ENCLOSURE 3

TENNESSEE VALLEY AUTHORITY
BROWNS FERRY NUCLEAR PLANT (BFN)
UNITS 1, 2, AND 3

EFFLUENT AND WASTE DISPOSAL ANNUAL REPORT
2004

EFFLUENT AND WASTE DISPOSAL ANNUAL REPORT
YEAR 2004

I. Regulatory and BFN ODCM Limits

A. Fission and Activation Gases in Gaseous Effluent:

The release of fission and activation gases is regulated by the dose limits of 10 CFR 50 Appendix I and BFN Offsite Dose Calculation Manual (ODCM). The air dose to areas at and beyond the site boundary due to noble gases released in gaseous effluents per unit, shall be limited during any calendar quarter to $\leq$ 5 millirad (mrad) for gamma radiation and $\leq$ 10 mrad for beta radiation; and during any calendar year to $\leq$ 10 mrad for gamma radiation and $\leq$ 20 mrad for beta radiation.

B. Iodines and Particulates with Half-Lives Greater than Eight Days in Gaseous Effluents.

The release of iodines and particulates in gaseous effluent is regulated by the dose limits of 10 CFR 50 Appendix I and the BFN ODCM. The dose to a member of the public from radioiodines, radioactive materials in particulate form, and radionuclides other than noble gases with half-lives greater than eight days in gaseous effluent released per unit to areas at and beyond the site boundary shall be limited to any organ during any calendar quarter to $\leq$ 7.5 millirem (mrem), and during any calendar year to $\leq$ 15 mrem.

C. Liquid Effluents

The release of radioactive liquid effluents is regulated by the dose limits of 10 CFR 50 Appendix I and the BFN ODCM. The doses or dose commitment to a member of the public from radioactive materials in liquid effluents released from each unit to unrestricted areas shall be limited during any calendar quarter to $\leq$ 1.5 mrem to the total body and $\leq$5 mrem to any organ and during any calendar year to $\leq$ 3 mrem to the total body and $\leq$ 10 mrem to any organ.

II. Limitation on Dose Rate

A. Fission and Activation Gases in Gaseous Effluent:

1. The instantaneous release rate of fission and activation gases is based on the dose rate limits of 10 CFR 20.1301 and the BFN ODCM. The dose rate at any time to areas at and beyond the site boundary due to noble gases released in gaseous effluents from the site shall be limited to $\leq$ 500 mrem per year to the total body and $\leq$ 3000 mrem per year to the skin.

2. The BFN ODCM Section 7.2 determines the maximum noble gas release rate.

II. Limitations on Dose Rate (Continued)

B. Iodines and Particulates with Half-Lives Greater than Eight Days in gaseous effluents.

1. The instantaneous release rate of particulates and iodines is regulated by the dose rate limits of the BFN ODCM. The dose rate at any time to areas at and beyond the site boundary, due to I-131, I-133, H-3 and particulates with greater than eight days half-lives released in gaseous effluents from the site, shall be limited to $\leq$ 1500 mrem per year to any organ.

2. The BFN ODCM Section 7.3 determines the maximum particulate and iodine dose rates.

C. Liquid Effluents

1. The concentration of radionuclides in liquid effluents released at any time from the site to unrestricted areas shall be limited to the concentrations specified in 10 CFR 20.1001 - 20.2402, Appendix B, Table 2, Column 2 for radionuclides other than dissolved or entrained noble gases.

2. For dissolved or entrained noble gases, the concentration shall be limited to 2E-4 μCi per milliliter (ml) total activity.

III. Measurements and Approximations of Total Radioactivity

A. Fission and Activation Gases:

1. Noble gases in the building vent and stack (elevated) gaseous effluents are continuously monitored. The flow rate of the stack is continuously monitored and the building vent effluent flow rates are calculated once a shift based on the configuration of operating exhaust fans. The vent flow is calculated for each release. Gas grab samples of the stack are taken and analyzed weekly. Gas grab samples of in-service vents are taken and analyzed monthly. The specific noble gas activity concentrations and total volume of the gases are used to calculate the total curies of noble gases released.

2. The tritium concentration is determined by the analysis of a monthly grab sample for each release point.

III. Measurements and Approximations of Total Radioactivity (continued)

B. Iodines and Particulates

1. Iodines and particulates are continuously sampled on impregnated charcoal filters and particulate filters, respectively. The charcoal and particulate samples are replaced at least weekly and analyzed to determine specific activity concentrations. The specific activity concentrations and vent flow rate data are used weekly to verify that release rate limits were not exceeded. The specific activity concentrations and total volume of gaseous effluent are used on a monthly basis to determine the total curies of each particulate and iodine released during the month.

2. The gross alpha concentration is determined by analysis of a monthly particulate filter composite sample and strontium -89 and -90 are determined by analysis of a quarterly particulate filter composite sample for each release point.

C. Liquid Effluents

1. The gamma ray emitting radionuclide concentrations are determined for each batch by gamma ray spectroscopy analysis of a grab sample. The allowable release rate is calculated for each batch based upon the known dilution flow. The flow rate of the liquid effluent is continuously monitored and the total volume released in each batch is determined. The total gamma activity released in each batch is determined by multiplying the radionuclide concentrations by the total volume discharged. The total gamma activity released during the month is then determined by summing the gamma activity content of each batch discharged during the month.

2. The gross alpha and tritium concentrations are measured on a monthly composite sample. The strontium -89 and -90 and iron -55 are measured on a quarterly composite sample.

D. The Radioactive Gaseous and Liquid Waste Monitoring Sampling and Analysis Program is specified in ODCM Sections 1/2.2.1 and 1/2.2.2.

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SUPPLEMENTAL INFORMATION
YEAR 2004

IV. Batch

A. Liquid	Units	Quarter 1	Quarter 2	Quarter 3	Quarter 4
1. Number of batches released	Each	0	0	0	0
2. Total time for batches released	Minutes	0	0	0	0
3. Maximum time period for a batch release	Minutes	0	0	0	0
4. Average time period for a batch release	Minutes	0	0	0	0
5. Minimum time period for a batch release	Minutes	0	0	0	0
6. Average stream flow during period of release into a flowing stream	Cubic feet per second	0	0	0	0

B. Gaseous

None

C. Abnormal/Unplanned Releases

Type	Number of Releases	Total Activity Releases (Curies)
Liquid	None	None
Gaseous	None	None

EFFLUENT AND WASTE DISPOSAL ANNUAL REPORT
LIQUID EFFLUENTS - SUMMATION OF ALL RELEASES
YEAR 2004

	Units	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Error %
A. Fission and Activation Products (Does not include tritium, gases, Alpha)						
1. Total Release	Curies	NR*	NR	NR	NR	9
2. Average Diluted Concentration Released During Period	µCi/ml	NR	NR	NR	NR	
3. Percent of Applicable Limit	%	**	**	**	**	
B. Tritium						
1. Total Releases	Curies	NR	NR	NR	NR	6
2. Average Diluted Concentration Released During Period	µCi/ml	NR	NR	NR	NR	
3. Percent of Applicable Limit	%	**	**	**	**	
C. Dissolved and Entrained Noble Gases						
1. Total Releases	Curies	NR	NR	NR	NR	8
2. Average Diluted Concentration Released During Period	µCi/ml	NR	NR	NR	NR	
3. Percent of Applicable Limit	%	**	**	**	**	
D. Gross Alpha Radioactivity						
1. Total Releases	Curies	NR	NR	NR	NR	48
2. Average Diluted Concentration Released During Period	µCi/ml	NR	NR	NR	NR	
E. Volume of Liquid Waste to Discharge Canal (Prior to dilution)	Liters	NR	NR	NR	NR	3
F. Volume of Dilution Water for Period	Liters	NR	NR	NR	NR	10
G. Total CCW	gigagallons	NR	NR	NR	NR	

*NR -- No liquid releases were made in the 1st 2nd 3rd and 4th quarters.
** The applicable limit is expressed in terms of dose. See Enclosure 1, Tables 5 through 8.

EFFLUENT AND WASTE DISPOSAL ANNUAL REPORT
LIQUID RELEASES FOR YEAR 2004 - BATCH MODE

CURIES Isotope (Required by Regulatory (REG) Guide 1.21)		Quarter 1	Quarter 2	Quarter 3	Quarter 4
1.	Ba-140	NR*	NR	NR	NR
2.	Ce-141	NR	NR	NR	NR
3.	Co-58	NR	NR	NR	NR
4.	Co-60	NR	NR	NR	NR
5.	Cr-51	NR	NR	NR	NR
6.	Cs-134	NR	NR	NR	NR
7.	Cs-137	NR	NR	NR	NR
8.	Fe-59	NR	NR	NR	NR
9.	I-131	NR	NR	NR	NR
10.	La-140	NR	NR	NR	NR
11.	Mn-54	NR	NR	NR	NR
12.	Mo-99	NR	NR	NR	NR
13.	Nb-95	NR	NR	NR	NR
14.	Sr-89	NR	NR	NR	NR
15.	Sr-90	NR	NR	NR	NR
16.	Tc-99m	NR	NR	NR	NR
17.	Xe-133	NR	NR	NR	NR
18.	Xe-135	NR	NR	NR	NR
19.	Zn-65	NR	NR	NR	NR
20.	Zr-95	NR	NR	NR	NR

Others (Not Required by REG Guide 1.21)

NONE

*NR -- No liquid releases were made during the 1st 2nd 3rd and 4th quarters.

EFFLUENT AND WASTE DISPOSAL ANNUAL REPORT
GASEOUS EFFLUENTS - SUMMATION OF ALL RELEASES
YEAR 2004

	Units	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Error %
A. Fission and Activation Gases						
1. Total Releases	Curies	3.84E+00	ND	1.54E+01	ND	45
2. Average Release Rate for Period	µCi/sec	4.89E-01	ND	1.94E+00	ND	
3. Percent of Applicable Limit	%	*	*	*	*	
B. Iodines						
1. Total Iodine-131	Curies	1.91E-03	5.49E-04	1.11E-03	1.09E-03	36
2. Average Release Rate for Period	µCi/sec	2.43E-04	6.98E-05	1.39E-04	1.38E-04	
3. Percent of Applicable Limit	%	*	*	*	*	
C. Particulates						
1. Particulates with half-lives > eight days	Curies	1.65E-03	8.36E-04	1.36E-03	1.07E-03	35
2. Average Release Rate for Period	µCi/sec	2.10E-04	1.06E-04	1.71E-04	1.34E-04	
3. Percent of Applicable Limit	%	*	*	*	*	
4. Gross Alpha Radioactivity	Curies	ND**	ND	ND	ND	
D. Tritium						
1. Total Release	Curies	2.36E+01	1.03E+01	1.20E+01	8.61E+00	21
2. Average Release Rate for Period	µCi/sec	3.00E+00	1.31E+00	1.51E+00	1.08E+00	
3. Percent of Applicable Limit	%	*	*	*	*	

*Applicable Limits are expressed in terms of dose. See Enclosure 1, Tables 1 through 4.
**ND – Not Detected.

EFFLUENT AND WASTE DISPOSAL ANNUAL REPORT
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GASEOUS EFFLUENTS - ELEVATED RELEASE

CURIES	Quarter 1	Quarter 2	Quarter 3	Quarter 4
1. Fission Gases				
Kr-85m	3.84E+00	ND	ND	ND
Kr-85	ND*	ND	ND	ND
Kr-87	ND	ND	ND	ND
Kr-88	ND	ND	ND	ND
Xe-133	ND	ND	1.54E+01	ND
Xe-135m	ND	ND	ND	ND
Xe-135	ND	ND	ND	ND
Xe-138	ND	ND	ND	ND
Others (specify)				
NONE				
Total for Period	3.84E+00	ND	1.54E+01	ND
2. Iodines				
I-131	2.36E-04	1.96E-04	2.75E-04	2.29E-04
I-133	3.06E-04	3.48E-04	4.15E-04	4.19E-04
Total for Period	5.42E-04	5.44E-04	6.90E-04	6.48E-04

*ND – Not Detected.

EFFLUENT AND WASTE DISPOSAL ANNUAL REPORT
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GASEOUS EFFLUENTS - ELEVATED RELEASE

	CURIES	Quarter 1	Quarter 2	Quarter 3	Quarter 4
3.	Particulates*				
	Sr-89	3.03E-05	3.52E-05	5.51E-05	5.36E-05
	Sr-90	ND**	ND	ND	ND
	Cs-134	ND	ND	ND	ND
	Cs-137	ND	ND	ND	ND
	Ba-140	6.46E-05	8.54E-05	7.25E-05	3.73E-05
	La-140	2.56E-05	5.43E-05	3.62E-05	2.23E-05
	Others (specify)				
	Rb-88	6.32E-02	ND	ND	ND
	Rb-89	2.03E-02	9.82E-02	1.69E-02	5.61E-02
	Sr-91	8.16E-05	6.45E-04	7.95E-04	1.67E-04
	Y-91m	3.30E-04	5.28E-04	6.52E-04	3.70E-04
	Cs-138	1.00E-01	5.66E-02	9.39E-02	8.68E-02
	Ba-139	5.07E-02	7.10E-02	9.40E-02	6.14E-02
	Au-199	ND	ND	ND	ND
	Total for Period*	2.35E-01	2.27E-01	2.07E-01	2.05E-01
4.	Tritium	1.08E+00	1.60E+00	2.14E+00	1.06E+00

*Includes all nuclides, even those with less than an eight day half-life.
**ND – Not Detected.

EFFLUENT AND WASTE DISPOSAL ANNUAL REPORT
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GASEOUS EFFLUENTS - GROUND RELEASE

CURIES	Quarter 1	Quarter 2	Quarter 3	Quarter 4
1. Fission Gases				
Kr-85m	ND*	ND	ND	ND
Kr-85	ND	ND	ND	ND
Kr-87	ND	ND	ND	ND
Kr-88	ND	ND	ND	ND
Xe-133	ND	ND	ND	ND
Xe-135m	ND	ND	ND	ND
Xe-135	ND	ND	ND	ND
Xe-138	ND	ND	ND	ND
Others (specify)				
NONE				
Total for Period	ND	ND	ND	ND
2. Iodines				
I-131	7.23E-04	3.59E-05	4.93E-05	1.04E-04
I-132	ND	ND	ND	ND
I-133	9.94E-04	4.09E-05	1.93E-06	1.23E-04
I-135	ND	ND	ND	ND
Total for Period	1.72E-03	7.68E-05	5.12E-05	2.27E-04

*ND – Not Detected.

EFFLUENT AND WASTE DISPOSAL ANNUAL REPORT
YEAR 2004
GASEOUS EFFLUENTS - GROUND RELEASE

CURIES	Quarter 1	Quarter 2	Quarter 3	Quarter 4
3. Particulates*				
Sr-89	ND**	ND	ND	ND
Sr-90	ND	ND	ND	ND
Cs-134	ND	ND	ND	ND
Cs-137	ND	ND	ND	ND
Ba-140	1.00E-05	ND	ND	ND
La-140	ND	ND	ND	ND
Others (specify)				
Cr-51	ND	ND	ND	ND
Mn-54	1.25E-06	3.33E-06	ND	ND
Co-60	ND	ND	ND	ND
Sr-91	ND	ND	ND	ND
Y-91m	1.30E-04	ND	ND	ND
Cs-138	1.19E-02	ND	ND	ND
Ba-139	2.06E-02	4.90E-03	1.57E-03	ND
Total for Period*	3.26E-02	4.90E-03	1.57E-03	ND
4. Tritium	7.03E+00	2.48E+00	1.88E+00	8.12E-01

*Include all nuclides even those with less than an eight day half-life.
**ND – Not Detected.

EFFLUENT AND WASTE DISPOSAL ANNUAL REPORT
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GASEOUS EFFLUENTS - MIXED MODE RELEASE*

	CURIES	Quarter 1	Quarter 2	Quarter 3	Quarter 4
1.	Fission Gases				
	Kr-85m	ND**	ND	ND	ND
	Kr-85	ND	ND	ND	ND
	Kr-87	ND	ND	ND	ND
	Kr-88	ND	ND	ND	ND
	Xe-133	ND	ND	ND	ND
	Xe-135m	ND	ND	ND	ND
	Xe-135	ND	ND	ND	ND
	Xe-138	ND	ND	ND	ND
	Others (specify)				
	NONE				
	Total for Period	ND	ND	ND	ND
2.	Iodines				
	I-131	9.51E-04	3.17E-04	7.82E-04	7.61E-04
	I-133	6.03E-04	6.22E-04	2.25E-03	2.49E-03
	I-135	ND	ND	ND	ND
	Total for Period	1.55E-03	9.39E-04	3.03E-03	3.25E-03

*The Reactor Building and Radwaste Building are treated as split-level releases.
**ND – Not Detected.

EFFLUENT AND WASTE DISPOSAL ANNUAL REPORT
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GASEOUS EFFLUENTS - MIXED MODE RELEASE*

CURIES	Quarter 1	Quarter 2	Quarter 3	Quarter 4
3. Particulates**				
Sr-89	1.97E-05	ND***	ND	ND
Sr-90	ND	ND	ND	ND
Cs-134	4.61E-04	1.80E-04	2.03E-04	2.06E-04
Cs-137	5.01E-04	3.32E-04	3.59E-04	3.94E-04
Ba-140	6.43E-05	5.64E-06	4.86E-05	3.87E-05
La-140	1.21E-05	ND	ND	ND
Others (specify)				
Na-24	ND	3.96E-05	2.44E-04	ND
Cr-51	1.75E-04	ND	ND	ND
Mn-54	5.66E-05	1.69E-05	7.01E-05	2.23E-05
Co-58	5.04E-06	ND	1.35E-05	ND
Fe-59	1.76E-05	ND	ND	ND
Co-60	2.03E-04	6.46E-05	1.95E-04	1.48E-04
Zn-65	1.92E-05	6.00E-05	3.06E-04	1.66E-04
Y-91m	7.73E-04	1.21E-04	1.01E-03	1.07E-03
Sr-91	1.45E-04	ND	ND	ND
Sr -92	ND	2.15E-03	ND	ND

*The Reactor Building and Radwaste Building are treated as split-level releases.
**Includes all nuclides, even those with less than an eight day half-life.
***ND – Not Detected.

EFFLUENT AND WASTE DISPOSAL ANNUAL REPORT
YEAR 2004
GASEOUS EFFLUENTS - MIXED MODE RELEASE*

CURIES Particulates** (Continued) Others (specify)	Quarter 1	Quarter 2	Quarter 3	Quarter 4
Mo-99	ND	ND	ND	ND
Tc-99m	ND	ND	ND	ND
Ag-110m	2.14E-05	5.28E-05	3.68E-05	ND
Cs-138	ND	ND	ND	ND
Ba-139	2.56E-02	ND	ND	ND
Au-199	ND	ND	ND	ND
Total for Period**	2.80E-02	3.03E-03	2.48E-03	2.05E-03
4. Tritium	1.54E+01	6.21E+00	7.98E+00	6.74E+00

*The Reactor Building and Radwaste Building are treated as split-level releases.
**Includes all nuclides, even those with less than an eight day half-life.
***ND – Not Detected.

BROWNS FERRY NUCLEAR PLANT
ANNUAL EFFLUENT AND WASTE DISPOSAL REPORT
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SOLID WASTE AND IRRADIATED FUEL

A. Solid Waste Shipped Off-site for Burial or Disposal (Not Irradiated Fuel)

1. Type of Waste		Units	Amount	Error %
a.	Spent resins, filters, filter sludge	m^3	1.86E+02	
	evaporator bottoms, etc.	Ci	1.71E+03	+/-25.0
b.	Dry compressible waste, contaminated	m^3	3.12E+03	
	equipment, etc.	Ci	2.14E+01	+/-25.0
c.	Irradiated components, control rod	m^3	6.66E+00	
	blades, filters, LPRMs, IRMs & SRMs with fission chambers, & DAW.	Ci	4.25E+04	+/-25.0
d.	Other – none			

2. Estimate of Major Nuclide Composition by Waste Type

a. Spent resins, filters, filter sludge, evaporator bottoms, etc.

	Nuclide	Percent Abundance	Curies
1)	Fe-55	4.70E+01	8.04E+02
2)	Co-60	1.84E+01	3.15E+02
3)	Cs-137	1.68E+01	2.87E+02
4)	Cs-134	1.03E+01	1.75E+02
5)	Zn-65	3.63E+00	6.21E+01
6)	Mn-54	2.72E+00	4.65E+01
7)	Ag-110m	5.53E-01	9.46E+00
8)	Ni-63	4.29E-01	7.33E+00
9)	Cr-51	3.78E-02	6.47E-01
10)	H-3	5.23E-02	8.95E-01
11)	Sr-90	3.50E-02	5.98E-01
12)	C-14	2.90E-02	4.96E-01
13)	Pu-241	9.85E-03	1.68E-01
14)	Co-58	7.72E-03	1.32E-01
15)	Fe-59	3.94E-03	6.74E-02
16)	Tc-99	1.91E-03	3.26E-02
17)	I-131	1.85E-03	3.17E-02
18)	Sr-89	1.30E-03	2.23E-02
19)	Cm-242	3.66E-04	6.26E-03
20)	Zr-95	3.47E-04	5.99E-03
21)	I-129	3.50E-04	5.94E-03
22)	Sb-124	3.40E-04	5.82E-03
23)	Ce-144	2.69E-04	4.60E-03
24)	Ba-140	2.01E-04	3.44E-03
25)	La-140	1.47E-04	2.51E-03

b. Dry compressible waste, contaminated equipment, etc.

	Nuclide	Percent Abundance	Curies
1)	Co-60	4.66E+01	9.98E+00
2)	Fe-55	3.61E+01	7.74E+00
3)	Cr-51	3.45E+00	7.40E-01
4)	Cs-137	2.97E+00	6.37E-01
5)	Mn-54	2.43E+00	5.21E-01
6)	Ni-63	2.32E+00	4.98E-01
7)	Cs-134	2.24E+00	4.80E-01
8)	Pu-241	1.83E+00	3.93E-01
9)	Zn-65	1.06E+00	2.28E-01
10)	Fe-59	3.47E-01	7.43E-02
11)	Co-58	2.49E-01	5.34E-02
12)	Ag-110m	1.72E-01	3.69E-02
13)	Am-241	1.01E-01	2.16E-02
14)	Pu-238	6.09E-02	1.30E-02
15)	Pu-239	1.83E-02	3.92E-03
16)	Pu-240	1.83E-02	3.92E-03
17)	Cm-243	9.43E-03	2.02E-03
18)	La-140	9.41E-03	2.02E-03
19)	Cm-244	9.37E-03	2.01E-03
20)	Nb-95	8.53E-03	1.83E-03
21)	Zr-95	8.39E-03	1.80E-03
22)	Sb-124	7.67E-03	1.65E-03
23)	Ba-140	6.15E-03	1.32E-03
24)	C-14	3.58E-03	7.67E-04
25)	Sr-90	3.42E-03	7.33E-04
26)	I-131	2.30E-03	4.92E-04
27)	Ce-144	1.68E-03	3.59E-04
28)	Ce-141	9.78E-04	2.10E-04
29)	Co-57	3.90E-04	8.35E-05
30)	Cm-242	3.74E-04	8.01E-05

c. Irradiated components, Control Rod Blades, Filters, IRMs, SRMs & LPRMs with fission chambers and DAW.

	Nuclides	Percent Abundance	Curies
1)	Fe-55	5.06E+01	2.15E+04
2)	Co-60	4.36E+01	1.85E+04
3)	Ni-63	3.83E+00	1.63E+03
4)	Mn-54	1.72E+00	7.30E+02
5)	Cs-134	6.54E-02	2.78E+01
6)	Co-58	6.52E-02	2.77E+01
7)	Cs-137	4.83E-02	2.05E+01
8)	Ni-59	2.03E-02	8.62E+00
9)	Zn-65	1.05E-02	4.48E+00
10)	H-3	6.07E-03	2.58E+00
11)	C-14	6.06E-03	2.57E+00
12)	Ag-110m	5.80E-03	2.46E+00
13)	Cr-51	3.61E-03	1.53E+00
14)	Fe-59	2.83E-03	1.20E+00
15)	Sr-90	1.55E-04	6.56E-02
16)	Sr-89	1.23E-04	5.21E-02
17)	Sb-124	1.11E-04	4.69E-02
18)	Zr-95	9.23E-05	3.92E-02
19)	Nb-94	8.89E-05	3.77E-02
20)	Ce-144	3.36E-05	1.43E-02
21)	Tc-99	2.72E-05	1.15E-02
22)	Pu-241	2.09E-05	8.87E-03
23)	Pu-238	1.49E-05	6.33E-03
24)	Ce-141	8.90E-06	3.78E-03
25)	La-140	2.72E-06	1.15E-03
26)	Ba-140	1.70E-06	7.20E-04
27)	Cm-242	1.17E-06	4.96E-04
28)	Sb-125	3.08E-07	1.31E-04
29)	Cm-243	1.72E-07	7.29E-05
30)	Sn-113	1.36E-07	5.78E-05
31)	Co-57	1.05E-07	4.47E-05
32)	Pu-239	7.33E-08	3.11E-05
33)	Cm-244	6.88E-08	2.92E-05
34)	Pu-240	1.54E-08	6.52E-06
35)	Am-241	9.36E-09	3.97E-06
36)	Np-237	1.15E-09	4.88E-07
37)	Am-243	3.82E-10	1.62E-07
38)	U-235	1.72E-10	7.28E-08
		Percent	Curies
		1.00E+02	42450.7427

3. **Solid Waste Disposition**

a. Cask Shipments:

Number of Shipments	Mode of Transportation	Destination
04	HIC/Cask, Sole Use Truck 3 - Irradiated Hardware 1 - Resin	Barnwell Waste Management- Barnwell, SC
22	HIC/Cask, Sole Use Truck 22 - Resin	Duratek Consolidation & Services Facility- Barnwell, SC
02	Cask, Sole Use Truck 2 – Pump Impellers	Nuclear Services Support Facility- Barnwell, SC

. The 28 cask shipments consisted of the following:

Type of HIC	Number of Packages	Volume per Package (m^3)	Disposal Volume Shipped (m^3)
14-170	10	4.84E+00	4.84E+01
8-120	14	3.41E+00	4.77E+01
3-55	2	1.63E+00	3.26E+00
None	2	1.97E+00	3.94E+00

NOTE: The total waste volume of 1.03E+02 m^3 consisting of 4.42E+04 curies of activity in casks was all sent directly to burial or processed by a waste processor and then sent to burial during this reporting period. No volume reduction measures were applied to the above wastes by the processor.

b. General Design Packages:

Number of Shipments	Mode of Transportation	Destination
51	48 - Sole Use Truck 03 - Non Sole Use Truck	Duratek- Oak Ridge, TN
20	00 - Sole Use Truck 20 - Non Sole Use Truck	Duratek- Kingston, TN

The 71 shipments of waste packaged in general design packages consisted of the following:

Type of STC	Number of Packages	Volume per Package (m^3)	Disposal Volume Shipped(m^3)
40' "Sealand"	43	5.89E+01	2.53E+03
20' "Sealand"	35	2.94E+01	1.03E+03
Hx Cylinder	2	6.54E+00	1.31E+01

NOTE: A total waste volume of 3.57E+03 m^3 consisting of 3.90E+01 curies of activity was shipped in general design packages to waste processors. The volume is estimated to have been reduced to 2.53E+02 cubic meters by the processors and the curies of activity has remained unchanged.

B. Irradiated Fuel Disposition

Number of Shipments	Mode of Transportation	Destination
None	N/A	N/A

BROWNS FERRY NUCLEAR PLANT
EFFLUENT AND WASTE DISPOSAL ANNUAL REPORT
SUMMARY OF ABNORMAL/UNPLANNED RELEASES
2004

The release of radioactive material to the environment from Browns Ferry has been a small fraction of the 10 CFR 20 Appendix B and 10 CFR 50 Appendix I limits. There were no limits exceeded as specified in 10 CFR 20 Appendix B and 10 CFR 50 Appendix I.

No abnormal gaseous or liquid releases occurred in 2004.

During the reporting period, January 1 through December 31, 2004, there were no missed compensatory measures.

There was one missed sample period for Unit 3 reactor zone (mixed mode) gaseous effluent iodines and particulates from April 27, 2004 at 0254 hours until May 4, 2004 at 0358 hours. The charcoal and particulate filter set was found to be missing during the weekly change of the filters on May 04, 2004 (Problem Evaluation Report (PER) 60670). Activity from the filters removed on April 27, 2004 (sample prior to the missing filter set) and May 11, 2004 (sample after the missing filter set) were compared. Both filter sets contained only Cs-137. The highest concentration was from the set removed on April 27, 2004. The Unit 3 reactor had completed a refueling outage in April and activity was trending down. The April 27, 2004 concentration was included for the missing filter set.

In calendar year 2004, Browns Ferry had no changes to the radwaste system or the Process Control Program (PCP).

ENCLOSURE 4

TENNESSEE VALLEY AUTHORITY
BROWNS FERRY NUCLEAR PLANT (BFN)
UNITS 1, 2, AND 3

INOPERABLE RADIOLOGICAL EFFLUENT INSTRUMENTATION REPORT 2004

INOPERABLE RADIOLOGICAL EFFLUENT INSTRUMENTATION REPORT
2004

This report complies with Browns Ferry Nuclear Plant Offsite Dose Calculation Manual (ODCM) Sections 1/2.1.1 and 1/2.1.2. The ODCM requires the exertion of best efforts to return inoperable instruments to operable status within 30 days. Failure to return such instruments to an operable status within the prescribed interval requires a description in the Annual Radioactive Effluent Release Report.

During the reporting period, January 1 through December 31, 2004, there were no radioactive liquid effluent monitoring instrumentation out of service for greater than 30 days; however, two gaseous effluent monitors were out of service for greater than 30 days. The Unit 1 Reactor/Turbine/Refuel Building Ventilation Monitor (1-RM-90-250) was inoperable from May 12, 2004 at 2150 hours until July 26, 2004 at 1530 hours and the Unit 3 Reactor/Turbine/Refuel Building Ventilation Monitor (3-RM-90-250) was inoperable from November 19, 2004 at 1706 hours through the end of the reporting period. Monitor 3-RM-90-250 was retuned to service on February 1, 2005 at 1830 hours. Both monitors' flow measuring systems were inoperable. The flow systems were obsolete and could not be replaced. New flow control systems were designed and installed. All compensatory measures were completed as required.

ODCM Section 1.1.2 requires the radioactive gaseous effluent monitoring instruments alarm/trip setpoints be set in accordance with ODCM section 7.2 to ensure ODCM control limits are not exceeded. During a design review of the ten building gaseous effluent radiation monitoring instruments, it was discovered that the setpoints were set a factor of 60 low since installation in 1991. This included the three Reactor/Turbine/Refuel Building Ventilation Monitors (1, 2 and 3-RM-90-250), the six Turbine Building Ventilation Monitors (1, 2, and 3-RM-90-249 and 1, 2, and 3-RM-90-251) and the Radwaste Building Ventilation Monitor (0-RM-90-252). Monitor flows were recorded in units of cc/sec instead of cc/min as required by the vendor firmware. This resulted in the monitors reading a factor of 60 low. All affected monitors were placed in an inoperable status and compensatory measures were implemented until flow readings could be corrected. A review of data generated since 1991 was completed, and it was determined that no release rate limit was exceeded during the period the setpoints were non-conservative.

Some effluent monitors and flow instrumentation were placed in "out-of-service" status because these monitors' effluent streams were isolated. Therefore, these monitors are not included in this report.

ENCLOSURE 5

TENNESSEE VALLEY AUTHORITY
BROWNS FERRY NUCLEAR PLANT (BFN)
UNITS 1, 2, AND 3

CHANGES TO THE OFFSITE DOSE CALCULATION MANUAL
2004

CHANGES TO THE OFFSITE DOSE CALCULATION MANUAL (ODCM)

This report covers the period from January 1 through December 31, 2004. During this period, one change was made to the ODCM. A revision was made in Section 9.0 of the BFN ODCM. The change reflects a revision in the REMP location for off site ground water sample collection that had to be made when the farm providing the well water sample went out of operation. This revision also added a footnote to Table 1.1-2 for the gaseous effluent flow instruments. This footnote clarified that the 4 hours allowed for the noble gas monitor, iodine cartridge, and particulate filter to be out-of-service for functional testing, calibration, or repair without initiating grab sampling also applies to the flow instrument.

TENNESSEE VALLEY AUTHORITY

BROWNS FERRY NUCLEAR PLANT

OFFSITE DOSE CALCULATION MANUAL

ODCM

REVISION 16

PREPARED BY: Dale W. Nix PHONE: 2682

RESPONSIBLE ORGANIZATION: RADCHEM, CHEMISTRY

APPROVED BY: MICHAEL SCAGGS DATE: 03/06/2004

EFFECTIVE DATE: 03/06/2004

LEVEL OF USE: REFERENCE USE

QUALITY-RELATED

REVISION LOG

Procedure Number: ODCM Revision Number: 16

Page Affected: 23, 24, 201, and 204.

Pagination Pages: None

Description of Changes: IC-17.

The flow instrumentation is an integral part of the radioactive gaseous effluent instrumentation and is required for the radioactive gaseous effluent instrumentation to perform its intended function. The flow instrumentation does not perform a useful function if the noble gas monitor, iodine cartridge, and particulate filter are not operational. Footnote C of Table 1.1-2 allows the noble gas monitor, iodine cartridge, and particulate filter to be out of service for 4 hours for functional testing, calibration, or repair without providing or initiating grab sampling. Since the flow instrumentation is an integral part of the radioactive gaseous effluent instrumentation, the 4 hours would apply equally to the flow instrumentation (Table 1.1-2 instrument component 1-4d and 5b).

This change is intended to clarify that the 4 hours applies to the flow instrumentation. (BF PER 01-010725)

A revision is made in Section 9.0 of the BFN ODCM. The change reflects a revision in the REMP location for off site ground water sample collection that had to be made when the farm providing the well water sample went out of operation.

The change to the clarify that Footnote C applies to the flow instrumentation and the change in the REMP will maintain the levels of radioactive effluent control required by 10 CFR 20.1302, 40 CFR 190, 10 CFR 50.36a, and 10 CFR 50, Appendix I, and not adversely impact the accuracy or reliability of effluent, dose, or setpoint calculations.

Clarifying Footnote C concerning flow instrumentation and the REMP change will maintain the levels of radioactive effluent control required by 10 CFR 20.1302, 40 CFR 190, 10 CFR 50.36a, and 10 CFR 50, Appendix I, and not adversely impact the accuracy or reliability of effluent, dose, or setpoint calculations.