

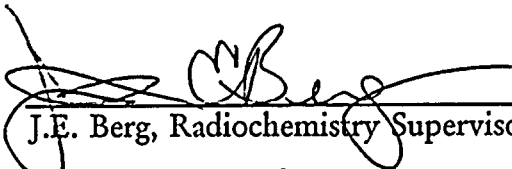
Turkey Point Plant
Units 3 and 4

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT

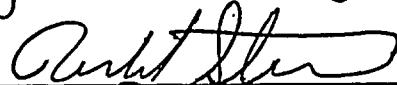
January 1994 through December 1994

Submitted by:

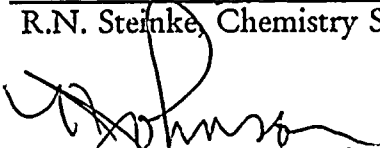
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FLORIDA POWER AND LIGHT COMPANY



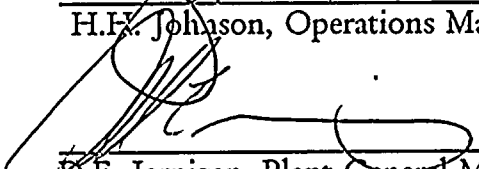
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TURKEY POINT UNITS 3 AND 4
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1.0 REGULATORY LIMITS

1.1. Liquid Effluent

(a) The concentration of radioactive material released in liquid effluent to unrestricted areas shall not exceed 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 2.0 E-04 micro-curies per milliliter.

(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.

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2.0 MAXIMUM PERMISSIBLE 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 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 radioactive 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, and Fe-55 by chemical separation.

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

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

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

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

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

Portions of the gas waste treatment system are shared by both units and generally all gas releases from the shared system are allocated on a 50/50 basis to each unit.

Meteorological data for the period January 1994 through December 1994, in the form of Joint Frequency Distribution Tables, is maintained on site.

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4.3 Estimation of Errors

a) Sampling Error

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

b) Analytical Error

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

| <u>NUCLIDE TYPE</u> | <u>AVERAGE ERROR</u> | <u>MAXIMUM ERROR</u> |
|---------------------|----------------------|----------------------|
| Liquid | $\pm 6.1\%$ | $\pm 17.0\%$ |
| Gaseous | $\pm 6.2\%$ | $\pm 12.4\%$ |

5.0 BATCH RELEASES

5.1 LIQUID

| | <u>Unit3</u> | <u>Unit 4</u> |
|---|--------------|---------------|
| a) Number of releases | 2.83E+02 | 2.83E+02 |
| b) Total time period of batch releases | 2.39E+04 | 2.39E+04 |
| c) Maximum time period for a batch release, minutes | 2.00E+02 | 2.00E+02 |
| d) Average time period for a batch release, minutes | 8.33E+01 | 8.33E+01 |
| e) Minimum time for a batch release, minutes | 1.00E+00 | 1.00E+00 |
| f) Average stream flow during period of release of effluent into a flowing stream, liters-per-minute | 2.62E+06 | 2.62E+06 |

5.1 GASEOUS

| | <u>Unit3</u> | <u>Unit 4</u> |
|---|--------------|---------------|
| a) Number of releases | 1.15E+01 | 1.15E+01 |
| b) Total time period of batch releases | 7.50E+02 | 7.50E+02 |
| c) Maximum time period for a batch release, minutes | 2.40E+02 | 2.40E+02 |
| d) Average time period for a batch release, minutes | 1.30E+02 | 1.30E+02 |
| e) Minimum time for a batch release, minutes | 2.00E+01 | 2.00E+01 |

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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 gaseous releases this 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) | 9.00E-07 | 1.71E-06 |
| Liver (mrem) | 1.47E-06 | 3.76E-06 |
| Thyroid (mrem) | 3.41E-04 | 5.33E-04 |
| Kidney (mrem) | 2.55E-06 | 2.35E-06 |
| Lung (mrem) | 4.85E-07 | 2.00E-06 |
| GI-LLI (mrem) | 9.14E-07 | 2.21E-06 |
| Total Body (mrem) | 6.03E-07 | 2.21E-06 |

| | |
|-----------------------|----------|
| Gamma Air Dose (mrad) | 3.62E-05 |
| Beta Air Dose (mrad) | 7.70E-05 |

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9.0 OFFSITE DOSE CALCULATION MANUAL (ODCM) REVISIONS

Attachment 1 is the revision to the ODCM for this report.

10.0 SOLID WASTE AND IRRADIATED FUEL SHIPMENTS

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

11.0 PROCESS CONTROL PROGRAM REVISIONS

There were no changes to the Process Control Program during this reporting period.

12.0 INOPERABLE EFFLUENT MONITORING INSTRUMENTATION

No inoperable effluent monitoring instrumentation requiring reportability during this period.

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LIQUID EFFLUENTS SUMMARY

UNIT 3
TABLE 1

A. FISSION AND ACTIVATION PRODUCTS

| | UNITS | Qtr 1 | Qtr 2 | Qtr 3 | Qtr 4 | Est. Error (%) |
|--|--------|----------|----------|----------|----------|----------------|
| 1. Total Release (not including tritium, gases, alpha) | CI | 7.48E-02 | 9.15E-02 | 5.89E-02 | 4.72E-02 | 7.00 |
| 2. Average diluted concentration during the period | uCi/ml | 1.24E-09 | 1.55E-10 | 8.55E-11 | 1.35E-10 | |
| 3. Percent of applicable limit | % | 2.32E-01 | 2.98E-01 | 8.70E-02 | 8.31E-02 | |

B. TRITIUM

| | UNITS | Qtr 1 | Qtr 2 | Qtr 3 | Qtr 4 | Est. Error (%) |
|--|--------|----------|----------|----------|----------|----------------|
| 1. Total Release | CI | 1.51E+02 | 1.06E+02 | 8.45E+01 | 3.44E+01 | 4.00 |
| 2. Average diluted concentration during the period | uCi/ml | 4.24E-06 | 3.23E-06 | 3.66E-06 | 1.02E-06 | |
| 3. Percent of applicable limit | % | 4.24E-01 | 3.23E-01 | 3.66E-01 | 1.02E-01 | |

C. DISSOLVED AND ENTRAINED GASES

| | UNITS | Qtr 1 | Qtr 2 | Qtr 3 | Qtr 4 | Est. Error (%) |
|--|--------|----------|----------|----------|----------|----------------|
| 1. Total Release | CI | 2.55E-02 | 4.62E-03 | 1.44E-03 | 2.33E-04 | 7.00 |
| 2. Average diluted concentration during the period | uCi/ml | 7.16E-10 | 1.41E-10 | 6.24E-11 | 6.90E-12 | |
| 3. Percent of applicable limit | % | 3.58E-04 | 7.07E-05 | 3.12E-05 | 3.45E-06 | |

D. GROSS ALPHA RADIOACTIVITY

| | UNITS | Qtr 1 | Qtr 2 | Qtr 3 | Qtr 4 | Est. Error (%) |
|------------------|-------|-------|-------|-------|-------|----------------|
| 1. Total Release | CI | -- | -- | -- | -- | 5.00 |

E. LIQUID VOLUMES

| | | Qtr 1 | Qtr 2 | Qtr 3 | Qtr 4 | Est. Error (%) |
|---|--------|----------|----------|----------|----------|----------------|
| 1. Batch waste released, prior to dilution | LITERS | 1.43E+06 | 1.74E+06 | 1.37E+06 | 2.06E+06 | 10.00 |
| 2. Continuous waste released, prior to dilution | LITERS | -- | -- | -- | -- | |
| 3. Dilution water used during period | LITERS | 3.56E+10 | 3.27E+10 | 2.31E+10 | 3.39E+10 | |

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LIQUID EFFLUENTS SUMMARY

UNIT 3
TABLE 2

| NUCLIDES RELEASED | UNITS | BATCH MODE | | | |
|----------------------|-------|------------|----------|----------|----------|
| | | Qtr 1 | Qtr 2 | Qtr 3 | Qtr 4 |
| Fe-55 | CI | 3.07E-02 | 4.31E-02 | 1.70E-02 | 1.02E-02 |
| Sr-89 | CI | -- | 1.54E-04 | 9.44E-05 | -- |
| Sr-90 | CI | 6.56E-05 | 6.34E-05 | -- | -- |
| Na-24 | CI | -- | 6.34E-05 | -- | -- |
| Cr-51 | CI | -- | 4.20E-04 | -- | 4.14E-04 |
| Mn-54 | CI | 1.09E-02 | 2.64E-02 | 1.90E-02 | 1.53E-02 |
| Co-57 | CI | 2.14E-05 | 2.04E-05 | 4.24E-05 | -- |
| Co-58 | CI | 2.08E-02 | 1.11E-02 | 1.25E-02 | 1.54E-02 |
| Fe-59 | CI | -- | 1.14E-05 | 2.47E-06 | 8.69E-06 |
| Co-60 | CI | 1.15E-02 | 6.80E-03 | 3.74E-03 | 2.41E-03 |
| Zn-65 | CI | -- | -- | -- | -- |
| Nb-95 | CI | -- | 4.74E-06 | 3.19E-05 | 9.58E-05 |
| Zr-97 | CI | -- | 2.13E-05 | -- | 4.11E-05 |
| Mo-99 | CI | -- | -- | -- | -- |
| Ru-103 | CI | -- | -- | -- | -- |
| Ag-110 | CI | 2.68E-04 | 1.53E-03 | 3.80E-04 | 2.15E-03 |
| Sn-113 | CI | -- | 3.69E-06 | -- | -- |
| Sn-117 | CI | -- | -- | -- | -- |
| Sb-124 | CI | -- | 6.70E-04 | 4.04E-05 | 1.87E-04 |
| Sb-125 | CI | 1.50E-04 | 7.76E-04 | 6.20E-04 | 3.42E-04 |
| I-131 | CI | -- | 7.70E-06 | -- | -- |
| I-133 | CI | -- | 1.49E-05 | -- | -- |
| I-134 | CI | -- | -- | -- | -- |
| Cs-134 | CI | 1.66E-04 | 2.86E-05 | 2.42E-03 | 7.97E-05 |
| I-135 | CI | -- | -- | -- | -- |
| Cs-137 | CI | 1.85E-04 | 2.33E-04 | 3.00E-03 | 5.06E-04 |
| La-140 | CI | -- | 3.99E-05 | 6.65E-07 | 1.12E-06 |
| Co-141 | CI | -- | -- | -- | -- |
| Co-144 | CI | -- | -- | -- | 4.63E-06 |
| W-187 | CI | 4.17E-06 | 5.51E-05 | -- | 9.80E-05 |
| Np-239 | CI | -- | -- | -- | -- |
| TOTAL FOR PERIOD | CI | 7.48E-02 | 9.15E-02 | 5.89E-02 | 4.72E-02 |

LIQUID EFFLUENTS - DISSOLVED GAS SUMMARY

UNIT 3
TABLE 2

| NUCLIDES RELEASED | UNITS | BATCH MODE | | | |
|----------------------|-------|------------|----------|----------|----------|
| | | Qtr 1 | Qtr 2 | Qtr 3 | Qtr 4 |
| Ar-41 | CI | -- | -- | -- | -- |
| Kr-85m | CI | -- | -- | -- | -- |
| Kr-85 | CI | -- | 2.99E-03 | 1.44E-03 | -- |
| Xe-133 | CI | 2.55E-02 | 1.63E-03 | -- | 2.31E-04 |
| Xe-133m | CI | -- | -- | -- | -- |
| Xe-135 | CI | -- | -- | -- | 2.12E-06 |
| TOTAL FOR PERIOD | CI | 2.55E-02 | 4.62E-03 | 1.44E-03 | 2.33E-04 |

LIQUID EFFLUENTS - DOSE SUMMATION

| | | |
|--------------------------|-------------|-------------------|
| Age group : Teenager | | |
| Location : Cooling Canal | | |
| Shoreline Deposition | Dose (mrem) | % of Annual Limit |
| TOTAL BODY | 1.41E-03 | 4.69E-02 |

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GASEOUS EFFLUENTS SUMMARY

UNIT 3
TABLE 3

A. FISSION AND ACTIVATION PRODUCTS

| | UNITS | Qtr 1 | Qtr 2 | Qtr 3 | Qtr 4 | Est. Error (%) |
|---|---------|----------|----------|----------|----------|----------------|
| 1. Total Release | CI | 9.11E+00 | 5.50E+00 | 0.00E+00 | 8.63E-03 | 7.00 |
| 2. Average release rate for the period | uCi/sec | 1.13E-06 | 6.84E-07 | -- | 1.07E-09 | |
| 3. Percent of Technical Specification Limit | % | 1.64E-10 | 1.13E-10 | 0.00E+00 | 6.08E-14 | |

B. IODINES

| | UNITS | Qtr 1 | Qtr 2 | Qtr 3 | Qtr 4 | Est. Error (%) |
|---|---------|----------|----------|----------|----------|----------------|
| 1. Total Release | CI | 2.37E-03 | 1.68E-05 | 3.23E-07 | 5.05E-07 | 2.00 |
| 2. Average release rate for the period | uCi/sec | 1.82E-08 | 1.28E-10 | 2.43E-12 | 3.81E-12 | |
| 3. Percent of Technical Specification Limit | % | 4.58E-03 | 3.25E-05 | 6.24E-07 | 9.77E-07 | |

C. PARTICULATES

| | UNITS | Qtr 1 | Qtr 2 | Qtr 3 | Qtr 4 | Est. Error (%) |
|---|---------|-------|----------|-------|----------|----------------|
| 1. Particulates with half-life >8 days | CI | -- | 2.18E-05 | -- | 6.10E-08 | 15.00 |
| 2. Average release rate for the period | uCi/sec | -- | 1.66E-10 | -- | 4.60E-13 | |
| 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 | -- | 3.06E-01 | 1.29E-01 | 2.83E-01 | 4.00 |
| 2. Average release rate for the period | uCi/sec | -- | 2.34E-06 | 9.74E-07 | 2.14E-06 | |
| 3. Percent of Technical Specification Limit | % | † | † | † | † | |

† NOTE : THESE PERCENTAGES ARE INCLUDED IN THE IODINE LIMIT CALCULATION

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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 | |
| Kr-85m | Ci | 3.88E-03 | -- | -- | -- | |
| Kr-85 | Ci | -- | -- | -- | 5.36E-03 | |
| Xe-131m | Ci | 1.41E-01 | 1.19E-01 | -- | 8.59E-05 | |
| Xe-133 | Ci | 8.25E+00 | 1.20E+00 | -- | 3.15E-03 | |
| Xe-133m | Ci | 1.23E-01 | -- | -- | 3.22E-05 | |
| Xe-135 | Ci | 1.01E-01 | 1.37E-03 | -- | 4.02E-06 | |
| Ar-41 | Ci | -- | 3.78E-02 | -- | -- | |
| TOTAL FOR PERIOD | | Ci | 8.62E+00 | 1.36E+00 | 0.00E+00 | 8.63E-03 |

| 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 | 4.95E-01 | 4.14E+00 | -- | -- |
| Xe-133m | Ci | -- | -- | -- | -- |
| Xe-135 | Ci | -- | -- | -- | -- |
| Xe-135m | Ci | -- | -- | -- | -- |
| Xe-138 | Ci | -- | -- | -- | -- |
| | | | | | |
| TOTAL FOR PERIOD | Ci | 4.95E-01 | 4.14E+00 | -- | -- |

B. IODINES

| NUCLIDES RELEASED | UNITS | CONTINUOUS MODE | | | |
|----------------------|-------|-----------------|----------|----------|----------|
| | | Qtr 1 | Qtr 2 | Qtr 3 | Qtr 4 |
| Br-82 | Ci | -- | -- | -- | -- |
| I-131 | Ci | 2.37E-03 | 1.68E-05 | 3.23E-07 | 5.05E-07 |
| I-133 | Ci | 1.59E-02 | -- | -- | -- |
| TOTAL FOR PERIOD | Ci | 1.82E-02 | 1.68E-05 | 3.23E-07 | 5.05E-07 |

C. PARTICULATES

| NUCLIDES RELEASED | UNITS | CONTINUOUS MODE | | | |
|----------------------|-------|-----------------|----------|-------|----------|
| | | Qtr 1 | Qtr 2 | Qtr 3 | Qtr 4 |
| Co-58 | Ci | -- | 3.51E-06 | -- | 6.10E-08 |
| Co-60 | Ci | -- | 6.30E-06 | -- | -- |
| Mn-54 | Ci | -- | 5.47E-06 | -- | -- |
| Cr-51 | Ci | -- | 6.52E-06 | -- | -- |
| TOTAL FOR PERIOD | Ci | -- | 2.18E-05 | -- | 6.10E-08 |

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DOSES DUE TO IODINE, TRITIUM, AND PARTICULATES

**UNIT 3
TABLE 5**

| PATHWAY | BONE | LIVER | THYROID | KIDNEY | LUNG | GILL | SKIN | TOTAL BODY |
|---------------------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| Cow milk - Infant (mrem) | 1.08E-04 | 1.36E-04 | 4.09E-02 | 3.49E-05 | 5.39E-06 | 1.23E-05 | -- | 7.82E-05 |
| Fruit & Veg Fresh (mrem) | 3.48E-06 | 6.09E-06 | 1.56E-03 | 9.77E-06 | 9.15E-07 | 2.91E-06 | -- | 3.62E-06 |
| Ground Plane (mrem) | 6.63E-06 | 6.63E-06 | 6.63E-06 | 6.63E-06 | 6.63E-06 | 6.63E-06 | 7.96E-06 | 6.63E-06 |
| Inhalation - Adult (mrem) | 6.24E-07 | 3.46E-06 | 2.40E-04 | 4.21E-06 | 2.77E-06 | 3.07E-06 | -- | 2.85E-06 |
| TOTAL (mrem) | 1.18E-04 | 1.52E-04 | 4.27E-02 | 5.56E-05 | 1.57E-05 | 2.49E-05 | 7.96E-06 | 9.13E-05 |
| % of Annual Limit | 7.89E-04 | 1.02E-03 | 2.85E-01 | 3.70E-04 | 1.05E-04 | 1.66E-04 | 5.31E-05 | 6.09E-04 |

DOSE DUE TO NOBLE GASES

| | mrads | % of Annual Limit |
|----------------|----------|-------------------|
| Gamma Air Dose | 1.01E-04 | 1.01E-03 |
| Beta Air Dose | 2.85E-04 | 2.85E-03 |

TURKEY POINT UNITS 3 AND 4
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT
JANUARY 1994 THROUGH DECEMBER 1994

LIQUID EFFLUENTS SUMMARY

**UNIT 4
TABLE 1**

A. FISSION AND ACTIVATION PRODUCTS

| | UNITS | Qtr 1 | Qtr 2 | Qtr 3 | Qtr 4 | Est. Error (%) |
|--|--------|----------|----------|----------|----------|----------------|
| 1. Total Release (not including tritium, gases, alpha) | CI | 7.48E-02 | 9.15E-02 | 5.89E-02 | 4.72E-02 | 7.00 |
| 2. Average diluted concentration during the period | uCi/ml | 6.18E-10 | 7.75E-11 | 4.27E-11 | 6.73E-11 | |
| 3. Percent of applicable limit | % | 2.32E-01 | 2.98E-01 | 8.70E-02 | 8.31E-02 | |

B. TRITIUM

| | UNITS | Qtr 1 | Qtr 2 | Qtr 3 | Qtr 4 | Est. Error (%) |
|--|--------|----------|----------|----------|----------|----------------|
| 1. Total Release | CI | 1.51E+02 | 1.06E+02 | 8.45E+01 | 3.44E+01 | 4.00 |
| 2. Average diluted concentration during the period | uCi/ml | 4.24E-06 | 3.23E-06 | 3.66E-06 | 1.02E-06 | |
| 3. Percent of applicable limit | % | 4.24E-01 | 3.23E-01 | 3.66E-01 | 1.02E-01 | |

C. DISSOLVED AND ENTRAINED GASES

| | UNITS | Qtr 1 | Qtr 2 | Qtr 3 | Qtr 4 | Est. Error (%) |
|--|--------|----------|----------|----------|----------|----------------|
| 1. Total Release | CI | 2.55E-02 | 4.62E-03 | 1.44E-03 | 2.33E-04 | 7.00 |
| 2. Average diluted concentration during the period | uCi/ml | 7.16E-10 | 1.41E-10 | 6.24E-11 | 6.90E-12 | |
| 3. Percent of applicable limit | % | 3.58E-04 | 7.07E-05 | 3.12E-05 | 3.45E-06 | |

D. GROSS ALPHA RADIOACTIVITY

| | UNITS | Qtr 1 | Qtr 2 | Qtr 3 | Qtr 4 | Est. Error (%) |
|------------------|-------|-------|-------|-------|-------|----------------|
| 1. Total Release | CI | -- | -- | -- | -- | 5.00 |

E. LIQUID VOLUMES

| | | Qtr 1 | Qtr 2 | Qtr 3 | Qtr 4 | Est. Error (%) |
|---|--------|----------|----------|----------|----------|----------------|
| 1. Batch waste released, prior to dilution | LITERS | 1.43E+06 | 1.74E+06 | 1.37E+06 | 2.06E+06 | 10.00 |
| 2. Continuous waste released, prior to dilution | LITERS | -- | -- | -- | -- | |
| 3. Dilution water used during period | LITERS | 3.56E+10 | 3.27E+10 | 2.31E+10 | 3.39E+10 | |

TURKEY POINT UNITS 3 AND 4
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT
JANUARY 1994 THROUGH DECEMBER 1994

LIQUID EFFLUENTS SUMMARY

UNIT 4
TABLE 2

| NUCLIDES RELEASED | UNITS | BATCH MODE | | | |
|----------------------|-------|------------|----------|----------|----------|
| | | Qtr 1 | Qtr 2 | Qtr 3 | Qtr 4 |
| Fe-55 | CI | 3.07E-02 | 4.31E-02 | 1.70E-02 | 1.02E-02 |
| Sr-89 | CI | -- | 1.54E-04 | 9.44E-05 | -- |
| Sr-90 | CI | 6.56E-05 | 9.17E-05 | 4.21E-05 | -- |
| Na-24 | CI | -- | 6.34E-05 | -- | -- |
| Cr-51 | CI | -- | 4.20E-04 | -- | 4.14E-04 |
| Mn-54 | CI | 1.09E-02 | 2.64E-02 | 1.90E-02 | 1.53E-02 |
| Co-57 | CI | 2.14E-05 | 2.04E-05 | 4.24E-05 | -- |
| Co-58 | CI | 2.08E-02 | 1.11E-02 | 1.25E-02 | 1.54E-02 |
| Fe-59 | CI | -- | 1.14E-05 | 2.47E-06 | 8.69E-06 |
| Co-60 | CI | 1.15E-02 | 6.80E-03 | 3.74E-03 | 2.41E-03 |
| Zn-65 | CI | -- | -- | -- | -- |
| Nb-95 | CI | -- | 4.74E-06 | 3.19E-05 | 9.58E-05 |
| Zr-97 | CI | -- | 2.13E-05 | -- | 4.11E-05 |
| Mo-99 | CI | -- | -- | -- | -- |
| Ru-103 | CI | -- | -- | -- | -- |
| Ag-110 | CI | 2.68E-04 | 1.53E-03 | 3.80E-04 | 2.15E-03 |
| Sn-113 | CI | -- | 3.69E-06 | -- | -- |
| Sn-117 | CI | -- | -- | -- | -- |
| Sb-124 | CI | -- | 6.70E-04 | 4.04E-05 | 1.87E-04 |
| Sb-125 | CI | 1.50E-04 | 7.76E-04 | 6.20E-04 | 3.42E-04 |
| I-131 | CI | -- | 7.70E-06 | -- | -- |
| I-133 | CI | -- | 1.49E-05 | -- | -- |
| I-134 | CI | -- | -- | -- | -- |
| Cs-134 | CI | 1.66E-04 | 2.86E-05 | 2.42E-03 | 7.97E-05 |
| I-135 | CI | -- | -- | -- | -- |
| Cs-137 | CI | 1.85E-04 | 2.33E-04 | 3.00E-03 | 5.06E-04 |
| La-140 | CI | -- | 3.99E-05 | 6.65E-07 | 1.12E-06 |
| Ce-141 | CI | -- | -- | -- | -- |
| Ce-144 | CI | -- | -- | -- | 4.63E-06 |
| W-187 | CI | 4.17E-06 | 5.51E-05 | -- | 9.80E-05 |
| Np-239 | CI | -- | -- | -- | -- |
| TOTAL FOR PERIOD | CI | 7.48E-02 | 9.15E-02 | 5.89E-02 | 4.71E-02 |

LIQUID EFFLUENTS - DISSOLVED GAS SUMMARY

| NUCLIDES RELEASED | UNITS | BATCH MODE | | | |
|----------------------|-------|------------|----------|----------|----------|
| | | Qtr 1 | Qtr 2 | Qtr 3 | Qtr 4 |
| Ar-41 | CI | -- | -- | -- | -- |
| Kr-85m | CI | -- | -- | -- | -- |
| Kr-85 | CI | -- | 2.99E-03 | 1.44E-03 | -- |
| Xe-133 | CI | 2.55E-02 | 1.63E-03 | -- | 2.31E-04 |
| Xe-133m | CI | -- | -- | -- | -- |
| Xe-135 | CI | -- | -- | -- | 2.12E-06 |
| TOTAL FOR PERIOD | CI | 2.55E-02 | 4.62E-03 | 1.44E-03 | 2.33E-04 |

LIQUID EFFLUENTS - DOSE SUMMATION

| | | |
|--------------------------|-------------|-------------------|
| Age group : Teenager | | |
| Location : Cooling Canal | | |
| Shoreline Deposition | Dose (mrem) | % of Annual Limit |
| TOTAL BODY | 1.41E-03 | 4.69E-02 |

TURKEY POINT UNITS 3 AND 4
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT
JANUARY 1994 THROUGH DECEMBER 1994

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 | 9.11E+00 | 3.97E+00 | 0.00E+00 | 3.86E-02 | 7.00 |
| 2. Average release rate for the period | uCi/sec | 1.13E-06 | 4.94E-07 | -- | 4.81E-09 | |
| 3. Percent of Technical Specification Limit | % | 1.64E-10 | 6.87E-11 | -- | 9.17E-12 | |

B. IODINES

| | UNITS | Qtr 1 | Qtr 2 | Qtr 3 | Qtr 4 | Est. Error (%) |
|---|---------|----------|----------|----------|----------|----------------|
| 1. Total Release | CI | 2.37E-03 | 1.13E-05 | 3.23E-07 | 5.05E-07 | 2.00 |
| 2. Average release rate for the period | uCi/sec | 1.82E-08 | 8.62E-11 | 2.43E-12 | 3.81E-12 | |
| 3. Percent of Technical Specification Limit | % | 4.58E-03 | 2.19E-05 | 6.24E-07 | 9.77E-07 | |

C. PARTICULATES

| | UNITS | Qtr 1 | Qtr 2 | Qtr 3 | Qtr 4 | Est. Error (%) |
|---|---------|-------|----------|-------|----------|----------------|
| 1. Particulates with half-life >8 days | CI | -- | 2.18E-05 | -- | 6.10E-08 | 15.00 |
| 2. Average release rate for the period | uCi/sec | -- | 1.66E-10 | -- | 4.66E-13 | |
| 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 | -- | 2.54E-03 | 1.29E-01 | 1.84E-01 | 4.00 |
| 2. Average release rate for the period | uCi/sec | -- | 1.96E-08 | 9.95E-07 | 1.42E-06 | |
| 3. Percent of Technical Specification Limit | % | † | † | † | † | |

† NOTE : THESE PERCENTAGES ARE INCLUDED IN THE IODINE LIMIT CALCULATION

TURKEY POINT UNITS 3 AND 4
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT
JANUARY 1994 THROUGH DECEMBER 1994

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 | -- | -- | -- | 1.71E-02 |
| Kr-85 | Ci | -- | -- | -- | 5.36E-03 |
| Xe-131m | Ci | 1.41E-01 | -- | -- | 8.59E-05 |
| Xe-133 | Ci | 8.25E+00 | 6.15E-02 | -- | 1.61E-02 |
| Xe-133m | Ci | 1.23E-01 | -- | -- | 3.22E-05 |
| Xe-135 | Ci | 1.01E-01 | 1.37E-03 | -- | 4.02E-06 |
| Xe-135m | Ci | -- | -- | -- | -- |
| TOTAL FOR PERIOD | Ci | 8.62E+00 | 6.29E-02 | -- | 3.86E-02 |

| 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 | 4.95E-01 | 3.91E+00 | -- | -- |
| Xe-133m | Ci | -- | -- | -- | -- |
| Xe-135 | Ci | -- | -- | -- | -- |
| Xe-135m | Ci | -- | -- | -- | -- |
| Xe-138 | Ci | -- | -- | -- | -- |
| | | | | | |
| TOTAL FOR PERIOD | Ci | 4.95E-01 | 3.91E+00 | -- | -- |

B. IODINES

| NUCLIDES RELEASED | UNITS | CONTINUOUS MODE | | | |
|----------------------|-------|-----------------|----------|----------|----------|
| | | Qtr 1 | Qtr 2 | Qtr 3 | Qtr 4 |
| Br-82 | Ci | -- | -- | -- | -- |
| I-131 | Ci | 2.37E-03 | 1.13E-05 | 3.23E-07 | 5.05E-07 |
| I-133 | Ci | 1.59E-02 | -- | -- | -- |
| TOTAL FOR PERIOD | Ci | 1.82E-02 | 1.13E-05 | 3.23E-07 | 5.05E-07 |

C. PARTICULATES

| NUCLIDES RELEASED | UNITS | CONTINUOUS MODE | | | |
|----------------------|-------|-----------------|----------|-------|----------|
| | | Qtr 1 | Qtr 2 | Qtr 3 | Qtr 4 |
| Co-58 | Ci | -- | 3.51E-06 | -- | 6.10E-08 |
| Co-60 | Ci | -- | 6.30E-06 | -- | -- |
| Mn-54 | Ci | -- | 5.47E-06 | -- | -- |
| Cr-51 | Ci | -- | 6.52E-06 | -- | -- |
| TOTAL FOR PERIOD | Ci | -- | 2.18E-05 | -- | 6.10E-08 |

TURKEY POINT UNITS 3 AND 4
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT
JANUARY 1994 THROUGH DECEMBER 1994

DOSES DUE TO IODINE, TRITIUM, AND PARTICULATES

**UNIT 4
TABLE 5**

| PATHWAY | BONE | LIVER | THYROID | KIDNEY | LUNG | GILL | SKIN | TOTAL BODY |
|---------------------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| Cow milk - Infant (mrem) | 1.07E-04 | 1.33E-04 | 4.08E-02 | 3.35E-05 | 2.37E-06 | 9.23E-06 | -- | 7.50E-05 |
| Fruit & Veg Fresh (mrem) | 3.48E-06 | 5.57E-06 | 1.56E-03 | 8.88E-06 | 4.01E-07 | 2.40E-06 | -- | 3.10E-06 |
| Ground Plane (mrem) | 3.57E-06 | 3.57E-06 | 3.57E-06 | 3.57E-06 | 3.57E-06 | 3.57E-06 | 4.24E-06 | 3.57E-06 |
| Inhalation - Adult (mrem) | 6.24E-07 | 3.46E-06 | 2.40E-04 | 4.21E-06 | 2.77E-06 | 3.07E-06 | -- | 2.85E-06 |
| TOTAL (mrem) | 1.15E-04 | 1.46E-04 | 4.27E-02 | 5.02E-05 | 9.11E-06 | 1.83E-05 | 4.24E-06 | 8.45E-05 |
| % of Annual Limit | 7.67E-04 | 9.71E-04 | 2.84E-01 | 3.35E-04 | 6.07E-05 | 1.22E-04 | 2.83E-05 | 5.63E-04 |

DOSES DUE TO NOBLE GASES

| | mrad | % of Annual Limit |
|----------------|----------|-------------------|
| Gamma Air Dose | 1.53E-04 | 1.53E-03 |
| Beta Air Dose | 2.56E-04 | 2.56E-03 |

TURKEY POINT UNITS 3 AND 4
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT
JANUARY 1994 THROUGH DECEMBER 1994

DOSES DUE TO IODINE, TRITIUM, AND PARTICULATES

SUMMATION
TABLE 5

| PATHWAY | BONE | LIVER | THYROID | KIDNEY | LUNG | GI-LLI | SKIN | TOTAL BODY |
|--------------------------|----------|----------|----------|----------|----------|----------|----------|------------|
| Cow milk - Infant | 2.15E-04 | 2.69E-04 | 8.18E-02 | 6.85E-05 | 7.76E-06 | 2.15E-05 | -- | 1.53E-04 |
| Fruit & Veg Fresh | 6.96E-06 | 1.17E-05 | 3.12E-03 | 1.87E-05 | 1.32E-06 | 5.31E-06 | -- | 6.73E-06 |
| Ground Plane | 1.02E-05 | 1.02E-05 | 1.02E-05 | 1.02E-05 | 1.02E-05 | 1.02E-05 | 1.22E-05 | 1.02E-05 |
| Inhalation - Adult | 1.25E-06 | 6.91E-06 | 4.79E-04 | 8.41E-06 | 5.54E-06 | 6.14E-06 | -- | 5.71E-06 |
| TOTAL (mrem) | 2.33E-04 | 2.98E-04 | 8.54E-02 | 1.06E-04 | 2.48E-05 | 4.32E-05 | 1.22E-05 | 1.76E-04 |
| % of Annual Limit | 1.56E-03 | 1.99E-03 | 5.69E-01 | 7.05E-04 | 1.65E-04 | 2.88E-04 | 8.13E-05 | 1.17E-03 |

DOSES DUE TO NOBLE GASES

| | mrad | % of Annual Limit |
|----------------|----------|-------------------|
| Gamma Air Dose | 2.55E-04 | 2.55E-03 |
| Beta Air Dose | 5.41E-04 | 5.41E-03 |

**TURKEY POINT UNITS 3 AND 4
ANNUAL RADIOACTIVE EFFLUENTS RELEASE REPORT
TABLE 6**

SOLID WASTE AND IRRADIATED FUEL SHIPMENTS

A. Solid Waste Shipped Off-Site for Burial or Disposal

| 1. | Type of Waste | Units | 12 Mo. Period | Error % |
|----|---|----------------------|----------------------|---------|
| a. | Spent Resin, Process Filters (Note 1) | m ³ Ci | 9.637E+0 3.769E+1 | 2.0 E+1 |
| b. | Dry Compressible Waste (Note 2) | m ³ Ci | 5.821E+1 1.200E+0 | 2.0 E+1 |
| c. | Irradiated Components | m ³ Ci | 8.269E-1 1.484E+3 | 2.0 E+1 |
| d. | Other | | | |
| 1. | Non-Compressible Waste | m ³ Ci | 1.139E+1 7.385E+0 | 2.0 E+1 |

2. Estimate of Major Nuclide Composition By Type of Waste

| | Units | Value |
|--------|-------|-------|
| a. | | |
| Fe 55 | % | 34.8 |
| Ni 63 | % | 30.7 |
| Co 60 | % | 18.2 |
| Co 58 | % | 7.4 |
| Cs 137 | % | 5.1 |
| Cs 134 | % | 2.8 |
| b. | | |
| Fe 55 | % | 44.4 |
| Co 60 | % | 32.0 |
| Ni 63 | % | 15.9 |
| Co 58 | % | 2.5 |
| Cs 137 | % | 2.3 |
| Sb 125 | % | 1.0 |
| Ni 59 | % | 0.9 |

**TURKEY POINT UNITS 3 AND 4
ANNUAL RADIOACTIVE EFFLUENTS RELEASE REPORT
TABLE 6**

2. Estimate of Major Nuclide Composition (continued)

| | Units | Value |
|------------|-------|-------|
| c. Cr 51 | % | 30.5 |
| Co 58 | % | 20.2 |
| Fe 55 | % | 12.5 |
| Co 60 | % | 11.7 |
| Nb 95 | % | 9.2 |
| Zr 95 | % | 7.4 |
| Ni 63 | % | 6.6 |
| Ce 144 | % | 1.0 |
| d.1. Fe 55 | % | 56.8 |
| Co 60 | % | 31.5 |
| Ag 110m | % | 5.4 |
| Ni 63 | % | 3.2 |
| Mn 54 | % | 2.8 |

3. Solid Waste Disposition

| Number of Shipments | Mode of Transportation | Destination |
|---------------------|------------------------|-----------------------|
| 6 Sole Use Truck | | Barnwell, S.C. |
| 22 (Note 3) | Sole Use Truck | S.E.G., Oak Ridge, TN |

B. Irradiated Fuel Shipments

None

**TURKEY POINT UNITS 3 AND 4
ANNUAL RADIOACTIVE EFFLUENTS RELEASE REPORT
TABLE 6**

SOLID WASTE SUPPLEMENT

| Waste Class | Total Volume Ft ³ | Total Curies (Note 4) | Principal Radionuclides (Note 5) | Type of Waste (Note 6) | Category Reg-Guide 1.21 | Type of Container (Note 7) | Solidification Agent |
|-------------|---------------------------------|--------------------------|---|--------------------------------|-------------------------------|--|----------------------|
| Class A | 2055.8 | 1.20 | None | PWR Compactible Trash | 1.b | Non-Specification Strong Tight Package | None |
| Class A | 402.1 | 7.38 | Ni ⁶³ , Pu ²⁴¹ , TRU* | PWR Noncompactible Trash | 1.d.1 | NRC Certified LSA >Type A | None |
| Class A | 205.8 | 6.04 | Ni ⁶³ , Cs ¹³⁷ | PWR Ion Exchange Resins | 1.a | NRC Certified LSA >Type A | None |
| Class C | 135.8 | 31.65 | C ¹⁴ , Co ⁶⁰ , Ni ⁶³ , Sr ⁹⁰ , Cs ¹³⁷ , Sum of Nuclides with T ^{1/2} <5 Years, TRU* | PWR Filter Cartridges | 1.a | NRC Certified LSA >Type A | None |
| Class C | 29.2 | 1483.71 | Co ⁶⁰ , Ni ⁶³ , Sum of Nuclides with T ^{1/2} <5 Years | LWR Nonfuel Reactor Components | 1.c | Type B | None |

*TRU - Alpha-emitting transuranic nuclides with T^{1/2} >5 years.

**TURKEY POINT UNITS 3 AND 4
ANNUAL RADIOACTIVE EFFLUENTS RELEASE REPORT
TABLE 6**

SOLID WASTE AND IRRADIATED FUEL SHIPMENTS

- Note 1: Spent resin and process filter volume indicates the volume of waste shipped directly to the disposal site.
- Note 2: Dry compressible waste volume indicates the volume of waste shipped to the disposal site following reduction by a waste processing facility. The volume shipped to the waste processing facility was 1,105.6 m³.
- Note 3: Material shipped to Oak Ridge, Tennessee was consigned to a licensed processing facility for volume reduction or decontamination activities. The material remaining after processing was shipped by the processor to Barnwell, South Carolina for disposal.
- Note 4: The total curie quantity and the 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. In general, 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 both on-site analysis for principle gamma emitters and periodic off-site analyses for difficult to measure radionuclides. The on-site analyses are performed either on a batch basis or routine basis using representative samples appropriate for the waste type. Off-site analyses are used to establish scaling factors or other methods for estimating difficult to measure radionuclides.

- Note 5: "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 for the nuclide listed in Table 2 of 10 CFR 61.55.
- Note 6: "Type of Waste" is generally specified as described in NUREG 0782, Draft Environmental Impact Statement on 10 CFR 61, "Licensing Requirements for Land Disposal of Radioactive Waste".
- Note 7: "Type of Container" refers to the transport package.

**TURKEY POINT UNITS 3 AND 4
ANNUAL RADIOACTIVE EFFLUENTS RELEASE REPORT
JANUARY 1994 THROUGH DECEMBER 1994**

ATTACHMENT 1

The following information is provided in Attachment 1:

- ▶ PNSC approval for the ODCM revisions
- ▶ The revised List Of Effective Pages for the ODCM
- ▶ The revised pages of the ODCM

Pages dated 1/1/94 were reported with the 1993 Turkey Point Unit 3 and 4 Annual Radioactive effluent Release Report.

TO: PNSC

DATE:

PTN-NC-94-075

Aug 9, 1994

FROM: J. E. Berg

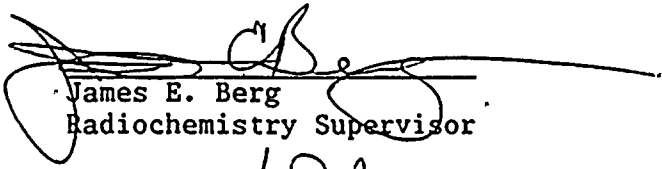
DEPARTMENT:

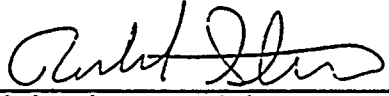
Nuclear Chemistry

SUBJECT: Off Site Dose Calculation Manual

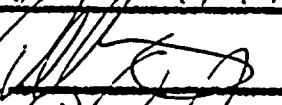

Attached are revised pages of the Off Site Dose Calculation Manual, (ODCM), necessary to implement setpoint calculations for iodine and particulate channel alarm setpoints. This revision is in response to Condition Report 94-689 and will ensure that the limits of Tech Spec 3.11.2.1.b will not be exceeded. A table outlining how radiation monitor setpoints are determined is also included to this revision.

This revision was reviewed by Site Licensing, and Corporate Chemistry/HP with all comments resolved or incorporated as appropriate.


James E. Berg
Radiochemistry Supervisor


Richard N. Steinke
Chemistry Supervisor

MTG# 94-147 8/9/94

| | | | |
|-----------------------|---|------|--------|
| FNSC APPROVAL |  | DATE | 8/9/94 |
| PLT. MGR. APPROVAL |  | DATE | 8/9/94 |

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

REVISION 5

AMENDMENT 1

CHANGE DATED 08/09/94

Florida Power and Light Company

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- o The dose to a person from tritium via the vegetation (fruit 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 $\chi/Q = 1 \times 10^{-7} \text{ sec/m}^3$.
- o The dose commitment via a given pathway as a result of measured discharges from a release point is accumulated with

$$D_{an} = \sum_k D_{ank} \quad (26)$$

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

3.6 Effluent Gas Monitor Alarm Setpoints

The radioactive gaseous effluent monitoring instrumentation channels alarm setpoints are set in accordance with Specification 3.3.3.6, to ensure the limits of Specification 3.11.2.1 are not exceeded.

Each radioactive noble gas effluent monitor setpoint is derived on the basis of total body dose equivalent rate at or beyond the site boundary. The setpoint derivation assumes that noble gas releases occur at ground-level.

For the purpose of deriving a setpoint, the distribution of radioactive noble gases in an effluent stream may be determined in one of the following ways:

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.

Each monitoring channel has a unique response, h , which is determined by the instrument calibration.

Atmospheric dispersion depends upon the local atmospheric conditions. For the purpose of calculating a radioactive noble gas effluent monitor setpoint, the atmospheric dispersion factor, χ/Q , will be based on prevailing meteorological conditions or on reference meteorological conditions. The minimum atmospheric dispersion off-site derived from reference meteorological conditions at the site boundary is 5.8×10^{-7} sec/m³ at a location 1950 meters south southeast of the plant.

The applicable dose conversion factors, DF_i , for deriving setpoints are in Table 3-5.

The limiting factor for Equation 27 is the total body dose rate limit of 500 mrem/year which is included in the 1.06 conversion factor. The use of the total body dose assumes that the total body dose will be the controlling dose rate and the dominant contributor to this dose will be Xe-133.

Each iodine and particulate effluent monitor setpoint may be calculated using the equation below, or a method which gives a lower setpoint value. Since the iodine and particulate channels are not required by Technical Specification 3.3.3.6, the primary method to ensure Technical Specification 3.11.2.1 is met is the performance of the sampling and analysis program in table 4.11-2 and the noble gas alarm setpoints.

$$S = \frac{DR \cdot h \cdot S_f \cdot 3600 \cdot t \cdot V_R}{TA_{anip} \cdot \chi_d/Q} + BKG \quad (28)$$

where:

DR = the dose rate limit the effluent pathway is limited to; 1500 mrem/year.

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 exposed via pathway p (inhalation), as described in section 3.3.3,

$$\left(\frac{\text{mrem/yr}}{\mu\text{Ci/m}^3} \right) ; \text{ See Appendix A.}$$

3600 = conversion constant, (sec/hr).

h = monitor response to activity deposited on the sample collection media, cpm/uCi.

t = period of time over which the effluent release takes place, (hours).

X_d/Q = atmospheric dispersion factor adjusted for depletion by deposition at the off-site location of interest (sec/m³).

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.

V_R = Ratio of sample volume to release volume.

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

| <u>Channel</u> | <u>Setpoint Determination</u> |
|-------------------|---|
| 3/4-R-11 | Determined from Technical Specifications |
| 3/4-R-12 | Determined from Technical Specifications |
| R-14 | From ODCM Section 3.6 |
| 3/4-R-15 | Between 2 and 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 | From ODCM Section 2.6 |
| 3/4-R-19 | From ODCM Section 2.6 |
| 3/4-R-20 | Between 2 and 5 times the monitor Background at the time of Calibration |
| SPING ch. 1,2,3,6 | From ODCM Section 3.6 or default maximum |
| Sping ch. 5,7,9 | From ODCM Section 3.6 |

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.

3.7 Projected Dose for Gaseous Effluents

Technical Specification 3.11.2.4 requires that the gas decay tank system shall be operable and used to reduce radioactive materials in gaseous waste prior to their discharge if the projected gaseous effluent dose per reactor due to gaseous effluent releases to areas at and beyond the site boundary when averaged over 31 days exceeds 0.2 mrad for gamma radiation and 0.4 mrad for beta radiation, and the ventilation exhaust treatment system shall be used to reduce radioactive materials in gaseous waste prior to their discharge if the projected gaseous effluent dose per reactor due to gaseous effluent releases to areas at and beyond the site boundary when averaged over 31 days exceeds 0.3 mrem to any organ.

Technical Specification 4.11.2.4.1 requires the doses, to areas at and beyond the site boundary, due to radioactive material released in gaseous effluent to be projected at least once per 31 days.

This requirement is satisfied by extrapolating the dose to date during the current month to include the entire month. The dose to date is calculated as described in Sections 3.4.1, 3.4.2, and 3.5.2.

The dose is projected with the relation:

$$P = \frac{31 \cdot D}{X} \quad (30)$$

where:

P = the projected dose during the month, (mrem)

31 = number of days in a calendar month, (days)

X = number of days in current month to date represented by available radioactive effluent sample, (days)

D = dose to date during current month calculated according to Sections 3.4.1, 3.4.2, and 3.5.2, (mrem), i.e., gamma, beta, or organ dose respectively.

Alternately, the monthly dose may be projected by computing the dose accumulated during the most recent month and assuming the result represents the projected dose for the current month. The dose during the proceeding month will be computed as described in Sections 3.4.1, 3.4.2, and 3.5.2.

The limiting factor when using equation 27 to determine a setpoint is the total body dose rate limit of 500 mrem/yr which is included in the 1.06 conversion factor. The use of total body dose assumes that the total body dose will be the controlling dose rate and the dominant contributor to this dose will be Xe-133.

Each iodine and particulate effluent monitor setpoint may be calculated using the equation below, or a method which gives a lower setpoint value.

$$S = \frac{DR \cdot h \cdot S_f \cdot 3600 \cdot t \cdot V_R}{TA_{anip} \cdot X_d/Q} + BKG \quad (28)$$

where:

DR = the dose rate limit the effluent pathway is limited to; 1500 mrem/year.

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 exposed via pathway p (inhalation), as described in section 3.3.3,

$$\left(\frac{\text{mrem/yr}}{\mu\text{Ci/m}^3} \right) ; \text{ See Appendix A.}$$

3600 = conversion constant, (sec/hr).

h = monitor response to activity deposited on the sample collection media, cpm/uCi.

t = period of time over which the effluent release takes place, (hours).

X_d/Q = atmospheric dispersion factor adjusted for depletion by deposition at the off-site location of interest (sec/m³).

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.

V_R = Ratio of sample volume to release volume.

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

| <u>Channel</u> | <u>Setpoint Determination</u> |
|-------------------|---|
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| 3/4-R-19 | From ODCM Section 2.6 |
| 3/4-R-20 | Between 2 and 5 times the monitor Background at the time of Calibration |
| SPING ch. 1,2,3,6 | From ODCM Section 3.6 or default maximum |
| Sping ch. 5,7,9 | From ODCM Section 3.6 |

Equation 28 is based on limiting dose due to iodine, tritium and particulates to less than 1500 mrem/year. These factors in this equation assume that a hypothetical infant located at the site boundary where the minimum atmospheric dispersion occurs is the receptor. This approach assures the most conservative estimate of dose. When this assumption is used, the infant thyroid via the inhalation pathway is the critical organ and controlling pathway respectively. The dose transfer factor is based solely on the radioiodines (I-131, I-133) because the radioiodines contribute essentially all of the dose to the infant's thyroid, when estimating dose due to iodines, tritium, and particulates with half lives greater than 8 days.

