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L-2003-077
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, 2002, through December 31, 2002, 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,

William Jefferson, Jr.
Vice President
Turkey Point Plant

OH

Attachment

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

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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 were no unplanned gas releases for either unit during this period.

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

Table Of Contents

Turkey Point Plant
Units 3 and 4

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT

January 2002 through December 2002

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

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.

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 data 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 2002 through December 2002, in the form of Joint Frequency Distribution Tables, are maintained on site.

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 ± 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:

NUCLIDE TYPE	AVERAGE ERROR	MAXIMUM ERROR
Liquid	± 5.9%	± 11.0%
Gaseous	± 2.7%	± 11.0%

5.0 BATCH RELEASES

5.1 LIQUID	Unit 3	Unit 4
a) Number of releases	8.15E+01	8.15E+01
b) Total time period of batch releases, minutes	6.69E+03	6.69E+03
c) Maximum time period for a batch release, minutes	3.35E+02	3.35E+02
d) Average time period for a batch release, minutes	8.01E+01	8.01E+01
e) Minimum time for a batch release, minutes	2.00E+01	2.00E+01
f) Average stream flow during period of release of effluent into a flowing stream, liters-per-minute	6.08E+06	6.08E+06

5.1 GASEOUS	Unit 3	Unit 4
a) Number of releases	1.55E+01	2.15E+01
b) Total time period of batch releases, minutes	6.64E+02	2.82E+03
c) Maximum time period for a batch release, minutes	6.80E+01	3.60E+01
d) Average time period for a batch release, minutes	4.30E+01	9.40E+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 were no unplanned gas releases during this reporting period for either Unit 3 or Unit 4.

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)	3.70E-08	6.68E-08
Liver (mrem)	1.65E-07	1.47E-07
Thyroid (mrem)	1.75E-05	2.27E-05
Kidney (mrem)	2.02E-7	9.41E-08
Lung (mrem)	1.13E-07	7.92E-08
GI-LLI (mrem)	1.22E-07	8.33E-08
Total Body (mrem)	1.43E-7	1.30E-7

Gamma Air Dose (mrad)	5.13E-05
Beta Air Dose (mrad)	1.85E-04

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

During 2002, a revision was issued to the Turkey Point Nuclear Plant Process Control Program to reflect the acquisition of Chem-Nuclear by Duratek, and to incorporate a new Dewatering procedure for Duratek 14-215 or smaller liners at Turkey Point.

12.0 INOPERABLE EFFLUENT MONITORING INSTRUMENTATION

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

TURKEY POINT UNITS 3 AND 4
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT
JANUARY 2002 THROUGH DECEMBER 2002

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 tntium,gases, alpha)	Ci	3 48E-03	3 91E-03	3 27E-03	2.62E-03	3 44
2 Average diluted concentration during the period	uCi/ml	2 75E-10	3 30E-10	4 27E-10	3 08E-10	
3 Percent of applicable limit	%	1 69E-02	1 59E-02	1.86E-02	3 93E-02	

B. TRITIUM

	UNITS	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Est Error (%)
1 Total Release	Ci	1.34E+02	5 78E+01	1 08E+02	1.59E+02	2 50
2 Average diluted concentration during the period	uCi/ml	1 06E-05	4 87E-06	1.42E-05	1 87E-05	
3 Percent of applicable limit	%	1.06E+00	4 87E-01	1 42E+00	1 87E+00	

C. DISSOLVED AND ENTRAINED GASES

	UNITS	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Est Error (%)
1. Total Release	Ci	4 34E-03	1 06E-02	8 06E-06	1 03E-04	3 44
2. Average diluted concentration during the period	uCi/ml	3 44E-10	8 95E-10	1 05E-12	1 21E-11	
3 Percent of applicable limit	%	1.72E-04	4 47E-04	5 27E-07	6 05E-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	6 34E+05	5 43E+05	3 18E+05	3 39E+05	10 00
2 Continuous waste released, prior to dilution	LITERS	--	--	--	--	
3 Dilution water used during period	LITERS	1 26E+10	1.19E+10	7 65E+09	8 49E+09	

TURKEY POINT UNITS 3 AND 4
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT
JANUARY 2002 THROUGH DECEMBER 2002

LIQUID EFFLUENTS SUMMARY

UNIT 3
TABLE 2

NUCLIDES RELEASED	UNITS	BATCH MODE			
		Qtr 1	Qtr 2	Qtr 3	Qtr 4
Fe-55	Ci	--	--	5 15E-04	4 07E-04
Ni-63	Ci	6 72E-04	3 46E-04	9 41E-05	7.22E-04
Sr-89	Ci	1.27E-05	--	1 34E-05	--
Sr-90	Ci	--	--	--	--
Na-24	Ci	--	2 43E-06	--	--
Cr-51	Ci	6 81E-06	2 39E-05	4 79E-05	--
Mn-54	Ci	3 23E-06	1 95E-06	7 05E-07	1.24E-05
Co-57	Ci	6 13E-06	--	--	--
Co-58	Ci	9 97E-04	6 47E-05	1.24E-05	4 47E-05
Fe-59	Ci	--	--	--	--
Co-60	Ci	2 42E-04	7.76E-05	8 50E-05	7.85E-04
Zn-65	Ci	--	--	--	--
Nb-95	Ci	--	3 65E-06	3 90E-07	3.50E-06
Zr-95	Ci	--	--	--	--
Mo-99	Ci	7.12E-06	--	--	--
Ru-106	Ci	--	--	--	--
Ag-110	Ci	2 08E-05	2 58E-06	4 36E-06	2.05E-04
Sn-113	Ci	--	--	--	--
Sn-117	Ci	--	--	--	--
Sb-124	Ci	9 86E-06	1.60E-04	8 23E-05	--
Sb-125	Ci	1.48E-03	3.20E-03	2 40E-03	4 29E-04
I-131	Ci	1.44E-06	2.06E-06	--	--
I-133	Ci	--	6.95E-07	--	--
I-134	Ci	--	--	--	--
Cs-134	Ci	2.31E-06	2.75E-06	--	--
I-135	Ci	--	--	--	--
Cs-137	Ci	1.59E-05	2.10E-05	1.32E-05	9 07E-06
La-140	Ci	--	--	--	--
Ce-141	Ci	--	--	--	--
Ce-144	Ci	--	--	--	--
W-187	Ci	--	--	--	--
Np-239	Ci	--	--	--	--
TOTAL FOR PERIOD	Ci	3.48E-03	3.91E-03	3 27E-03	2 62E-03

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	4.60E-04	1.91E-03	--	4 19E-05
Xe-131	Ci	--	3.01E-04	--	--
Xe-133	Ci	3.86E-03	8.40E-03	8 06E-06	5 92E-05
Xe-133m	Ci	1.47E-05	--	--	--
Xe-135	Ci	8 42E-06	3 54E-06	--	1.58E-06
Xe-138	Ci	--	--	--	--
TOTAL FOR PERIOD	Ci	4 34E-03	1.06E-02	8 06E-06	1.03E-04

LIQUID EFFLUENTS - DOSE SUMMATION

Age group : Teenager
Location : Cooling Canal

Shoreline Deposition	Dose (mrem)	% of Annual Limit
TOTAL BODY	8 71E-05	2 90E-03

TURKEY POINT UNITS 3 AND 4
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT
JANUARY 2002 THROUGH DECEMBER 2002

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	2.11E+00	4 75E-01	4.12E-01	6 98E-01	2 79
2. Average release rate for the period	uCi/sec	2.72E-01	6 04E-02	5 18E-02	8 97E-02	
3. Percent of Technical Specification LImit	%	8.35E-12	1.31E-12	1 01E-13	9 86E-13	

B. IODINES

	UNITS	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Est Error (%)
1. Total Release	Ci	--	2.43E-04	--	--	3 44
2. Average release rate for the period	uCi/sec	--	3 09E-05	--	--	
3. Percent of Technical Specification LImit	%	--	4.17E-02	--	--	

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
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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	1.48E-06	4 19E-06	--	2 20E-05
Kr-85	Ci	1 81E-01	1 77E-01	4 11E-01	5 67E-01
Kr-85m	Ci	1.10E-05	--	--	1 09E-04
Xe-131m	Ci	3 58E-02	5 82E-03	--	3.18E-04
Xe-133	Ci	1.88E+00	2 92E-01	8 29E-04	1.14E-01
Xe-133m	Ci	1.72E-02	3 48E-04	--	2 87E-03
Xe-135	Ci	3.77E-03	1.04E-05	--	1.25E-02
Xe-135m	Ci	--	--	--	--
TOTAL FOR PERIOD	Ci	2 11E+00	4 75E-01	4 12E-01	6 98E-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 36E-04	--	--
I-133	Ci	--	6 35E-06	--	--
TOTAL FOR PERIOD	Ci	--	2 43E-04	--	--

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
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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)	9 73E-06	1.16E-05	3 74E-03	2 91E-06	0 00E+00	4 37E-07	--	6 80E-06
Fruit & Veg Fresh (mrem)	4 66E-07	4 78E-07	1 55E-04	2 91E-07	0 00E+00	4.11E-08	--	3 60E-07
Ground Plane (mrem)	6 49E-08	6 49E-08	6 49E-08	6 49E-08	6 49E-08	6 49E-08	7.88E-08	6 49E-08
Inhalation - Adult (mrem)	1 90E-08	2 71E-08	8 97E-06	4 60E-08	0 00E+00	4 88E-09	--	1 54E-08
TOTAL (mrem)	1 03E-05	1 22E-05	3 90E-03	3 31E-06	6 49E-08	5 48E-07	7.88E-08	7.24E-06
% of Annual Limit	6 86E-05	8 12E-05	2 60E-02	2 21E-05	4 32E-07	3 65E-06	5.25E-07	4 83E-05

DOSE DUE TO NOBLE GASES

	mrad	% of Annual Limit
Gamma Air Dose	1 58E-05	1 58E-04
Beta Air Dose	9 39E-05	4 70E-04

TURKEY POINT UNITS 3 AND 4
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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	3 48E-03	3 91E-03	3 27E-03	2.62E-03	3 44
2 Average diluted concentration during the penod	uCi/ml	2 75E-10	3 30E-10	4 27E-10	3 08E-10	
3 Percent of applicable limit	%	1 69E-02	1 59E-02	1 86E-02	3 93E-02	

B. TRITIUM

	UNITS	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Est Error (%)
1. Total Release	Ci	1.34E+02	5 78E+01	1.08E+02	1.59E+02	2.50
2. Average diluted concentration during the penod	uCi/ml	1.06E-05	4 87E-06	1.42E-05	1.87E-05	
3 Percent of applicable limit	%	1.06E+00	4 87E-01	1 42E+00	1.87E+00	

C. DISSOLVED AND ENTRAINED GASES

	UNITS	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Est Error (%)
1. Total Release	Ci	4 34E-03	1.06E-02	8 06E-06	1.03E-04	3 44
2. Average diluted concentration during the penod	uCi/ml	3 44E-10	8 95E-10	1.05E-12	1.21E-11	
3. Percent of applicable limit	%	1.72E-04	4 47E-04	5 27E-07	6.05E-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	6 34E+05	5 43E+05	3 18E+05	3 39E+05	10 00
2 Continuous waste released, prior to dilution	LITERS	--	--	--	--	
3 Dilution water used during period	LITERS	1 26E+10	1.19E+10	7.65E+09	8 49E+09	

TURKEY POINT UNITS 3 AND 4
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT
JANUARY 2002 THROUGH DECEMBER 2002

LIQUID EFFLUENTS SUMMARY

UNIT 4
TABLE 2

NUCLIDES RELEASED	UNITS	BATCH MODE			
		Qtr 1	Qtr 2	Qtr 3	Qtr 4
Fe-55	Ci	--	--	5 15E-04	4 07E-04
Ni-63	Ci	6.72E-04	3.46E-04	9 41E-05	7.22E-04
Sr-89	Ci	1.27E-05	--	1.34E-05	--
Sr-90	Ci	--	--	--	--
Na-24	Ci	--	2.43E-06	--	--
Cr-51	Ci	6 81E-06	2.39E-05	4 79E-05	--
Mn-54	Ci	3 23E-06	1.95E-06	7.05E-07	1.24E-05
Co-57	Ci	6 13E-06	--	--	--
Co-58	Ci	9 97E-04	6.47E-05	1 24E-05	4 47E-05
Fe-59	Ci	--	--	--	--
Co-60	Ci	2 42E-04	7.76E-05	8 50E-05	7.85E-04
Zn-65	Ci	--	--	--	--
Nb-95	Ci	--	3.65E-06	3 90E-07	3 50E-06
Zr-95	Ci	--	--	--	--
Mo-99	Ci	7.12E-06	--	--	--
Ru-106	Ci	--	--	--	--
Ag-110	Ci	2 08E-05	2.58E-06	4 36E-06	2 05E-04
Sn-113	Ci	--	--	--	--
Sn-117	Ci	--	--	--	--
Sb-124	Ci	9 86E-06	1.60E-04	8 23E-05	--
Sb-125	Ci	1.48E-03	3 20E-03	2 40E-03	4.29E-04
I-131	Ci	1 44E-06	2 06E-06	--	--
I-133	Ci	--	6 95E-07	--	--
I-134	Ci	--	--	--	--
Cs-134	Ci	2 31E-06	2 75E-06	--	--
I-135	Ci	--	--	--	--
Cs-137	Ci	1.59E-05	2 10E-05	1.32E-05	9 07E-06
La-140	Ci	--	--	--	--
Ce-141	Ci	--	--	--	--
Ce-144	Ci	--	--	--	--
W-187	Ci	--	--	--	--
Np-239	Ci	--	--	--	--
TOTAL FOR PERIOD	Ci	3.48E-03	3 91E-03	3.27E-03	2.62E-03

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	4 60E-04	1.91E-03	--	4 19E-05
Xe-131	Ci	--	3.01E-04	--	--
Xe-133	Ci	3 86E-03	8 40E-03	8 06E-06	5.92E-05
Xe-133m	Ci	1.47E-05	--	--	--
Xe-135	Ci	8 42E-06	3 54E-06	--	1.58E-06
Xe-138	Ci	--	--	--	--
TOTAL FOR PERIOD	Ci	4 34E-03	1 06E-02	8 06E-06	1.03E-04

LIQUID EFFLUENTS - DOSE SUMMATION

Age group : Teenager
Location : Cooling Canal

Shoreline Deposition	Dose (mrem)	% of Annual Limit
TOTAL BODY	8 71E-05	2 90E-03

TURKEY POINT UNITS 3 AND 4
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT
JANUARY 2002 THROUGH DECEMBER 2002

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	4 46E+01	1.04E+00	4.12E-01	6 98E-01	2 79
2 Average release rate for the period	uCi/sec	5 74E+00	1.32E-01	5 18E-02	8 97E-02	
3 Percent of Technical Specification LImit	%	1 76E-10	1.96E-11	1.01E-13	9 86E-13	

B. IODINES

	UNITS	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Est Error (%)
1. Total Release	Ci	6 80E-05	2.43E-04	--	--	3 44
2. Average release rate for the period	uCi/sec	8.74E-06	3 09E-05	--	--	
3. Percent of Technical Specification LImit	%	1.17E-02	4.17E-02	--	--	

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	3 88E-03	3 53E-02	--	--	2 50
2. Average release rate for the period	uCi/sec	4 99E-04	4 48E-03	--	--	
3 Percent of Technical Specification LImit	%	2 92E-08	2 65E-07	--	--	

TURKEY POINT UNITS 3 AND 4
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT
JANUARY 2002 THROUGH DECEMBER 2002

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	3 91E-02	1 28E-01	--	2 20E-05
Kr-85	Ci	4 22E+00	1.77E-01	4.11E-01	5 67E-01
Kr-85m	Ci	1.10E-05	--	--	1.09E-04
Xe-131m	Ci	1 74E+00	5 82E-03	--	3 18E-04
Xe-133	Ci	3 82E+01	2 92E-01	8 29E-04	1.14E-01
Xe-133m	Ci	4 47E-01	4 36E-01	--	2.87E-03
Xe-135	Ci	3.68E-02	1 04E-05	--	1 25E-02
Xe-135m	Ci	--	--	--	--
TOTAL FOR PERIOD	Ci	4 46E+01	1.04E+00	4 12E-01	6 98E-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	6 80E-05	2 36E-04	--	--
I-133	Ci	--	6 35E-06	--	--
TOTAL FOR PERIOD	Ci	6 80E-05	2 43E-04	--	--

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 2002 THROUGH DECEMBER 2002

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)	1.25E-05	1.52E-05	4 81E-03	3 87E-06	2.94E-07	8.56E-07	--	9.05E-06
Fruit & Veg Fresh (mrem)	6 00E-07	6 45E-07	2 00E-04	3 95E-07	3.06E-08	8 36E-08	--	4 94E-07
Ground Plane (mrem)	8 35E-08	8.35E-08	8 35E-08	8 35E-08	8.35E-08	8 35E-08	1.01E-07	8 35E-08
Inhalation - Adult (mrem)	2 45E-08	1.68E-07	1.17E-05	1.92E-07	1.33E-07	1.39E-07	--	1.53E-07
TOTAL (mrem)	1.32E-05	1.61E-05	5 02E-03	4 55E-06	5.41E-07	1 16E-06	1.01E-07	9 78E-06
% of Annual Limit	8.83E-05	1 08E-04	3 35E-02	3 03E-05	3.61E-06	7.75E-06	6.76E-07	6 52E-05

DOSES DUE TO NOBLE GASES

	mrad	% of Annual Limit
Gamma Air Dose	2 88E-04	2 88E-03
Beta Air Dose	1 00E-03	5 02E-03

TURKEY POINT UNITS 3 AND 4
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT
JANUARY 2002 THROUGH DECEMBER 2002

DOSES DUE TO IODINE,TRITIUM, AND PARTICULATES

Summation Table 5

PATHWAY	BONE	LIVER	THYROID	KIDNEY	LUNG	GI-LLI	SKIN	TOTAL BODY
Cow milk - Infant	2 23E-05	2 69E-05	8.55E-03	6 78E-06	2 94E-07	1 29E-06	--	1 59E-05
Fruit & Veg Fresh	1 07E-06	1.12E-06	3.55E-04	6 87E-07	3 06E-08	1 25E-07	--	8 54E-07
Ground Plane	1 48E-07	1.48E-07	1.48E-07	1.48E-07	1 48E-07	1 48E-07	1 80E-07	1 48E-07
Inhalation - Adult	4 35E-08	1.95E-07	2.06E-05	2.38E-07	1 33E-07	1 44E-07	--	1 68E-07
TOTAL (mrem)	2 35E-05	2 83E-05	8 92E-03	7.86E-06	6 06E-07	1 71E-06	1 80E-07	1 70E-05
% of Annual Limit	1 57E-04	1 89E-04	5 95E-02	5 24E-05	4 04E-06	1.14E-05	1 20E-06	1.13E-04

DOSES DUE TO NOBLE GASES

	mrad	% of Annual Limit
Gamma Air Dose	3 04E-04	3.04E-03
Beta Air Dose	1.10E-03	5 49E-03

TABLE 6

SOLID WASTE AND IRRADIATED FUEL SHIPMENTS

A. SOLID WASTE SHIPPED OFFSITE FOR BURIAL OR DISPOSAL

1.	TYPE OF WASTE	UNITS	12 MONTH PERIOD	% ERROR
a.	Spent resin, filters, sludge, evaporator bottoms, etc.	m^3 Ci	1.85E+01 5.00E+02	2.00E+00
b.	Dry compressible waste (Note 1)	m^3 Ci	2.10E+01 1.43E+00	2.00E+00
c.	Irradiated components, control rods, etc.	m^3 Ci	(None shipped)	
d.	Other: non-compressed DAW	m^3 Ci	3.41E+00 1.30E+00	2.00E+00

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

a.	NUCLIDE	UNITS	VALUE
	Fe-55	%	4.82E+00
	Co-58	%	1.60E+00
	Co-60	%	2.58E+01
	Ni-63	%	6.35E+01
	Cs-137	%	2.52E+00

b.	NUCLIDE	UNITS	VALUE
	Cr-51	%	2.97E+00
	Fe-55	%	5.69E+01
	Co-58	%	1.21E+01
	Co-60	%	4.77E+00
	Ni-63	%	7.65E+00
	Nb-95	%	7.78E+00
	Zr-95	%	4.17E+00
	Sb-125	%	1.26E+00

TABLE 6

c. (None shipped)

d.

NUCLIDE	UNITS	VALUE
Cr-51	%	2.78E+00
Fe-55	%	5.67E+01
Co-58	%	1.20E+01
Co-60	%	4.69E+00
Ni-63	%	8.08E+00
Nb-95	%	7.68E+00
Zr-95	%	4.26E+00
Sb-125	%	1.29E+00

3. SOLID WASTE DISPOSITION

Number of Shipments	Mode of Transportation	Destination
10 (Note 2)	Sole use truck	Oak Ridge, TN
5 (Note 2)	Sole use truck	Barnwell, SC

B. IRRADIATED FUEL SHIPMENTS (Disposition)

None

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	1.43E+04	1.09E+00	None	Compressible Waste	1.b.	Strong Tight
Class A	1.20E+02	1.30E+00	None	Non-Compressed Waste	1.d.	Cask
Class A	4.12E+02	1.39E+01	Ni-63 Cs-137	Dewatered Resin	1.a.	Cask
Class B	1.20E+02	6.78E+01	Ni-63 Sr-90 Cs-137	Dewatered Resin	1.a.	Cask
Class C	1.20E+02	4.18E+02	Co-60 Ni-63 Sr-90 Cs-137 <5 Yr half-life	Dewatered Resin.	1.a.	Cask

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

TABLE 6

NOTE 1: Dry compressible waste volume indicates volume shipped to a burial site following reduction by a waste processing facility. During calendar year 2002, a total of 4.09E+02 cubic meters was shipped to processors.

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 2002

APPENDIX A

REVISION OF TURKEY POINT ODCM 2002

Chapter 1

1. Offsite Dose Calculation Manual front page:

Change: Revision "10" to "11" 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 Effective Pages:

Change: Revision dates for the pages that have been revised changed to the date the review is approved by the Plant General Manager.

Bases: Revision dates for any revised section page is changed to indicate last revision date.

3. Page 1-8 dated 2/14/96 Rated Thermal Power

Change: The rated thermal power was changed to reflect the UFSAR stated rated thermal power for the units.

4. Page 1-13 dated 2/14/96 Figure 1.5 - 2 Plant Area Map

Change: The location of a new storm drain was added to the map.

4. Some formatting and clarification changes.

APPENDIX A

REVISION OF TURKEY POINT ODCM 2002

Chapter 2

1. Page 2-1 dated 2/14/96 B. 1 Liquid Radwaste System

Change: Included processing to Monitor Tanks from the waste demineralizer system.

Bases: As described in UFSAR Chapter 11.1.2 Waste Disposal demineralizer.

2. Page 2-4 dated 2/14/96 Figure 2-1 Radioactive Liquid Waste

Change: a) East Storm Drain to canal

Bases: East storm drain source is partly located in the RCA and the outflow is sampled monthly.

Change: b) Unit 3 containment tendon gallery sump to Waste Holdup Tank #1

Bases: Included to represent current plant configuration.

Change: c) Molybdate Holdup Tank transfer to Waste Monitor Tanks

Bases: Included to represent current plant configuration.

Change: d) Waste processing to Monitor Tanks.

Bases: As described in UFSAR Chapter 11.1.2 Waste Disposal demineralizer.

3. Some formatting and clarification changes.

APPENDIX A

REVISION OF TURKEY POINT ODCM 2002

Chapter 3

1. Page 3-21 dated 1/30/98, 3/4 R-15 Setpoint Determination

Change: "Between 2 and 5 times background" was changed to "less than 5 times background"

Bases: Allows for a more conservative alarm set point.

4. Some formatting and clarification changes.

APPENDIX A

REVISION OF TURKEY POINT ODCM 2002

Chapter 4

Some formatting and clarification changes.

APPENDIX A

REVISION OF TURKEY POINT ODCM 2002

Chapter 5

Some formatting and clarification changes.

OFFSITE DOSE CALCULATION MANUAL

FOR

GASEOUS AND LIQUID EFFLUENTS

FROM THE

TURKEY POINT PLANT UNITS 3 AND 4

REVISION 11

CHANGE DATED 11/22/02

Florida Power and Light Company

TURKEY POINT UNIT 3 & 4 OFFSITE DOSE CALCULATION MANUAL

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TURKEY POINT UNIT 3 & 4 OFFSITE DOSE CALCULATION MANUAL

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5.0 Radiological Environmental Monitoring Program

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.

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).

SECTION 1

ADMINISTRATIVE CONTROLS

1.0 ADMINISTRATIVE CONTROLS

CONTROL 1.1 : ODCM REVIEW AND APPROVAL

1.1.1 **Responsibility for Review** The Chemistry Department Supervisor or designee shall perform a review of the ODCM annually.

1.1.2 **Documentation of Reviews** Following the performance of the annual review required by Section 1.1.1, the individual performing the review shall submit a report for PNSC approval. This report should contain the following information:

1. A copy of any requested changes to the ODCM.
2. Information necessary to support the rationale for the requested changes.
3. A determination that the requested changes will not reduce the accuracy or reliability of dose calculations or setpoint determinations.
4. If no changes are being requested, no actions are required.

1.1.3 **Institution of Changes** Changes to the ODCM shall become effective upon review and approval by the Plant General Manager, (PGM).

1.1.4 **Submittal of Changes** Changes to the ODCM and any supporting documentation shall be submitted to the NRC in the Annual Radioactive Effluent Release Report for the period in which the changes were made effective. This submittal, per Control 1.3, shall contain the following information:

1. Sufficiently detailed information to totally support the rationale for the changes(s) without benefit of additional or supplemental information.
2. Information submitted should consist of a package of those pages of the ODCM to be changed with each page numbered, dated and containing the revision number, together with appropriate analyses or evaluations justifying the change(s)
3. A determination that the change(s) will not reduce the accuracy or reliability of dose calculations or setpoint determinations; and
4. Documentation of the fact that the change(s) has been reviewed and found acceptable by the PGM.

1.0 ADMINISTRATIVE CONTROLS

CONTROL 1.2 : MAJOR CHANGES TO LIQUID, GASEOUS AND SOLID RADWASTE TREATMENT SYSTEMS*

Licensee-initiated major changes to the Liquid, Gaseous, and Solid Radwaste Treatment Systems :

a. Shall be reported to the Commission in the Annual Radioactive Effluent Release Report for the period in which the evaluation was reviewed by the Plant General Manager. The discussion of each change shall contain:

(1) A summary of the evaluation that led to the determination that the change could be made in accordance with 10 CFR 50.59;

(2) Sufficient detailed information to totally support the reason for the change without benefit of additional or supplemental information;

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

(4) An evaluation of the change, which shows the predicted releases of radioactive materials in liquid and gaseous effluents and/or quantity of solid waste that differ from those previously predicted in the License application and amendments thereto;

(5) An evaluation of the change, which shows the expected maximum exposures to a MEMBER OF THE PUBLIC in the UNRESTRICTED AREA and to the general population that differ from those previously estimated in the License application and amendments thereto;

(6) A comparison of the predicted releases of radioactive materials, in liquid and gaseous effluents and in solid waste, to the actual releases for the period prior to when the change is to be made;

(7) An estimate of the exposure to plant operating personnel as a result of the change; and

(8) Documentation of the fact that the change was reviewed and found acceptable by the PGM.

b. Shall become effective upon review and acceptance by the PGM.

* Licensees may choose to submit the information called for in this Control as part of the annual FSAR update.

1.5 DEFINITIONS (continued)

DOSE EQUIVALENT I-131

1.5.5 DOSE EQUIVALENT I-131 shall be that concentration of I-131 (microCurie/gram) which alone would produce the same thyroid dose as the quantity and isotopic mixture of I-131, I-132, I-133, I-134, and I-135 actually present. The thyroid dose conversion factors used for this calculation shall be those listed in Table III of TID-14844, "Calculation of Distance Factors for Power and Test Reactor Sites" or Table E-7 of NRC Regulatory Guide 1.109, Revision 1, October 1977.

FREQUENCY NOTATION

1.5.6 The FREQUENCY NOTATION specified for the performance of Surveillance Requirements shall correspond to the intervals defined in Table 1.5-1

GAS DECAY TANK SYSTEM

1.5.7 A GAS DECAY TANK SYSTEM shall be any system designed and installed to reduce radioactive gaseous effluents by collecting Reactor Coolant System off gases from the Reactor Coolant System and providing for delay or holdup for the purpose of reducing the total radioactivity prior to release to the environment.

MEMBER(S) OF THE PUBLIC

1.5.8 MEMBER(S) OF THE PUBLIC shall mean any individual except when that individual is receiving an occupational dose.

OFFSITE DOSE CALCULATION MANUAL

1.5.9 The OFFSITE DOSE CALCULATION MANUAL (ODCM) shall contain the methodology and parameters used in the calculation of offsite doses resulting from radioactive gaseous and liquid effluents, in the calculation of gaseous and liquid effluent monitoring Alarm/Trip setpoints, and in the conduct of the Environmental Radiological Monitoring Program. The ODCM shall also contain (1) the Radioactive Effluent Controls and Radiological Environmental Monitoring Programs required by Tech Spec Section 6.8.4 and (2) descriptions of the information that should be included in the Annual Radioactive Effluent Release Report and the Annual Radiological Environmental Operating Report required by Controls 1.3 and 1.4.

1.5 DEFINITIONS (continued)

OPERABLE - OPERABILITY

1.5.10 A system, subsystem, train, component or device shall be OPERABLE or have OPERABILITY when it is capable of performing its specified function(s), and when all necessary attendant instrumentation, controls, electrical power, cooling or seal water, lubrication or other auxiliary equipment that are required for the system, subsystem, train, component, or device to perform its function(s) are also capable of performing their related support function(s).

OPERATIONAL MODE - MODE

1.5.11 An OPERATIONAL MODE (i.e., MODE) shall correspond to any one inclusive combination of core reactivity condition, power level, and average reactor coolant temperature specified in Table 1.5-2

PROCESS CONTROL PROGRAM

1.5.12 The PROCESS CONTROL PROGRAM (PCP) shall contain the current formulas, sampling, analysis, tests, and determinations to be made to ensure that processing and packaging of solid radioactive wastes based on demonstrated processing of actual or simulated wet solid wastes will be accomplished in such a way as to assure compliance with 10 CFR Parts 20, 61, and 71 and Federal and State regulations, burial ground requirements, and other requirements governing the disposal of radioactive waste.

PURGE - PURGING

1.5.13 PURGE or PURGING shall be any controlled process of discharging air or gas from a confinement to maintain temperature, pressure, humidity, concentration or other operating condition, in such a manner that replacement air or gas is required to purify the confinement.

RATED THERMAL POWER

1.5.14 RATED THERMAL POWER shall be a total reactor core heat transfer rate to the reactor coolant of 2300 MWt |

1.5 DEFINITIONS (continued)

TABLE 1.5-2

OPERATIONAL MODES

MODE	REACTIVITY CONDITION, K_{eff}	% RATED THERMAL POWER *	AVERAGE COOLANT TEMPERATURE
1. POWER OPERATION	≥ 0.99	> 5%	≥ 350 °F
2. STARTUP	> 0.99	≤ 5%	≥ 350 °F
3. HOT STANDBY	< 0.99	0	≥ 350 °F
4. HOT SHUTDOWN	< 0.99	0	350 °F > Tavg > 200 °F
5. COLD SHUTDOWN	< 0.99	0	≤ 200 °F
6. REFUELING**	≤ 0.95	0	≤ 140 °F

* Excluding decay heat.

** Fuel in the reactor vessel with the vessel head closure bolts less than fully tensioned or with the head removed.

1.5 DEFINITIONS (continued)

FIGURE 1.5 - 1

SITE AREA MAP

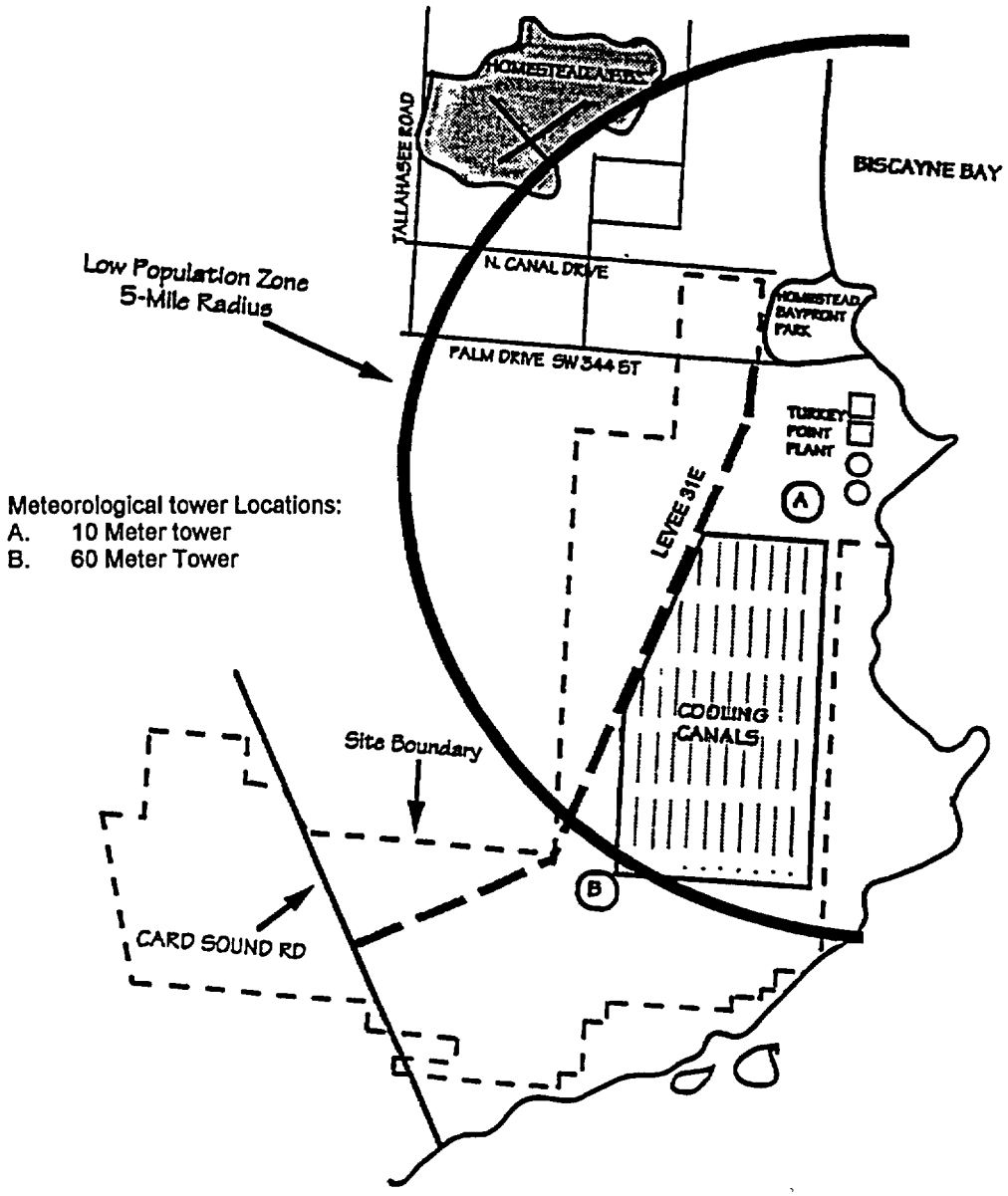
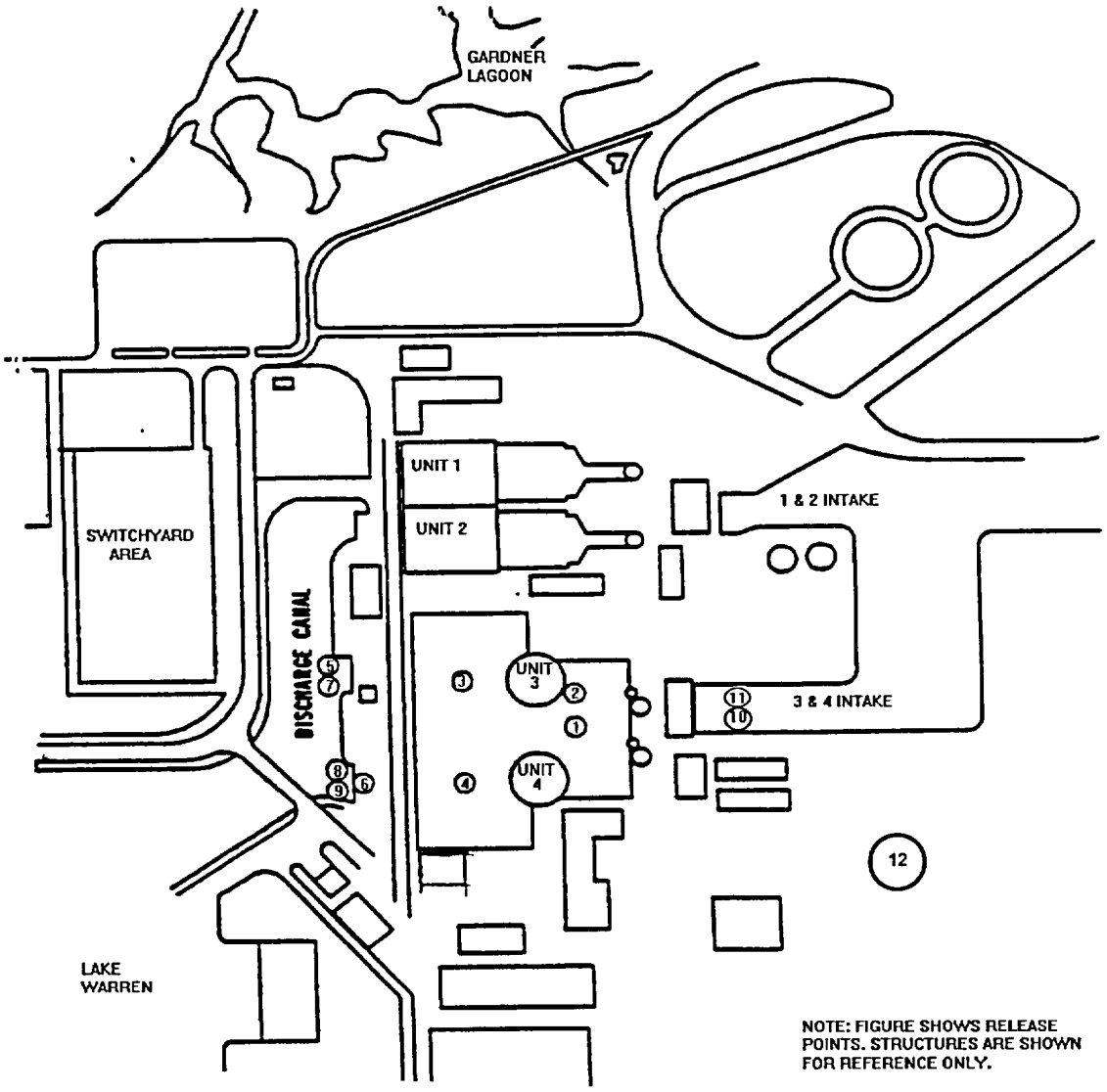


FIGURE 1.5 - 2

PLANT AREA MAP

Gaseous Effluent Release Points
1. Plant Vent (Unit 4 Spent Fuel Pool Vent)
2. Unit 3 Spent Fuel Pool Vent
3. Unit 3 Air Ejector Vent
4. Unit 4 Air Ejector Vent

Liquid Effluent Release Points
5. Effluent from Liquid Radwaste System
6. Effluent from Liquid Radwaste System
7. Unit 3 Steam Generator Blowdown
8. Unit 4 Steam Generator Blowdown
9. Storm Drain
10. Storm Drain
11. Storm Drain
12. Storm Drain



1.0 ADMINISTRATIVE CONTROLS

1.6 APPLICABILITY OF CONTROLS

1.6.1 Compliance with the Controls, contained in this ODCM, is required during the OPERATIONAL MODES or other conditions specified therein; except that upon failure to meet the Control, the associated ACTION requirements shall be met.

1.6.2 Noncompliance with a specification shall exist when the requirements of the Control and associated ACTION requirements are not met within the specified time intervals. If the Control is restored prior to expiration of the specified time intervals, completion of the ACTION requirements is not required.

1.6.3 When a Control is not met, except as provided in the associated ACTION requirements, within 1 hour action shall be initiated to place the unit, as applicable, in :

a. At least HOT STANDBY within the next 6 hours,
b. At least HOT SHUTDOWN within the following 6 hours, and
c. At least COLD SHUTDOWN within the subsequent 24 hours.

Where corrective measures are completed that permit operation under the ACTION requirements, the action may be taken in accordance with the specified time limits as measured from the time of failure to meet the Control. Exceptions to these requirements are stated in the individual control.

This control is not applicable in MODES 5 or 6.

1.6.4 Entry into an OPERATIONAL MODE or other specified condition shall not be made when the conditions for the Control are not met and the associated ACTION requires a shutdown if they are not met within a specified time interval. Entry into an OPERATIONAL MODE or specified condition may be made in accordance with ACTION requirements when conformance to them permits continued operation of the facility for an unlimited period of time. This provision shall not prevent passage through or to OPERATIONAL MODES as required to comply with ACTION requirements. Exceptions to these requirements are stated in the individual controls.

2.0 RADIOACTIVE LIQUID EFFLUENTS

OBJECTIVES & SYSTEM DESCRIPTION

A. Objectives

To provide calculational methodology needed to assure compliance with Technical Specifications which require the following determinations and surveillance:

- o The concentration of radioactive materials released in liquid effluents.
- o The concentrations of radioactive materials released are maintained within the limits of Control 2.2.
- o Quarterly and annual cumulative dose contributions to a member of the public from radioactivity in liquid effluents released from each unit to unrestricted areas are maintained within the limits of Control 2.3.
- o Projected doses due to liquid releases to unrestricted areas are maintained within the limits of Control 2.4.
- o Operation of appropriate portions of the Liquid Radwaste Treatment System when projected doses exceed limits of Control 2.4.
- o The operability of Liquid Radwaste System is verified by meeting Controls 2.2 and 2.3

B. Bases

Radioactive liquid effluents from Turkey Point Units 3 and 4 are released through radiation monitors which provide an alarm and automatic termination of radioactive releases. There are three discharge points from the units: steam generator blowdown from each unit and a common radwaste monitor tank discharge. The liquid effluent monitoring instrumentation and controls at Turkey Point for controlling and monitoring normal radioactive releases in accordance with Turkey Point Technical Specification 6.8.4.f consist of the following :

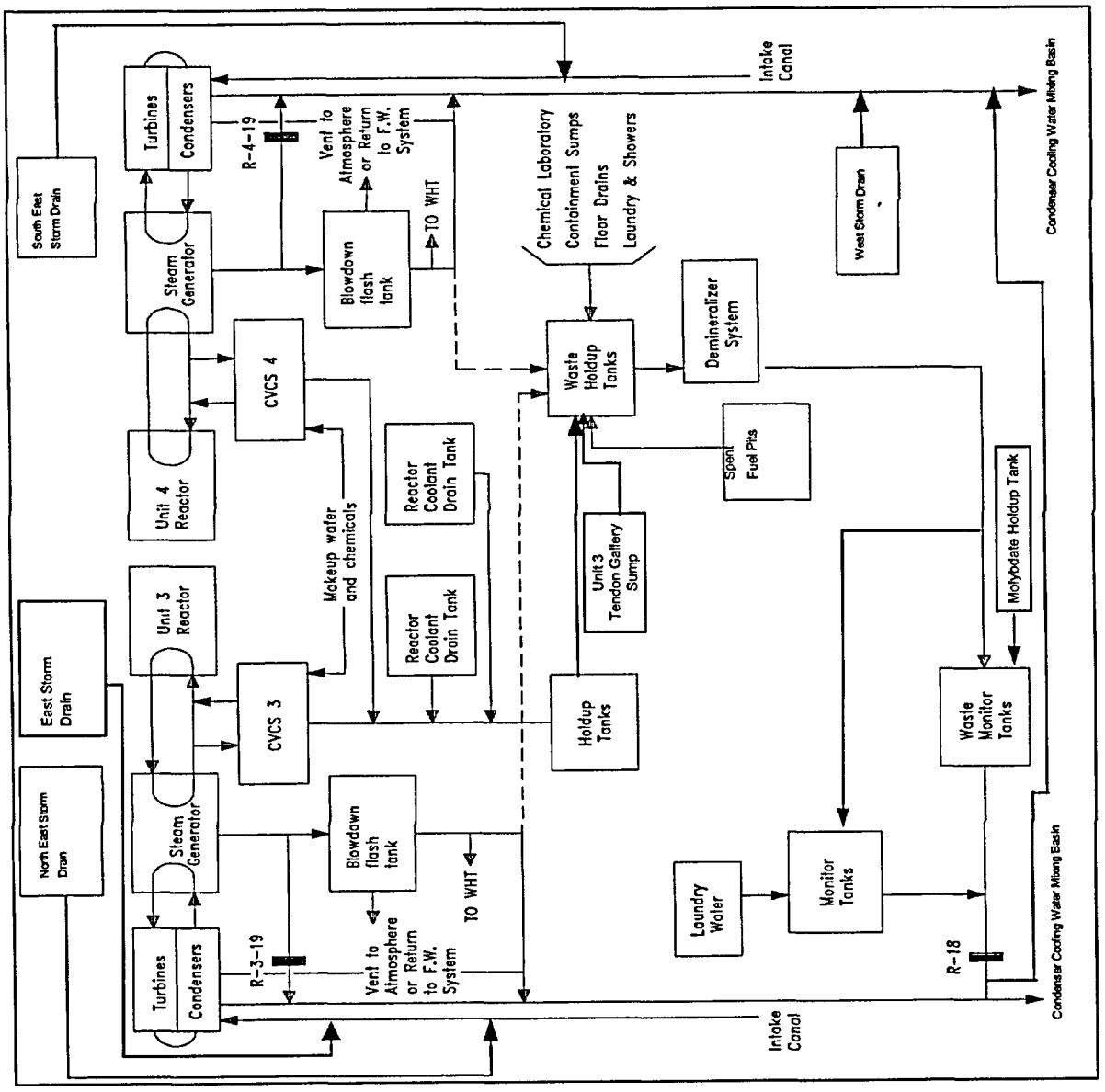
1 Liquid Radwaste System

Potentially radioactive liquid waste from Units 3 and 4 chemistry laboratories, containment sumps, floor drains, showers and miscellaneous sources are collected in waste hold up tanks. These wastes are processed through a demineralizer system and the effluent stored in one of the three waste monitor tanks or one of two monitor tanks (Refer to Figure 2-1). Laundry wastes are normally segregated and sent to one of two monitor tanks.

2.0 RADIOACTIVE LIQUID EFFLUENTS

FIGURE 2-1

RADIOACTIVE LIQUID WASTE



2.0 RADIOACTIVE LIQUID EFFLUENTS

CONTROL 2.1: LIQUID EFFLUENT MONITORING INSTRUMENTATION, OPERABILITY AND ALARM/TRIP SETPOINTS

The radioactive liquid effluent monitoring instrumentation channels shown in Table 2.1-1 shall be OPERABLE with their Alarm/Trip Setpoints set to ensure that the limits of Control 2.2 are not exceeded. The Alarm/ Trip Setpoints of these channels shall be determined and adjusted in accordance with the methodology and parameters in this OFFSITE DOSE CALCULATION MANUAL (ODCM).

APPLICABILITY : At all times, except as indicated in Table 2.1-1

ACTION :

a. With a radioactive liquid effluent monitoring instrumentation channel Alarm/Trip Setpoint less conservative than required by the above Control, immediately suspend the release of radioactive liquid effluents monitored by the affected channel or declare the channel inoperable, or change the setpoint so it is acceptably conservative.

b. With less than the minimum number of radioactive liquid effluent monitoring instrumentation channels OPERABLE, take the ACTION shown in Table 2.1-1. Restore the inoperable instrumentation to OPERABLE status within 30 days and, if unsuccessful, explain in the next Annual Radioactive Effluent Release Report pursuant to Administrative Control 1.3, why this inoperability was not corrected in a timely manner.

c. The provisions of Administrative Control section 1.6.3 are not applicable.

SURVEILLANCE REQUIREMENTS

2.1.1 Each radioactive liquid effluent monitoring instrumentation channel shall be demonstrated OPERABLE by performance of the CHANNEL CHECK, SOURCE CHECK, CHANNEL CALIBRATION and ANALOG CHANNEL OPERATIONAL TEST at the frequencies shown in Table 2.1-2.

2.0 RADIOACTIVE LIQUID EFFLUENTS

CONTROL 2.1 : LIQUID EFFLUENT MONITORING INSTRUMENTATION, OPERABILITY AND ALARM/TRIP SETPOINTS, (continued)

TABLE 2.1-1, (Continued)

TABLE NOTATION

ACTION 2.1.1 With the number of channels OPERABLE less than required by the Minimum Channels OPERABLE requirement, effluent releases via this pathway may continue provided that prior to initiating a release:

a. At least two independent samples are analyzed in accordance with the surveillance requirement of Control 2.2.1, and

b. At least two technically qualified members of the facility staff independently verify the release rate calculations and discharge valve line-up;

Otherwise, suspend release of radioactive effluents via this pathway.

ACTION 2.1.2 With the number of channels OPERABLE less than required by the Minimum Channels OPERABLE requirement, effluent releases via this pathway may continue provided grab samples are analyzed for gross (beta or gamma) radioactivity at a lower limit of detection of no more than 1×10^{-7} microcuries/ml or analyzed isotopically (Gamma) at a lower limit of detection of at least 5×10^{-7} microcuries/ml :

a. At least once per 12 hours when the specific activity of the secondary coolant is greater than 0.01 microcuries/gram DOSE EQUIVALENT I-131, or

b. At least once per 24 hours when the specific activity of the secondary coolant is less than or equal to 0.01 microcuries/gram DOSE EQUIVALENT I-131.

ACTION 2.1.3 With the number of channels OPERABLE less than required by the Minimum Channels OPERABLE requirement, effluent releases via this pathway may continue provided the flow rate is estimated at least once per 4 hours during actual releases. Pump performance curves may be used to estimate flow.

2.0 RADIOACTIVE LIQUID EFFLUENTS

CONTROL 2.1 : LIQUID EFFLUENT MONITORING INSTRUMENTATION, OPERABILITY AND ALARM/TRIP SETPOINTS (continued)

METHOD 2.1.2 : ESTABLISHING LIQUID EFFLUENT MONITOR ALARM AND TRIP SETPOINTS, (continued)

FEC_b= fraction of unrestricted area Effluent Concentration (EC) present in the condenser cooling water mixing basin outflow due to a batch release, determined in method 2.2.A.

g_b = detection efficiency of monitor detector; ratio of effluent radiation monitor counting rate to laboratory counting rate or activity concentration in a given batch sample (cpm per cpm/ml or cpm per µCi/ml) which ever units are consistent with the units A_b.

Bkg = background (cpm)

S_f = A factor to allow for multiple sources from different or common release points. The allowable operating setpoints are administratively controlled by assigning a fraction of the total allowable release to each of the release sources. The assigned fraction for releases made from the Liquid Radwaste System is 0.7.

B. Setpoint for a Continuous Release

The liquid effluent line radiation monitor alarm setpoint for a continuous release is determined with the equation below or by a method which gives a lower setpoint value, as described in approved plant procedures.

$$S_c = \frac{A_c\ S_f}{FEC_c} \bullet g_c + Bkg \qquad \text{Eqn 2.1-2}$$

where:

S_c = radiation monitor alarm setpoint for a continuous release, (cpm)

A_c = laboratory counting rate (cpm/ml) or activity concentration (µCi/ml) of sample from continuous release

FEC_c = fraction of unrestricted area EC present in the condenser cooling water mixing basin outflow due to a continuous release determined in method 2.2.B.

2.0 RADIOACTIVE LIQUID EFFLUENTS

CONTROL 2.1 : LIQUID EFFLUENT MONITORING INSTRUMENTATION, OPERABILITY AND ALARM/TRIP SETPOINTS (continued)

METHOD 2.1.2 : ESTABLISHING LIQUID EFFLUENT MONITOR ALARM AND TRIP SETPOINTS, (continued)

EXAMPLE CALCULATION : Liquid Radwaste Effluent Monitor Alarm Setpoint for a Batch Release

The monitor alarm setpoint for liquid batch releases is based on the fraction of the unrestricted area EC (FEC) that will be present in the condenser cooling water mixing basin as a result of the activity concentration present in the liquid radwaste to be released.

The monitor setpoint can be determined using equation from Method 2.1.2 for batch and continuous releases respectively.

Example:

$$S_b = \frac{A_b \bullet S_f}{FEC_b} \bullet g_b + Bkg$$

where:

S_b = radiation monitor alarm setpoint for a batch release, (cpm)

A_b = laboratory counting rate (cpm/ml) or activity concentration (µCi/ml) of sample from batch tank

FEC_b = fraction of unrestricted area EC present in the condenser cooling water mixing basin outflow due to a batch release; determined from equation 2.2-2.

g_b = detection response of monitor detector; ratio of effluent radiation monitor counting rate to laboratory counting rate or activity concentration in a given batch sample (cpm per cpm/ml or cpm per µCi/ml which ever units are consistent with the units A_b).

Bkg = background, (cpm)

S_f = A factor to allow for multiple sources from different or common release points. The allowable operating setpoints will be controlled administratively by assigning a fraction of the total allowable release to each of the release sources. The assigned fraction for releases made from the Liquid Radwaste System is 0.7.

2.0 RADIOACTIVE LIQUID EFFLUENTS

CONTROL 2.1 : LIQUID EFFLUENT MONITORING INSTRUMENTATION, OPERABILITY AND ALARM/TRIP SETPOINTS (continued)

Determine the monitor setpoint when:

FEC_b = 6×10^{-4}

A_b = 8.85×10^{-5} µCi/ml

g_b = 15,000 cpm/µCi/ml

S_f = 0.7

Bkg = 10,000 cpm

$$S_b = \frac{8.85 \times 10^{-5} \times .7}{6 \times 10^{-4}} \times 1.5 \times 10^{4} + 1 \times 10^{4} = 11{,}550 \text{ cpm}$$

CONTROL 2.2 : CONCENTRATIONS IN RADIOACTIVE LIQUID EFFLUENTS, (continued)

TABLE 2.2-1 (Continued)

TABLE NOTATIONS (Continued)

(3) The principal gamma emitters for which the LLD specification exclusively applies 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 considered. Other gamma peaks that are identifiable, together with those of the above nuclides, shall also be analyzed and reported in the Annual Radioactive Effluent Release Report pursuant to Control 1.3.

Nuclides, which are below the LLD for the analysis, should not be reported as being present at the LLD for that nuclide. When a radionuclide's calculated LLD is greater than it's listed LLD limit, the calculated LLD should be assigned as the activity of the radionuclide; or, the activity of the radionuclide should be calculated using measured ratios with those radionuclides which are routinely identified and measured.

(4) 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 that is representative of the liquids released.

(5) A continuous release is the discharge of liquid wastes of a non discrete volume, e.g., from a volume of a system that has an input flow during the continuous release.

(6) Prior to analyses, all samples taken for the composite shall be thoroughly mixed in order for the composite sample to be representative of the effluent release.

(7) Sampling and analysis of steam generator blowdown is not required during Mode 5 or 6.

(8) Sampling and analysis of steam generator blowdown on the applicable unit is only necessary for these species when primary to secondary leakage is occurring as indicated by the condenser air ejector noble gas activity monitor. (See Control 3.1, Table 3.1-1, Item 2a).

2.0 RADIOACTIVE LIQUID EFFLUENTS

CONTROL 2.2 : CONCENTRATIONS IN RADIOACTIVE LIQUID EFFLUENTS, (continued)

METHOD 2.2 : AQUEOUS CONCENTRATION

The diluted concentration of radionuclides in the condenser cooling water mixing basin outflow is estimated with the equation :

$$C_{zi} = C_i \bullet \frac{F_1}{F_2} \quad Eqn.\ 2.2\text{–}1$$

where:

C_{zi} = concentration of radionuclide i in the condenser cooling water mixing basin outflow, (μCi/ml)

C_i = concentration of radionuclide i in liquid radwaste released, (μCi/ml)

F_1 / F_2 = dilution

F_1 = flow in radioactive liquid discharge line, (gal/min).*

F_2 = total condenser cooling water flow, (gal/min).*
This value has been conservatively estimated at 156,000 gpm per circulating water pump for units 3 & 4, and 134,000 gpm per circulating water pump for units 1 & 2, based on expected condenser fouling and pump curves.

* F_1 and F_2 may have any suitable but identical units of flow, (volume/time).

A. Batch Release

A sample of each batch of liquid radwaste is analyzed before release for I-131 and other principal gamma emitters. With the activity concentration in a batch sample, b, based on the total isotopic activity, the fraction of the unrestricted area effluent concentration (FEC) due to a batch release is derived by using the ratio of the individual isotopic concentrations and their related effluent concentration (EC).

2.0 RADIOACTIVE LIQUID EFFLUENTS

CONTROL 2.2 : CONCENTRATIONS IN RADIOACTIVE LIQUID EFFLUENTS, (continued)

METHOD 2.2 : Aqueous Concentration, batch release, (continued)

FEC_b is estimated with the equation :

$$FEC_b = \sum_i \frac{C_{zi}}{EC_i} \text{ for gamma emitting isotopes} + \sum_i \frac{C_{zi}}{EC_i} \text{ for beta emitting isotopes}$$

Eqn 2.2-2

where:

FEC_b = fraction of the unrestricted area EC present in the condenser cooling water mixing basin outflow due to a batch release.

C_{zi} = concentration of radionuclide i in the water in the condenser cooling water mixing basin out flow, (μCi/ml); determined from equation 2.2-1.

EC_i = ten times the activity concentration limit in water of radionuclide i according to 10 CFR 20, Appendix B, Table 2, Column 2, (μCi/ml).

The factor for beta emitting isotopes is an adjustment to account for radionuclides not measured prior to release but measured in the quarterly and monthly samples per ODCM Table 2.2-1, i.e., Sr-89, Sr-90, Fe-55, H-3. This value is calculated from previously measured data.

A gross beta-gamma analysis of a batch release may be performed when an isotopic analysis is not available. The fraction of the unrestricted EC due to a batch release using the gross beta-gamma analysis can be estimated by:

$$FEC_b = \frac{C_b}{5x10^{-7}} \qquad \text{Eqn. 2.2-3}$$

where:

C_b = Concentration of radioactivity in the water in the condenser cooling water mixing basin outflow due to a batch release.

$5x10^{-7}$ = The activity concentration limit in water of the most restrictive isotope routinely released in liquid effluents, from a pressurized water reactor, according to 10 CFR 20, Appendix B, Table 2, Column 2, (μCi/ml).

2.0 RADIOACTIVE LIQUID EFFLUENTS

CONTROL 2.2 : CONCENTRATIONS IN RADIOACTIVE LIQUID EFFLUENTS, (continued)

METHOD 2.2 : Aqueous Concentration, batch release, (continued)

B. Continuous Release

Continuous aqueous discharges are sampled and analyzed according to the schedule in ODCM Table 2.2-1. The fraction of the unrestricted area EC present in a continuously discharged radioactive stream, FEC_c, is derived from an isotopic analyses. The fraction of the unrestricted area EC can be derived using the ratio of the individual isotopic concentrations and their related ECs. FEC_c is estimated with the equation:

$$FEC_c = \sum_i \frac{C_{zi}}{EC_i} \text{ for gamma emitting isotopes } + \sum_i \frac{C_{zi}}{EC_i} \text{ for beta emitting isotopes}$$

Eqn 2.2-4

where:

FEC_c = fraction of the unrestricted area EC present in the condenser cooling water mixing basin outflow due to a continuous release

C_{zi} = concentration of radionuclide i in the water in the condenser cooling water mixing basin outflow determined from equation 2.2-1, (μCi/ml)

EC_i = ten times the activity concentration limit in water of radionuclide i according to 10CFR20, Appendix B, Table 2, Column 2, (μCi/ml)

The factor for beta emitting isotopes is an adjustment to account for radionuclides not measured prior to release but measured in the quarterly and monthly samples per ODCM Table 2.2-1, i.e., Sr-89, Sr-90, Fe-55, H-3. This value is calculated from previously measured data.

A gross beta-gamma analysis of a continuous release may be performed when an isotopic analysis is not available. The fraction of the unrestricted EC due to a continuous release using the gross beta-gamma analysis can be estimated by:

$$FECc = \frac{Cc}{5x10^{-7}} \qquad \text{Eqn. 2.2-5}$$

where:

C_c = Concentration of radioactivity in the water in the condenser cooling water mixing basin outflow due to a continuous release.

$5x10^{-7}$ = The activity concentration limit in water of the most restrictive isotope routinely released in liquid effluents, from a pressurized water reactor, according to 10 CFR 20, Appendix B, Table 2, Column 2, (μCi/ml).

2.0 RADIOACTIVE LIQUID EFFLUENTS

CONTROL 2.2 : CONCENTRATIONS IN RADIOACTIVE LIQUID EFFLUENTS, (continued)

METHOD 2.2 : Aqueous Concentration, continuous, (continued)

C. Cumulative Release

To ensure that the unrestricted area EC is not exceeded during periods of multiple releases, the fraction of EC determined for each type of release is summed to determine a total release fraction using the following equation:

$$FEC_T = FEC_b + FEC_c \qquad \text{Eqn 2.2-6}$$

Where:

FEC_T = the total fraction of the unrestricted area EC released.

FEC_b = the fraction of the unrestricted area EC due to batch releases

FEC_c = the fraction of the unrestricted area EC due to continuous releases.

BASIS 2.2 :

This control applies to the release of radioactive materials in liquid effluents from all units at the site. The specification of "10 times the concentration levels specified in 10 CFR Part 20, Appendix B, Table 2, Column 2" provides the datum against which the liquid effluent monitor setpoints are determined pursuant to Control 2.1. In essence, Control 2.2 is an instantaneous limit.

The concentration limit for "dissolved or entrained noble gases" is based upon the assumption that Xe-135 is the controlling radioisotope and its associated Maximum Permissible Concentration (MPC) in air (submersion) was converted to an equivalent concentration in water using the methods described in International Commission on Radiological Protection (ICRP) Publication 2.

Adherence to Controls 2.3 and 2.4 provide assurance that levels of radioactive materials in bodies of water in UNRESTRICTED AREAS will, on the average, be a small fraction of the concentration limits and result in exposures to MEMBERS OF THE PUBLIC within the objectives of Appendix I of 10 CFR Part 50 and 40 CFR 190.

Control 2.2 permits the flexibility of operation, compatible with considerations of health and safety, to provide a dependable source of power even under circumstances that temporarily result in elevated releases, but still within the limit as specified in 10 CFR Part 20.1302 (b)(2)(ii).

2.0 RADIOACTIVE LIQUID EFFLUENTS

CONTROL 2.2 : CONCENTRATIONS IN RADIOACTIVE LIQUID EFFLUENTS, (continued)

EXAMPLE CALCULATION: Determination of the Fraction of the Unrestricted Area EC from a Batch Release of Liquid Radwaste, FEC_b

$$FEC_b = \sum_i \frac{C_{zi}}{EC_i} \text{ for gamma emitting isotopes} + \sum_i \frac{C_{zi}}{EC_i} \text{ for beta emitting isotopes}$$

where:

C_{zi} = Radionuclide concentration in condenser cooling water mixing basin, µCi/ml

EC_i = Ten times the effluent concentration from 10 CFR 20 Appendix B, Table 2, Column 2, µCi/ml

Example:

Σ FEC for a release must be less than 1 or the release cannot be made. Σ FEC for the batch release in example 1 above is calculated as follows:

Nuclide	C_{zi}	EC_i*	C_{zi}/EC_i	FEC_b
Co-60	6.4×10^{-9}	3×10^{-5}	2.1×10^{-4}	2.1×10^{-4}
Co-58	1.6×10^{-10}	8×10^{-5}	2.0×10^{-6}	2.0×10^{-6}
Cr-51	5.6×10^{-11}	5×10^{-3}	1.1×10^{-8}	1.1×10^{-8}
Mn-54	4.0×10^{-10}	3×10^{-4}	1.3×10^{-6}	1.3×10^{-6}
Cs-137	4.0×10^{-11}	1×10^{-5}	4.0×10^{-6}	4.0×10^{-6}
I-131	2.4×10^{-11}	1×10^{-5}	2.4×10^{-6}	2.4×10^{-6}
Fe-55	3.2×10^{-09}	1×10^{-4}	3.2×10^{-5}	3.2×10^{-5}
Sr-90	1.6×10^{-11}	5×10^{-7}	3.2×10^{-5}	3.2×10^{-5}
H-3	5.6×10^{-6}	1×10^{-3}	5.6×10^{-3}	5.6×10^{-3}
Σ	5.6×10^{-6}	--	5.9×10^{-3}	5.9×10^{-3}

*Use ten times the value of the Effluent Concentration (EC) values given in 10 CFR 20, Appendix B, Table 2, Column 2.

The fraction of unrestricted area EC from a continuous release is calculated in the same manner as the batch release shown above.

2.0 RADIOACTIVE LIQUID EFFLUENTS

CONTROL 2.3 : DOSE FROM RADIOACTIVE LIQUID EFFLUENT, (continued)

Example Calculation: Determination of Cumulative Dose from Radioactive Liquid Effluents.

The dose or dose commitment to a member of the public from radioactive liquid effluent shall be calculated on a cumulative quarterly and cumulative annual basis at least once per 31 days.

The dose or dose commitment from radioactive liquid releases at Turkey Point is based on the irradiation of a teenager on the canal shoreline, the most restrictive age group and is calculated using equation 2.3-1.

$$D = 0.23 \sum_k \sum_i A_i^{shoreline} \bullet \frac{C_{ik} \bullet F_{lk} \bullet t_k}{V \bullet \lambda_i^e}$$

where:

D = total body or organ dose due to irradiation by radionuclides on the shoreline which originated in a liquid effluent release, (mrem).

0.23 = units conversion constant = $\frac{1Ci}{10^6 uCi} \times \frac{60 \min}{hr} \times \frac{3785ml}{gal}$

A_i = transfer factor relating a unit aqueous concentration of radionuclide i (μCi) to dose commitment rate to specific organs and the total body of an exposed person tabulated in Appendix A, (mrem/Ci . min/gal).

C_{ik} = the concentration of radionuclide in the undiluted liquid waste to be discharged that is represented by sample k, (uCi/ml).

F_{lk} = liquid waste discharge flow during release represented by sample k, (gal/min)

V = cooling canal effective volume, approximately 3.75 x 10^9 gallons.

t_k = period of time (hours) during which liquid waste represented by sample k is discharged.

λ_i^e = effective decay constant ($\lambda_i + F_3/ V$, minute $^{-1}$).

where:

λ_i = the radioactive decay constant

F_3 = canal-ground water interchange flow, approximately 2.25 x 10^5 gal/min

CONTROL 2.4 : LIQUID RADWASTE TREATMENT SYSTEM

The Liquid Radwaste Treatment System shall be OPERABLE and appropriate portions of the system shall be used to reduce releases of radioactivity when the projected doses due to the liquid effluent, from each unit, to UNRESTRICTED AREAS (see Figure 1.5-1) would exceed 0.06 mrem to the whole body or 0.2 mrem to any organ in a 31-day period.

APPLICABILITY : At all times.

ACTION :

a. With radioactive liquid waste being discharged without treatment and in excess of the above limits and any portion of the Liquid Radwaste Treatment System not in operation, prepare and submit to the Commission within 30 days, pursuant to Control 1.6.6, a Special Report that includes the following information:

   1. Explanation of why liquid radwaste was being discharged without treatment, identification of any inoperable equipment or subsystems, and the reason for the inoperability,

   2. Action(s) taken to restore the inoperable equipment to OPERABLE status, and

   3. Summary description of action(s) taken to prevent a recurrence.

b. The provisions of Administrative Control section 1.6.3 are not applicable.

SURVEILLANCE REQUIREMENTS

2.4.1 Doses due to liquid releases from each unit to UNRESTRICTED AREAS shall be projected at least once per 31 days in accordance with the methodology and parameters in the ODCM when Liquid Radwaste Treatment Systems are not being fully utilized.

2.4.2 The installed Liquid Radwaste Treatment System shall be considered OPERABLE by meeting Controls 2.2 and 2.3.

3.0 RADIOACTIVE GASEOUS EFFLUENTS

OBJECTIVES & SYSTEM DESCRIPTION (continued)

C. GASEOUS RADWASTE SYSTEM, (continued)

The total measured radioactivity discharged via a stack or vent during a specific time period can be determined from the effluent monitors by :

$$Q_j = \frac{N_j \bullet F \bullet 28317}{h}$$

where:

Q_j = total measured gaseous radioactivity release via a stack or vent during counting interval j, (μCi)

N_j = counts accumulated during counting interval j, (counts = N(cpm) x t (min))

F = discharge rate of gaseous effluent stream, (ft^3/min)

28317 = conversion constant, (cm^3/ft^3)

h = effluent noble gas monitor calibration or counting rate response for noble gas gamma radiation, $\frac{cpm}{\mu Ci / cm^3}$ |

During periods of primary to secondary leakage, the activity released through unmonitored pathways can be estimated using the following methods. Other more accurate methods may be used, when appropriate and with the proper level of management approval.

$$Q = C \times F_j \times T_j$$

where:

C = The concentration of the individual isotope released.

F_j = The mass of unmonitored water and steam released through unmonitored pathways.

$$F_j = M_w - (M_b + M_s)$$

M_w = Mass rate of make up water |

M_b = Mass rate of blowdown |

M_s = Mass rate of steam from monitored sources |

T_j = Time interval for the period being quantified

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)

A noble gas effluent monitor alarm and trip setpoint, based on dose rate, is calculated with the equation below, or a method which gives a lower setpoint value in accordance with approved plant procedures.

$$S = 1.06 \left[\frac{h \bullet S_f}{F \bullet \chi / Q}\right] \left[\frac{\sum_i C_i}{\sum_i (C_i \bullet DF_i)}\right] + Bkg \qquad \text{Eqn 3.1-1}$$

where:

S = The alarm setpoint, (cpm)

1.06 = conversion constant (500 mrem/yr·60 sec/min · 35.32 ft^3/m^3· $1m^3/10^6cm^3$)

h = monitor response to activity concentration of effluent, $\frac{cpm}{(\mu Ci/cc)}$

F = flow of gaseous effluent stream, i.e., flow past the monitor, (ft^3/min)

χ/Q = atmospheric dispersion factor at the off-site location of interest, (sec/m^3)

C_i = concentration of radionuclide i in gaseous effluent (µCi/cc).

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

S_f = A factor to allow for multiple sources from different or common release points. The allowable operating setpoints will be controlled administratively by assigning a fraction of the total allowable release to each of the release sources. For gas releases, this fraction is assigned as follows: 0.6 for the Plant Vent, 0.1 for the 3 Spent Fuel Pit Vent, 0.1 for each SJAE Vent, and 0.1 for unmonitored gas releases.

Bk = Instrument background count rate, cpm |

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)

Other miscellaneous radiation monitor alarm/trip setpoints are determined as outlined below:

Channel	Setpoint Determination
3/4-R-11	Determined from Technical Specifications
3/4-R-12	Determined from Technical Specifications
R-14	Determined prior to each batch release or from ODCM Method 3.1.2
3/4-R-15	Less than 5 times the monitor background at the time of Calibration
3/4-R-17A/B	Between 2 and 5 times the monitor background at the time of Calibration
R-18	Determined prior to each batch release or from ODCM Method 2.1.2
3/4-R-19	Determined after each response check
3/4-R-20	Between 2 and 5 times the monitor background at the time of Calibration
SPINGS	
ch. 1,2,3,6	From ODCM Method 3.1.2 or default maximum (Channels 1&2 abandoned on the SJAE SPING monitors)
ch. 5,7,9	From ODCM Method 3.1.2

Monitor setpoints may be changed from between 2 and 5 times the monitor background at the time of calibration in the event of system in leakage, changes in background radiation levels, or other events that would necessitate further monitoring of the channel without receiving alarms.

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)

Calculate the effect of a ground level release as follows:

Radionuclide	C_i	DF_i	$C_i \times DF_i$
Kr-85m	3.6×10^{-5}	1.17×10^{3}	4.2×10^{-2}
Kr-85	2.8×10^{-4}	1.61×10^{1}	4.5×10^{-3}
Kr-87	2.5×10^{-6}	5.92×10^{3}	1.5×10^{-2}
Kr-88	1.4×10^{-5}	1.47×10^{4}	2.1×10^{-1}
Xe-131m	1.0×10^{-2}	9.15×10^{1}	9.1×10^{-1}
Xe-133	4.3×10^{-2}	2.94×10^{2}	1.3×10^{1}
Xe-135	6.0×10^{-4}	1.81×10^{3}	1.1×10^{0}
Ar-41	7.7×10^{-5}	8.85×10^{3}	6.8×10^{-1}

$\Sigma C_i = 5.4 \times 10^{-2}$ $\Sigma C_i DF_i = 1.6 \times 10^{1}$

Calculate the setpoint as follows:

$$S = 1.06 \left(\frac{2.5 \times 10^{8} \cdot 0.6}{8.0 \times 10^{4} \cdot 5.8 \times 10^{-7}} \right) \left(\frac{5.4 \times 10^{-2}}{1.6 \times 10^{1}} \right) + 600$$

$= 1.06 [3.23 \times 10^{9}] [3.4 \times 10^{-3}] + 600$

$= 11{,}565{,}794$ cpm

Note: The range of the installed monitor is 300,000 cpm, therefore, the alarm setpoint is set in accordance with plant procedures.

3.0 RADIOACTIVE GASEOUS EFFLUENTS

CONTROL 3.2 : DOSE RATE FROM RADIOACTIVE GASEOUS EFFLUENTS

The dose rate due to radioactive materials released in gaseous effluents from the site to areas at and beyond the SITE BOUNDARY (see Figure 1.5-1) shall be limited to the following:

a. For noble gases: Less than or equal to 500 mrem/yr to the whole body and less than or equal to 3000 mrem/yr to the skin, and

b. For Iodine-131, for Iodine-133, for tritium, and for all radionuclides in particulate form with half-lives greater than 8 days: Less than or equal to 1500 mrem/yr to any organ.

APPLICABILITY : At all times.

ACTION :

With the dose rate(s) exceeding the above limits, immediately restore the release rate to within the above limit(s).

SURVEILLANCE REQUIREMENTS

3.2.1 The dose rate due to noble gases in gaseous effluents shall be determined to be within the above limits in accordance with the methodology and parameters in this ODCM.

3.2.2 The dose rate due to Iodine 131, Iodine 133, tritium, and all radionuclides in particulate form with half-lives greater than 8 days in gaseous effluents shall be determined to be within the above limits in accordance with the methodology and parameters in this ODCM by obtaining representative samples and performing analyses in accordance with the sampling and analysis program specified in Table 3.2-1.

3.0 RADIOACTIVE GASEOUS EFFLUENTS

CONTROL 3.2 : DOSE RATE FROM RADIOACTIVE GASEOUS EFFLUENTS, (continued)

METHOD 3.2 : Dose Rate Due to Gaseous Effluent, (continued)

A. TOTAL BODY DOSE RATE

The total body dose rate from radioactive noble gases may be calculated at any location off-site by assuming a person is immersed in and irradiated by a semi-infinite cloud of the noble gases. The dose rate is calculated using the equation

$$\dot{D}_{TB} = \frac{X}{Q} \bullet \frac{1}{t} \sum_i Q_i \bullet P_{\gamma i} \qquad \text{Eqn 3.2-1}$$

where:

$\dot{D}_{TB}$ = Dose rate to total body from noble gases,(mrem/year)

χ/Q = atmospheric dispersion factor at the off-site location of interest, (sec/m^3)

t = Averaging time of release, i.e., increment of time during which Q_i was released, (year)

Q_i = quantity of noble gas radionuclide i released during the averaging time, (μCi)

$P_{\gamma i}$ = factor converting time integrated concentration of noble gas radionuclide, i, at ground level to total body dose, $\frac{\text{mrem} - m^3}{(\mu Ci - sec)}$; see Table 3.2-2.

Since dose rate limits for airborne effluents apply everywhere off-site, compliance is assessed and alarm setpoints determined at the site boundary where the minimum atmospheric dispersion from the plant (maximum χ/Q) occurs. That location is selected on the basis of reference meteorology data in Appendix 3A-1. According to those data, the minimum dispersion off-site occurs at the site boundary 1950 meters SSE of the plant where $\chi/Q = 5.8 \times 10^{-7}$ sec/m^3.

3.0 RADIOACTIVE GASEOUS EFFLUENTS

CONTROL 3.2 : DOSE RATE FROM RADIOACTIVE GASEOUS EFFLUENTS, (continued)

METHOD 3.2 : Dose Rate Due to Gaseous Effluent, (continued)

B. Skin Dose Rate

The dose rate to skin from radioactive noble gases may be calculated at any location off-site by assuming a person is immersed in and irradiated by a semi-infinite cloud of the noble gases. The dose rate to skin is calculated using the equation :

$$\dot{D}_S = \frac{\chi}{Q} \bullet \frac{1}{t}[\sum_i Q_i \bullet S_{\beta i} + 1.11 Q_i \bullet A_{\gamma i}] \qquad \text{Eqn. 3.2-2}$$

where:

$\dot{D}_S$ = dose rate to skin from radioactive noble gases, (mrem/year)

$S_{\beta i}$ = factor converting time integrated concentration of noble gas radionuclide i at ground level, to skin dose from beta radiation, $\frac{\text{mrem}}{(\mu\text{Ci}\cdot\text{sec/m}^3)}$, see Table 3.2-2

1.11 = ratio of tissue dose equivalent to air dose in a radiation field, (mrem/mrad)

$A_{\gamma i}$ = factor for converting time integrated concentration of noble gas radionuclide, i, in a semi-infinite cloud, to air dose from its gamma radiation, $\frac{\text{mrad}}{(\mu\text{Ci}\cdot\text{sec/m}^3)}$, listed in Table 3.2-3

Since dose rate limits for airborne effluents apply everywhere off-site, compliance is assessed and alarm setpoints determined at the site boundary where the minimum atmospheric dispersion from the plant (maximum χ/Q) occurs. That location is selected on the basis of reference meteorology data in Appendix 3A-1. According to those data, the minimum dispersion off-site occurs at the site boundary 1950 meters SSE of the plant where $\chi/Q = 5.8 \times 10^{-7}$ sec/m^3.

3.0 RADIOACTIVE GASEOUS EFFLUENTS

CONTROL 3.2 : DOSE RATE FROM RADIOACTIVE GASEOUS EFFLUENTS, (continued)

METHOD 3.2 : Dose Rate Due to Gaseous Effluent, (continued)

Table 3.2-2

Transfer Factors for Maximum Dose to a
Person Offsite due to Radioactive Noble Gases

	Air Dose Transfer Factors	
	$P_{\gamma i}$	$S_{\beta i}$
Radionuclide	mrem / (μCi sec/m^3)	mrem / (μCi sec/m^3)
Kr-83m	2.4E-9	--
Kr-85m	3.7E-5	4.6E-5
Kr-85	5.1E-7	4.2E-5
Kr-87	1.9E-4	3.1E-4
Kr-88	4.7E-4	7.5E-5
Kr-89	5.3E-4	3.2E-4
Kr-90	4.9E-4	2.3E-4
Xe-131m	2.9E-6	1.5E-5
Xe-133m	8.0E-6	3.1E-5
Xe-133	9.3E-6	9.7E-6
Xe-135m	9.9E-5	2.3E-5
Xe-135	5.7E-5	5.9E-5
Xe-137	4.5E-5	3.9E-4
Xe-138	2.8E-4	1.3E-4
Ar-41	2.8E-4	8.5E-5

Ref: Regulatory Guide 1.109, Revision 1, Table B-1.

Note: Values in the regulatory guide are quoted in units of pCi*yr, to convert to units of μCi*sec multiply by a factor of 3.171 E-2.

3.0 RADIOACTIVE GASEOUS EFFLUENTS

CONTROL 3.2 : DOSE RATE FROM RADIOACTIVE GASEOUS EFFLUENTS, (continued)

METHOD 3.2 : Dose Rate Due to Gaseous Effluent, (continued)

EXAMPLE CALCULATIONS : Dose Rate Due to Gaseous Effluent

Determining the Total Body Dose Rate from Noble Gas

The total body dose rate from the radioactive noble gases may be calculated at any location by assuming a person is immersed in and irradiated by a semi-infinite cloud of the noble gases. Compliance is assessed and alarm setpoints established based on the dose rate at the site boundary where the minimum atmospheric dispersion from the plant occurs. This location is 1950 meters SSE of the plant where $\chi/Q = 5.8 \times 10^{-7}$ sec/m^3. The dose rate D may be calculated using equation 3.2-1.

Example:

During a 31 day period, the following noble gas activity was released from Unit 3. The total body dose rate is calculated by:

$$\dot{D}_{TB} = \frac{\chi}{Q} \bullet \frac{1}{t} \sum_i Q_i \bullet P_{\gamma i}$$

where:

$\dot{D}_{TB}$ = Dose rate to total body from noble gases, (mrem/year)

χ/Q = atmospheric dispersion factor at the off-site location of interest, (sec/m^3)

t = Averaging time of release, i.e., increment of time during which Q_i was released, (year)

Q_i = quantity of noble gas radionuclide i released during the averaging time, (μCi)

$P_{\gamma i}$ = factor converting time integrated concentration of noble gas radionuclide, i, at ground level, to total body dose, $\frac{\text{mrem}}{(\mu\text{Ci}\cdot\text{sec/m}^3)}$; See Reference Table 3.2-2

3.0 RADIOACTIVE GASEOUS EFFLUENTS

CONTROL 3.2 : DOSE RATE FROM RADIOACTIVE GASEOUS EFFLUENTS, (continued)

METHOD 3.2 : Dose Rate Due to Gaseous Effluent, (continued)

EXAMPLE CALCULATIONS : Dose Rate Due to Gaseous Effluent, (continued)

TA_{anip} = a factor relating the airborne concentration time integral of radionuclide, i, to the dose equivalent to organ, n, of a person in age group, a (infant), exposed via pathway, p (air-cow-grass-milk).

$\frac{\text{mrem/yr}}{(\mu Ci/m^3)}$; See Appendix 3B

The dose rate from tritium; iodine and particulate is summarized in the following table.

Radionuclide	Q_{ik}	TA_{anip}	$Q_{ik}TA_{anip}$
H-3	1.6E+5	2.37E+3	3.79E+8
Cr-51	8.0E-6	1.8E+4	1.44E-1
Co-58	5.0E-7	0	0
Co-60	9.5E-7	0	0
I-131	3.5E-7	9.94E+11	3.48E+5
Cs-137	2.0E-6	0	0

Notes: The time factor 1/3600t = 1.27E-7 where t = 2184hrs/qtr
The value of $\Sigma Q_{ik}TA_{anip}$ = 3.8E+8
The value of χ_d/Q = 5.8E-7

D_{anp} = 1.27E-7 x 5.8E-7 x 3.8E+8 = 2.8E-5 mrem/yr

3.0 RADIOACTIVE GASEOUS EFFLUENTS

CONTROL 3.3 : AIR DOSE FROM NOBLE GASES, (continued)

METHOD 3.3.1 : NOBLE GAS GAMMA RADIATION DOSE

The gamma radiation dose to air off site as a consequence of noble gas discharged from each unit can be calculated with the equation :

$$D_\gamma = \frac{\chi}{Q} \sum_j \sum_i Q_j \bullet A_\gamma \qquad \text{Eqn 3.3-1}$$

where :

D_γ = noble gas gamma dose to air, (mrad)

$A_{\gamma i}$ = factor converting time integrated, ground level concentration of noble gas radionuclide i to air dose from gamma radiation listed in Table 3.3-1, $\frac{\text{mrad}}{(\mu\text{Ci} \cdot \text{sec/m}^3)}$

χ/Q = atmospheric dispersion factor at the off-site location of interest, (sec/m^3)

Q_j = the measured gaseous radioactivity released via a stack or vent during a single counting interval, j, (μCi)

Surveillance 3.3.1 is satisfied by calculating the noble gas gamma radiation dose to air at the location identified in Figure 3-2. At that location, 1950 meters SSE of the Plant, the reference atmospheric dispersion factor to be used is $\chi/Q = 5.8 \times 10^{-7}$ sec/m^3.

Alternately, Surveillance 3.3.1 may be satisfied, when authorized for estimating doses due to an unplanned release, by calculating the gamma dose to air with the equation

$$D_\gamma = \frac{1}{0.8} \bullet \frac{\chi}{Q} \bullet A_{\gamma_{eff}} \bullet \sum_j Q_j \qquad \text{Eqn 3.3-2}$$

where :

0.8 = a conservative factor which, in effect, increases the estimated dose to compensate for variability in radionuclide distribution

CONTROL 3.3 : AIR DOSE FROM NOBLE GASES, (continued)

METHOD 3.3.1 : Noble Gas Gamma Radiation Dose, (continued)

$A_{\gamma eff}$ = effective gamma air dose factor converting time integrated, ground level, total activity concentration of radioactive noble gas, to air dose due to gamma radiation. This factor has been derived from noble gas radionuclide distributions in routine operational releases. (Refer to Appendix 3C for a detailed explanation). The effective gamma air dose factor is:

$$A_{\gamma eff} = 1.4 \times 10^{-5} \quad \frac{\text{mrad}}{(\mu Ci \cdot sec/m^3)}$$

The remaining factors have been defined previously.

METHOD 3.3.2: NOBLE GAS BETA RADIATION DOSE

The beta radiation dose to air off site as a consequence of noble gas discharged from each unit can be calculated with the equation:

$$D_\beta = \frac{\chi}{Q} \sum_j \sum_i Q_j \bullet A_{\beta i} \qquad \text{Eqn 3.3-3}$$

where :

D_β = noble gas beta dose to air, (mrad)

$A_{\beta i}$ = factor converting time-integrated, ground level concentration of noble gas radionuclide i to air dose from beta radiation, listed in Table 3.3-1, $\frac{\text{mrad}}{(\mu Ci \cdot sec/m^3)}$

χ/Q = atmospheric dispersion factor at the off-site location of interest, (sec/m^3)

Surveillance 3.3.1 is satisfied by calculating the noble gas beta radiation dose to air at the location identified in Figure 3-2. At that location, 1950 meters SSE of the Plant, the reference atmospheric dispersion factor to be used is $\chi/Q = 5.8 \times 10^{-7}$ sec/m^3.

3.0 RADIOACTIVE GASEOUS EFFLUENTS

CONTROL 3.3 : AIR DOSE FROM NOBLE GASES, (continued)

METHOD 3.3.2 Noble Gas Beta Radiation Dose, (continued)

Alternately, Control 3.3 may be satisfied, when authorized for estimating doses due to an unplanned release, by calculating the beta radiation dose to air with the equation

$$D_\beta = \frac{1}{0.8} \bullet \frac{\chi}{Q} \bullet A_{\beta eff} \bullet \sum_i Q_i \qquad \text{Eqn 3.3-4}$$

where

0.8 = a conservative factor which, in effect, increases the estimated dose to compensate for variability in radionuclide distribution

$A_{\beta eff}$ = effective beta air dose factor converting time integrated, ground level, total activity concentration of radioactive noble gas to air dose due to beta radiation. This factor has been derived from noble gas radionuclide distributions in routine operational releases. (Refer to Appendix 3C for a detailed explanation.) The effective beta air dose factor is:

$$A_{\beta eff} = 3.4 \times 10^{-5} \quad \frac{\text{mrad}}{(\mu\text{Ci} \cdot \text{sec/m}^3)}$$

The remaining factors have been defined previously.

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 rate, F, during a time increment, t. Thus, each release is quantified according to the relation

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

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, (μCi/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).

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, (continued)

B. Calculating the Dose Due to Iodine, Tritium, and Particulates, (continued)

Of all these pathways, the air-grass-cow-milk pathway is by far the controlling dose contributor. The radioiodines contribute essentially all of the dose, by this pathway, with I-131 typically contributing greater than 95%. The dose transfer factors for the radioiodines are much greater than for any of the other radionuclides. The critical organ is the infant's thyroid.

For this reason, the potential critical organ dose via airborne effluents can be estimated by determining an effective dose transfer factor for the radioiodines based on the typical radioactive effluent distribution, the air-grass-cow-milk pathway, and the infant thyroid as the receptor. Then for conservatism the total cumulative release of all radioiodines and particulates can be used along with the effective dose transfer factor to determine a conservative estimate of the infant thyroid dose.

Surveillance 3.4.1, requires an evaluation be performed once per 31 days to verify that the accumulated total body or organ dose for the current calendar quarter and calendar year does not exceed the limit as given in Control 3.4. Dose commitment due to iodine and particulates may be calculated by using the following equation:

$$DM_k = \frac{3.17x10^{-8}}{0.8} \bullet \frac{D}{Q} \bullet TG_{131} \bullet \sum_i Q_{ik} \quad Eqn\ 3.4-2$$

where:

DM_k = the dose commitment to an infant's thyroid received from exposure via the air-grass-cow-milk pathway and attributable to iodine identified in analysis k of effluent air, (mrem)

3.17×10^{-8} = conversion constant, (yr/sec)

0.8 = a conservatism factor which, in effect, increases the estimated dose to compensate for variability in the radionuclide distribution.

D/Q = relative deposition rate onto ground from a mixed mode atmospheric release (m^{-2})

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, (continued)

B. Calculating the Dose Due to Iodine, Tritium, and Particulates, (continued)

Alternately, the requirement of Surveillance 3.4.1, to perform once per 31 days determinations of dose commitments due to radioiodine, tritium and radioactive particulates in effluent air may be made by using equations 3.4-3 through 3.4-5. These equations are normally used when calculating doses for the Annual Radioactive Effluent Release Report.

The dose commitment from exposure to airborne concentrations of radioactive material other than noble gas from a release, Q_{ik}, via the inhalation and irradiation pathways is calculated with the equation

$$D_{ank} = 3.17 \times 10^{-8} \bullet \frac{\chi_d}{Q} \bullet \sum_i Q_{ik} \bullet \sum_p TA_{anip} \qquad \text{Eqn 3.4-3}$$

where :

D_{ank} = the dose commitment to organ n of a person in age group a due to radionuclides identified in analysis k of an air effluent, (mrem).

3.17×10^{-8} = conversion constant, (yr/sec)

χ_d/Q = atmospheric dispersion factor adjusted for depletion by deposition, (sec/m^3).

Q_{ik} = the quantity of radionuclide i released in a given effluent stream based on analysis k, (μCi).

TA_{anip} = a factor converting airborne concentration of radionuclide i to dose commitment to organ n of a person in age group, a, where exposure is directly due to airborne material via pathway, p (inhalation, or external exposure to the plume),
mrem/yr ; (See Appendix 3B).
($\mu Ci/m^3$)

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, (continued)

B. Calculating the Dose Due to Iodine, Tritium, and Particulates, (continued)

The dose to a person from iodine and particulates discharged as airborne effluents via the inhalation and irradiation pathways is evaluated at the nearest garden, 3.6 miles west northwest of the plant. At that location, the reference atmospheric dispersion factor adjusted for depletion by deposition is $\chi_d/Q = 1 \times 10^{-7}$ sec/m^3, (Table 3A-2).

The dose commitment via exposure pathways involving radionuclide deposition from the atmosphere onto vegetation or the ground is calculated with the equation

$$D_{ank} = 3.17 \times 10^{-8} \bullet \frac{D}{Q} \bullet \sum_i Q_{ik} \bullet \sum_p TG_{anip} \qquad \text{Eqn 3.4-4}$$

where:

D/Q = relative deposition rate onto ground from a mixed mode atmospheric release, (m^{-2})

TG_{anip} = factor converting ground deposition of radionuclide i to dose commitment to organ n of a person in age group a where exposure is due to radioactive material via pathway p (direct radiation from ground plane deposition, fruits and vegetables, air-grass-cow-meat, or air-grass-cow-milk), See Appendix 3B. $\frac{\text{mrem/yr}}{(\mu Ci/m^2 \cdot sec)}$,

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, (continued)

B. Calculating the Dose Due to Iodine, Tritium, and Particulates, (continued)

The dose to a person from iodine and particulates discharged as airborne effluents via the air-grass-cow-milk pathway is evaluated by assuming a cow is on a pasture 4.5 miles west of the plant.(There are no milk or meat animals within 5 miles). At this location, the reference atmospheric deposition factor is $D/Q = 5 \times 10^{-10}$ m $^{-2}$ (Table 3A-3).

The concentration of tritium in vegetation is a function of the airborne concentration rather than the deposition. Thus, the dose commitment from airborne tritium via vegetation, (fruits and vegetables), air- grass-cow-milk, or air-grass-cow-meat pathways is calculated with the equation

$$D_{ank} = 3.17 \times 10^{-8} \bullet \frac{\chi}{Q} \bullet \sum_{i} Q_{ik} \bullet \sum_{p} TA_{anip} \qquad \text{Eqn 3.4-5}$$

where:

χ/Q = atmospheric dispersion factor at the off-site location of interest (sec/m^3)

The dose to a person from tritium via the vegetation, (fruits and vegetables), air-grass-cow-milk, or air-grass-cow-meat pathways is evaluated at the nearest garden (with residence assumed) 3.6 miles west northwest of the plant. At that location, the reference atmospheric dispersion factor is $\chi/Q = 1 \times 10^{-7}$ sec/m^3.

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, (continued)

B. Calculating the Dose Due to Iodine, Tritium, and Particulates, (continued)

The dose commitment via a given pathway as a result of measured discharges from a release point is accumulated with

$$D_{an} = \sum_k D_{ank} \qquad \text{Eqn 3.4-6}$$

where:

D_{an} = the dose commitment to organ n of a person in age group, a.

k = the counting index; it may represent either:
p, analysis of a grab sample
w, a weekly sample analysis
m, a monthly composite analysis, or
q, a quarterly composite analysis

3.0 RADIOACTIVE GASEOUS EFFLUENTS

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

BASIS 3.4 : DOSE - IODINE 131, IODINE 133, TRITIUM, AND RADIOACTIVE MATERIAL IN PARTICULATE FORM

This control applies to the release of radioactive materials in gaseous effluents from each unit at the site. For units with shared radwaste treatment systems, the gaseous effluents from the shared systems are proportioned among the units sharing that system.

This control is provided to implement the requirements of Appendix I, 10 CFR Part 50. The Control implements the guides set forth in Appendix I. The ACTION statements provide the required operating flexibility and at the same time implement the guides set forth in Appendix I to assure that the releases of radioactive materials in gaseous effluents to UNRESTRICTED AREAS will be kept "as low as is reasonably achievable." The ODCM calculation methods specified in the Surveillance Requirements implement the requirements in Appendix I that conformance with the guides of Appendix I be shown by calculational procedures based on models and data such that the actual exposure of a MEMBER OF THE PUBLIC through appropriate pathways is unlikely to be substantially underestimated. The ODCM calculational methodology and parameters for calculating the doses due to the actual release rates of the subject materials are consistent with the methodology 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 and 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. These equations also provide for determining the actual doses based upon the historical average atmospheric conditions. The release rate specifications for Iodine-131, Iodine-133, tritium, and radionuclides in particulate form with half-lives greater than 8 days are dependent upon the existing radionuclide pathways to man in the areas at and beyond the SITE BOUNDARY. The pathways that were examined in the development of the calculations were: (1) individual inhalation of airborne radionuclides, (2) deposition of radionuclides onto green leafy vegetation with subsequent consumption by man, (3) deposition onto grassy areas where milk animals and meat producing animals graze with consumption of the milk and meat by man, and (4) deposition on the ground with subsequent exposure of man.

3.0 RADIOACTIVE GASEOUS EFFLUENTS

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

EXAMPLE CALCULATIONS : Determining Dose Due to Iodine, Tritium, and Particulates

Dose estimate should account for exposure of a person via the following pathways involving deposition of radioactivity on the ground.

- direct radiation from airborne radionuclides except noble gases
- inhalation
- direct radiation from ground plane deposition
- fruits and vegetables
- air-grass-cow-meat
- air-grass-cow-milk

The requirement to determine the dose commitments due to radioiodine, tritium, and radioactive particulates once per 31 days may be satisfied by using Equations 3.4-2, 3.4-3, 3.4-4, and 3.4-5.

Example:

Calculate the organ and total body dose to an infant from tritium inhalation and irradiation pathways and from radioiodine and particulates via the grass-cow-milk pathway using Equations 3.4-4 and 3.4-5. The major non-noble gas activities released over a 31 day period were used for the calculation. The atmospheric dispersion factor and deposition rate values for a mixed mode release at 3.6 miles WNW and 4.5 miles west of the plant respectively were obtained from Tables 3A-2 and 3A-3. Factors TA_{anip} and TG_{anip} converting airborne activity to dose commitment are obtained from Appendix 3B for the organ, age group, and pathway.

For Iodine and Particulate:

$$D_{ank} = 3.17 \times 10^{-6} \cdot \frac{D}{Q} \cdot \sum_i Q_{ik} \cdot \sum_p TG_{anip} \qquad \text{Eqn 3.4-4}$$

For Tritium;

$$D_{ank} = 3.17 \times 10^{-6} \cdot \frac{\chi}{Q} \cdot \sum_i Q_{ik} \cdot \sum_p TA_{anip} \qquad \text{Eqn 3.4-5}$$

EXAMPLE CALCULATIONS : Determining Dose Due to Iodine, Tritium, and Particulates, (continued)

where:

χ/Q = atmospheric dispersion factor for a mixed mode release, (sec/m3).

D/Q = relative deposition rate onto ground from a mixed mode atmospheric release (m^{-2}).

Q_{ik} = the quantity of radionuclide i released in a given effluent stream based on analysis k, (μCi).

TA_{anip} = a factor converting airborne concentration of radionuclide i to a dose commitment to organ n of a person in age group a where exposure is directly due to airborne material via pathway P (inhalation or external exposure to the plume), $\frac{\text{mrem/yr}}{(\mu Ci/m^3)}$.

TG_{anip} = factor converting ground deposition of radionuclide i to dose commitment to organ n of a person in age group a where exposure is due to radioactive material via pathway P (direct radiation from ground plane deposition, fruits and vegetables, air-grass-cow-meat, or air-grass-cow-milk) $\frac{\text{mrem/yr}}{(\mu Ci/m^2 \cdot \text{sec})}$

D_{ank} = the dose commitment to organ n of a person in age group a due to radionuclides identified in analysis k of an air effluent, (mrem).

The organ and total body dose to an infant from radioiodines and particulates via the grass-cow-milk pathway is shown in the following worksheet.

4.0 TOTAL DOSE

CONTROL 4.1: LIMITS OF TOTAL DOSE TO MEMBERS OF THE PUBLIC (continued)

METHOD 4.1: LIMITS OF TOTAL DOSE TO MEMBERS OF THE PUBLIC, (continued)

DOSE TO A PERSON FROM NOBLE GASES

Control 4.1 requires the calculation of the annual (calendar year) dose or dose commitment to a member of the public exposed to radioactive liquid and gaseous effluents from the plant. One component of personal dose is total body irradiation by gamma rays from noble gases. Another is irradiation of skin by beta and gamma radiation from noble gases. The methods for calculating these doses are presented below.

The amount of radioactive noble gas discharged is determined in the manner described in Method 3.2.

GAMMA DOSE TO TOTAL BODY

The gamma radiation dose to the whole body of a member of the public as a consequence of noble gas released from the Plant is calculated with the equation:

$$D_\gamma = \frac{\chi}{Q} \sum_i Q_i \bullet P_{\gamma i} \qquad \text{Eqn 4.1-1}$$

where:

D_γ = noble gas gamma dose to total body, (mrem)

Q_i = quantity of radioactive noble gas i discharged in gaseous effluent, (μCi)

χ/Q = atmospheric dispersion factor at the off-site location of interest, (sec/m^3)

$P_{\gamma i}$ = factor converting time integrated, ground level concentration of noble gas nuclide, I, to total body dose from gamma radiation listed in Table 4.1-1, $\frac{mrem}{(\mu Ci \cdot sec/m^3)}$

4.0 TOTAL DOSE

CONTROL 4.1: LIMITS OF TOTAL DOSE TO MEMBERS OF THE PUBLIC (continued)

METHOD 4.1: LIMITS OF TOTAL DOSE TO MEMBERS OF THE PUBLIC, (continued)

Table 4.1-1

Transfer Factors for Maximum Dose to a
Person Offsite due to Radioactive Noble Gases

Air Dose Transfer Factors

Radionuclide	$P_{\gamma i}$ $\frac{\text{mrem}}{(\mu\text{Ci sec/m}^3)}$	$S_{\beta i}$ $\frac{\text{mrem}}{(\mu\text{Ci sec/m}^3)}$
Kr-83m	2.4 E-9	–
Kr-85m	3.7 E-5	4.6 E-5
Kr-85	5.1 E-7	4.2 E-5
Kr-87	1.9 E-4	3.1 E-4
Kr-88	4.7 E-4	7.5 E-5
Kr-89	5.3 E-4	3.2 E-4
Kr-90	4.9 E-4	2.3 E-4
Xe-131m	2.9 E-6	1.5 E-5
Xe-133m	8.0 E-6	3.1 E-5
Xe-133	9.3 E-6	9.7 E-6
Xe-135m	9.9 E-5	2.3 E-5
Xe-135	5.7 E-5	5.9 E-5
Xe-137	4.5 E-5	3.9 E-4
Xe-138	2.8 E-4	1.3 E-4
Ar-41	2.8 E-4	8.5 E-5

Ref: Regulatory Guide 1.109, Revision 1, Table B-1.

Note: Values in the regulatory guide are quoted in units of pCi yr, to convert to units of μCi sec multiply by a factor of 3.171 E-2.

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, wet)	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 a 40 CFR 141.16 Table A value.

** Applies to drinking water

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

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. This is a 40 CFR 141.16 Table A value. +

** Applies to drinking water

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

5.0 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

CONTROL 5.1 : CONDUCT OF SAMPLING AND ANALYSIS (continued)

TABLE NOTATIONS - TABLE 5.1-3 (Continued)

(1) This list does not mean that only these nuclides are to be considered. Other peaks that are identifiable, together with those of the above nuclides, shall also be analyzed and reported in the Annual Radiological Environmental Operating Report pursuant to Control 1.4.

(2) Required detection capabilities for thermoluminescent dosimeters used for environmental measurements are given in Regulatory Guide 4.13.

(3) The LLD is defined, for purposes of these controls, as the smallest concentration of radioactive material in a sample that will yield a net count, above system background, that will be detected with 95% probability with only 5% probability of falsely concluding that a blank observation represents a "real" signal.

For a particular measurement system, which may include radiochemical separation:

$$LLD = \frac{4.66\ (S_b)}{E \cdot V \cdot 2.22 \cdot Y \cdot [\exp(-\lambda \Delta t)]}$$

Where:

LLD = the "a priori" lower limit of detection as defined above as picoCuries per unit mass or volume,

S_b = the standard deviation of the background counting rate or of the counting rate of a blank sample as appropriate (counts per minute),

E = the counting efficiency (counts per disintegration),

V = the sample size (units of mass or volume),

2.22 = the number of disintegrations per minute per picoCurie,

Y = the fractional radiochemical yield, when applicable,

λ = the radioactive decay constant for the particular radionuclide

Δt = the elapsed time between environmental collection, or end of the sample collection period, and time of counting (sec).

Typical values of E, V, Y, and Δt should be used in the calculation.

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 REMP with DOH and compliance with the REMP 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.