT 3 & 4 OFFSITE DOSE CALCULATION MANUAL

INTRODUCTION

PURPOSE

This manual describes methods which are acceptable for calculating radioactivity concentrations in the environment and potential offsite doses associated with liquid and gaseous effluents from the Turkey Point Nuclear Units. These calculations are performed to satisfy Technical Specifications and to ensure that the radioactive dose or dose commitment to any member of the public is not exceeded.

The radioactivity concentration calculations and dose estimates in this manual are used to demonstrate compliance with the Technical Specifications required by 10 CFR 50.36. The methods used are acceptable for demonstrating operational compliance with 10 CFR 20.1302, 10CFR50 Appendix I, and 40CFR190. Only the doses attributable to Turkey Point Units 3 and 4 are determined in demonstrating compliance with 40CFR190 since there are no other nuclear facilities within 50 miles of the plant. Monthly calculations are performed to verify that potential offsite releases do not exceed Technical Specifications and to provide guidance for the management of radioactive effluents. The dose receptor is described such that the exposure of any member of the public is not likely to be substantially underestimated.

Quarterly and annual calculations of committed dose are also performed to verify compliance with regulatory limits of offsite dose. For these calculations, the dose receptor is chosen on the basis of applicable exposure pathways identified in a land use survey and the maximum ground level atmospheric dispersion factor (χ/Q) at a residence, or on the basis of more conservative conditions such that the dose to any resident near the plant is not likely to be underestimated.

The radioactive effluent controls set forth in this ODCM are designed to allow operational flexibility but still maintain releases and doses "as low as is reasonably achievable"; that is, within the objectives of Appendix I, 10 CFR Part 50 and comply with the limits in 10 CFR 20.1302.

The methods specified in the OFFSITE DOSE CALCULATION MANUAL (ODCM) for calculating doses due to planned or actual releases are consistent with the guidance and methods provided in:

Regulatory Guide 1.109, "Calculation of Annual Doses to Man from Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10 CFR Part 50, Appendix I," Revision 1. October 1977.

Regulatory Guide 1.111, "Methods for Estimating Atmospheric Transport and Dispersion of Gaseous Effluents in Routine Releases from Light-Water Cooled Reactors," Revision 1, July 1977.

TURKEY POINT UNIT 3 & 4 OFFSITE DOSE CALCULATION MANUAL

INTRODUCTION, (continued)

Regulatory Guide 1.113, "Estimating Aquatic Dispersion of Effluents from Accidental and Routine Reactor Releases for the Purpose of Implementing Appendix I," April 1977.

The required detection capabilities for radioactive materials in liquid and gaseous waste samples are tabulated in terms of the lower limits of detection (LDD's). Detailed discussion of the LLD and other detection limits, can be found in Currie, L. A., "Lower Limit of Detection: Definition and Elaboration of a Proposed Position for Radiological Effluent and Environmental Measurements," NUREG/CR-4077 (September 1984), in HASL Procedures Manual, HASL300 and in Hartwell, J. K., "Detection Limits for Radioanalytical Counting Techniques," Atlantic Richfield Hanford Company Report ARH-SA-215 (June 1975).

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3.0 RADIOACTIVE GASEOUS EFFLUENT

CONTROL 3.1 : Radioactive Gaseous Effluent Monitoring Instrumentation; Operability and Alarm/Trip Setpoints, (continued)

METHOD 3.1.2 : ESTABLISHING GASEOUS EFFLUENT MONITOR ALARM AND TRIP SETPOINTS, (continued)

EXAMPLE CALCULATION : Determining the Noble Gas Monitor Alarm Setpoint, (continued)

DF_i = factor for exposure to a semi-infinite cloud of noble gas $\frac{\text{mrem}}{(\text{yr} \cdot \mu\text{Ci}/\text{m}^3)}$
see Table 3.1-3.

C_i = concentration of radionuclide, i, in gaseous effluent ($\mu\text{Ci}/\text{cc}$).

B_{kg} = monitoring instrument background (cpm).

Example:

The measured concentration of noble gases to be discharged to the atmosphere are:

<u>Radionuclide</u>	<u>$C_i (\mu\text{Ci}/\text{cc})$</u>
Kr-85m	3.6×10^{-5}
Kr-85	2.8×10^{-4}
Kr-87	2.5×10^{-6}
Kr-88	1.4×10^{-5}
Xe-131m	1.0×10^{-2}
Xe-133	4.3×10^{-2}
Xe-135	6.0×10^{-4}
Ar-41	7.7×10^{-5}

Determine the alarm setpoint, S (cpm) when:

$$h = 2.5 \times 10^8 \frac{\text{cpm}}{\mu\text{Ci}/\text{cc}}$$

$$F = 8.0 \times 10^4 \frac{\text{ft}^3}{\text{min}}$$

$$\chi/Q = 5.8 \times 10^{-7} \frac{\text{sec}}{\text{m}^3}$$

$$S_f = 0.6$$

$$B_{\text{kg}} = 600 \text{ cpm}$$

3.0 RADIOACTIVE GASEOUS EFFLUENTS

CONTROL 3.4 : DOSE - IODINE-131, IODINE-133, TRITIUM, AND RADIOACTIVE MATERIAL IN PARTICULATE FORM, (continued)

METHOD 3.4.1 : DOSE DUE TO IODINE, TRITIUM, AND PARTICULATES IN GASEOUS EFFLUENTS

A. Determining the Quantity of Iodine, Tritium, and Particulates

Radionuclides, other than noble gases, in gaseous effluents that are measured by the radioactive gaseous waste sampling and analysis program, described in ODCM Table 3.2-1, are used as the release term in dose calculations. Airborne releases are discharged either via a stack above the top of the containment building or via other vents and are treated as a mixed mode release from a single location. Releases of steam from the secondary system concurrent with primary to secondary leakage will also result in the release of activity to the atmosphere. For steam generator blowdown, using a blowdown sample analysis, it is assumed that 5% of the I-131 and I-133 and 33% of the tritium in the blowdown stream become airborne with the remainder staying in the liquid phase. For other unmonitored releases, the quantity of airborne releases may be determined by performing a steam mass balance. For each of these release combinations, samples are analyzed weekly, monthly, quarterly, or for each batch releases according to Table 3.2-1

Each sample provides a measure of the concentration of specific radionuclides, C_i , in gaseous effluent discharged at flow, F , during a time increment, t . Thus, each release is quantified according to the relation

$$Q_{ik} = C_{ik} \cdot \sum_j F_j \cdot t_j \quad \text{Eqn 3.4-1}$$

where :

- Q_{ik} = the quantity of radionuclide i released in a given effluent stream based on a single analysis, k , (μCi)
- C_{ik} = concentration of radionuclide i in a gaseous effluent identified by analysis, k , ($\mu\text{Ci/cc}$)
- F_j = effluent stream discharge rate during time increment, t_j , (cc/sec)
- t_j = time increment, t , during which radionuclide i at concentration C_{ik} is being discharged, (sec).

TURKEY POINT UNIT 3 & 4 OFFSITE DOSE CALCULATION MANUAL

5.0 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

CONTROL 5.1 : CONDUCT OF SAMPLING AND ANALYSIS (continued)

TABLE 5.1-2

REPORTING LEVELS FOR RADIOACTIVITY CONCENTRATIONS IN ENVIRONMENTAL SAMPLES

ANALYSIS	WATER (pCi/l)	AIRBORNE PARTICULATE OR GASES (pCi/m ³)	FISH (pCi/kg, <u>wet</u>)	MILK (pCi/l)	FOOD PRODUCTS (pCi/kg, wet)
H-3	30,000*				
Mn-54	1,000		30,000		
Fe-59	400		10,000		
Co-58	1,000		30,000		
Co-60	300		10,000		
Zn-65	300		20,000		
Zr-Nb-95***	400				
I-131	2**	0.9		3	100
Cs-134	30	10	1,000	60	1,000
Cs-137	50	20	2,000	70	2,000
Ba-La-140***	200			300	

* Since no drinking water pathway exists, a value of 30,000 pCi/l is used. For drinking water samples a value of 20,000 pCi/l is used. This is 40 CFR Part 141 value.

** Applies to drinking water

*** An equilibrium mixture of the parent and daughter isotopes which corresponds to the reporting value of the parent isotope

TURKEY POINT UNIT 3 & 4 OFFSITE DOSE CALCULATION MANUAL

5.0 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

CONTROL 5.1 : CONDUCT OF SAMPLING AND ANALYSIS (continued)

TABLE 5.1-3

DETECTION CAPABILITIES FOR ENVIRONMENTAL SAMPLE ANALYSIS⁽¹⁾

LOWER LIMIT OF DETECTION (LLD) ⁽²⁾⁽³⁾

ANALYSIS	WATER (pCi/l)	AIRBORNE PARTICULATE OR GASES (pCi/m ³)	FISH (pCi/kg, wet)	SEDIMENT (pCi/kg, dry)	MILK (pCi/l)	FOOD PRODUCTS (pCi/kg, wet)
Gross Beta	4	0.01				
H-3	3,000*					
Mn-54	15		130			
Fe-59	30		260			
Co-58	15		130			
Co-60	15		130			
Zn-65	30		260			
Zr-Nb-95***	15 ⁽⁵⁾					
I-131	1 ⁽⁴⁾	0.07			1	60
Cs-134	15	0.05	130	150	15	60
Cs-137	18	0.06	150	180	18	80
Ba-La-140***	15 ⁽⁵⁾				15 ⁽⁵⁾	

* Since no drinking water pathway exists, a value of 3,000 pCi/l is used. For drinking water samples a value of 2,000 pCi/l is used.

TURKEY POINT UNIT 3 & 4 OFFSITE DOSE CALCULATION MANUAL

5.0 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

CONTROL 5.1 : CONDUCT OF SAMPLING AND ANALYSIS (continued)

TABLE NOTATIONS (continued) - TABLE 5.1-3 (continued)

(3) The LLD is defined (continued)

It should be recognized that the LLD is defined as an a priori (before the fact) limit representing the capability of a measurement system and not as an a posteriori (after the fact) limit for a particular measurement. Analyses shall be performed in such a manner that the stated LLDs will be achieved under routine conditions. Occasionally background fluctuations, unavoidable small sample sizes, the presence of interfering nuclides, or other uncontrollable circumstances may render these LLDs unachievable. In such cases, the contributing factors shall be identified and described in the Annual Radiological Environmental Operating Report pursuant to Control 1.4.

(4) LLD for drinking water samples. If no drinking water pathway exists, the LLD of gamma isotopic analysis may be used.

(5) An equilibrium mixture of the parent and daughter isotopes which corresponds to 15 pCi/l of the parent isotope.

METHOD 5.1: RADIOLOGICAL ENVIRONMENTAL SURVEILLANCE - TURKEY POINT PLANT

It is the policy of Florida Power and Light Company (FPL) that the Turkey Point 3 and 4, Radiological Environmental Monitoring Programs, (REMP), are conducted by the State of Florida Department of Health (DOH), pursuant to an Agreement between FPL and DOH. The policy also states that the coordination of the REMF with DOH and compliance with the REMF requirements are the responsibility of the Nuclear Division Health Physics/Chemistry Staff.

The following pages describe the actual sampling and analysis program implemented to satisfy ODCM Table 5.1-1.

TURKEY POINT UNIT 3 & 4 OFFSITE DOSE CALCULATION MANUAL

5.0 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

CONTROL 5.1 : CONDUCT OF SAMPLING AND ANALYSIS (continued)

RADIOLOGICAL ENVIRONMENTAL SURVEILLANCE Key to Sample Locations

Pathway	Location	Description	Samples Collected	Sample Collection Frequency	Approx.Distance (miles)	Direction Sector
Direct Radiation	<u>SSE-1</u>	On site <u>South East side of cooling canals at "Turtle Point"</u>	TLD	Quarterly	1	<u>SSE</u>
Direct Radiation	SW-8	Card Sound Rd. 5 mi. SSE of US 1 at entrance to Navy facility.	TLD	Quarterly	8	SW
Direct Radiation	SSW-5	On site, southwest corner of cooling canals	TLD	Quarterly	5	SSW
Direct Radiation	SSW-10	At Card Sound Bridge on siren pole.	TLD	Quarterly	10	SSW
Direct Radiation	S-5	On site, south east end of cooling canals.	TLD	Quarterly	5	S
Direct Radiation	S-10	Card Sound Road at Steamboat Creek.	TLD	Quarterly	10	S

TURKEY POINT UNIT 3 & 4 OFFSITE DOSE CALCULATION MANUAL

5.0 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

CONTROL 5.1 : CONDUCT OF SAMPLING AND ANALYSIS (continued)

RADIOLOGICAL ENVIRONMENTAL SURVEILLANCE Key to Sample Locations

Pathway	Location	Description	Samples Collected	Sample Collection Frequency	Approx. Distance (miles)	Direction Sector
Direct Radiation	SSE-10	Ocean Reef	TLD	Quarterly	10	SSE
Direct Radiation	NNE-22*	Natoma Substation	TLD	Quarterly	22	NNE
Airborne	T51	Entrance to Homestead Bayfront Park	Radioiodine and Particulate	Weekly	2	NNW
Airborne (Alternate to T51)	T71	Red Barn / Beach Area	Radioiodine and Particulate	Weekly	0.5	NNE
Airborne	T57	<u>Siren pole 27, intersection of SW 112th Ave and SW 304th St.</u>	Radioiodine and Particulate	Weekly	4	NW
Airborne (Alternate to T57)	T52	Florida City Substation	Radioiodine and Particulate	Weekly	7	W
Airborne	T58	Turkey Point Entrance Rd	Radioiodine and Particulate	Weekly	1	NW

* Denotes control sample

TURKEY POINT UNIT 3 & 4 OFFSITE DOSE CALCULATION MANUAL

5.0 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

CONTROL 5.1 : CONDUCT OF SAMPLING AND ANALYSIS (continued)

RADIOLOGICAL ENVIRONMENTAL SURVEILLANCE Key to Sample Locations

Pathway	Location	Description	Samples Collected	Sample Collection Frequency	Approx. Distance (miles)	Direction Sector
Food Products	T67*	Biscayne Bay, vicinity of Cutler Plant north to Matheson Hammock Park	Crustacea	Semi-annually	13-18	N,NNE
			Fish	Semi-annually		
Food Products	T81	Card Sound near mouth of old Discharge Canal.	Crustacea	Semi-annually	6	S
			Fish	Semi-annually		
Food Products	T40	South of Palm Dr. on SW 117th St extension	Broad leaf vegetation	Monthly	3	W / WNW
Food Products	T41	Palm Dr. West of FPL wellness center near the site boundary	Broad leaf vegetation	Monthly	2	WNW
Food Products	T67*	Near Biscayne Bay, Vicinity of Cutler Plant North to Matheson Hammock Park	Broad leaf vegetation	Monthly	13 - 18	N, NNE

* Denotes control sample.

TURKEY POINT UNIT 3 & 4 OFFSITE DOSE CALCULATION MANUAL

5.0 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

Turkey Point Supplemental REMP Sampling

The sampling and analysis program outlined in this appendix is performed in addition to the sample and analysis program required by Control 5.1. The sample sites, frequency, and analyses have been agreed upon by the State of Florida Department of Health and Florida Power and Light Co. These samples are not required to be performed, but based on this agreement, are performed to provide a broader data base for the Radiological Environmental Monitoring Program.

TURKEY POINT UNIT 3 & 4 OFFSITE DOSE CALCULATION MANUAL

5.0 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

Turkey Point Supplemental REMP Sampling

Pathway: Ingestion, Milk

Sampling and Collection Frequency: Semiannual collection and Gamma- |
Spec analysis

Name	Sector	Distance *	Description
T99	WNW	12	<u>183rd block of SW 262nd St.</u>
(alt)	W	<u>10</u>	<u>134th block of SW 224th St.</u>

Pathway: Ingestion, Fish

Sampling and Collection Frequency: semi-annual collection and Gamma-
Spec analysis

Name #	Sector	Distance *	Description
T84	---	---	Cooling Canal

Pathway: Ingestion, Food Crop

Sampling and Collection Frequency: Annual collection (@ harvest) and
Gamma-Spec analysis

Name #	Sector	Distance *	Description
T43	Various locations: N thru NW to W typically 2 to 10 miles from plant		Various locations : 'truck farm' point of sale grownig fields, miscellaneous other sources of locally grown food crops (e.g., corn, potato, sugar cane, greens, etc)
T44			
T45			

Although the Name remains the same, the locations can vary with sample availability.

* Approximate Distance from plant in miles