

Document Control Desk, Director
 Office of Nuclear Material Safety and Safeguards
 U. S. Nuclear Regulatory Commission
 Washington, DC 20555-0001

Direct tel: 803-647-1000

cc: USNRC, Region II
 245 Peachtree Center Ave, NE, Suite 1200
 Atlanta, Georgia 30303-1257

Our ref: LTR-RAC-20-69

Subject: SNM-1107/70-1151
 NRC Semi-Annual Discharge Report
 January – June 2020

August 25, 2020

Dear Sir:

The following report fulfills regulatory requirements as listed in 10 CFR 40.65 and 10 CFR 70.59, "Effluent Monitoring Reporting Requirements." For the six-month period of January 1, 2020, through June 30, 2020, the following quantities of radionuclides were released to the unrestricted area by the Westinghouse Electric Company's Columbia, South Carolina Nuclear Fuel Plant:

Discharge	Total 6-month emissions (μCi)	Parameter	Total 6-month Measured Concentration	Regulatory Concentration Limit
Gaseous	182.8	Uranium (analyzed as gross alpha)	7 E ⁻¹⁵ μCi/mL*	5 E ⁻¹⁴ μCi/mL
Liquid Effluent[#]	1,683	U-234	3 E ⁻⁰⁸ μCi/mL	3 E ⁻⁰⁷ μCi/mL
	76	U-235		
	297	U-238		
	2,935	Tc-99	4 E ⁻⁰⁸ μCi/mL	6 E ⁻⁰⁵ μCi/mL

*Includes a dispersion factor of 1000 to account for dilution between the release point and the nearest site boundary

[#]Sum of fractions (SOF) equates to less than 1.0.

As shown above, the effluent releases are within the NRC's regulatory limits designed to protect public health and safety.

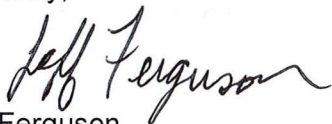
Gaseous effluent results were obtained from point source gross alpha analysis of stack gas effluent, and the individual radionuclide activity composition is inferred from the calculated average enrichment (85.25% U-234, 3.28% U-235, and 11.48% U-238). Tc-99 is not reported for gaseous effluents as the quantities of Tc-99 detected during benchmark testing of gaseous emissions were below the thresholds that would necessitate reporting.

Liquid effluent values were obtained by analysis of composite proportional samples prior to discharge to the Congaree River and basing the activity on the calculated average enrichment. All liquid discharges are pumped through a single discharge line to the Congaree River. Liquid effluent composites were analyzed by alpha spectroscopy, and significant quantities of U-236 were not detected using this method. The total liquid effluent volume released to the Congaree River during the first half of 2020 was 7.31E+10 milliliters (mL).

Calculated values have been reported for all results, due to variability of minimum detection concentrations (MDC). Negative values are reported as zero.

To meet the requested dosage information outlined in Regulatory Guide 4.16, Section 6.1, LTR-EHS-20-60, "2020 Semi-Annual Assessment of Public Dose due to Liquid and Gaseous Effluents" is attached.

Sincerely,

A handwritten signature in black ink, appearing to read "Jeff Ferguson", with a stylized flourish at the end.

Jeff Ferguson
Manager, Environment, Health and Safety

Attachment:

LTR-EHS-20-60, "2020 Semi-Annual Assessment of Public Dose due to Liquid and Gaseous Effluents"



Westinghouse Electric Company
Nuclear Fuel
Columbia Fuel Site
5801 Bluff Rd
Hopkins, South Carolina 29061
USA

To: Cynthia Logsdon, Diana Joyner

Date: August 17, 2020

cc: Jeff Ferguson, Elise Malek, Patrick Donnelly, Nancy Parr,
Anna Pearson,

From: David Wagoner
Ext: 1919
Fax: 803.695.4158

Your ref:
Our ref: LTR-EHS-20-60

Subject: **2020 Semi-Annual Assessment of Public Dose due to Liquid and Gaseous Effluents**

Effluents released from plant operations are monitored to determine the quantities of radionuclides discharged into the environment. The cumulative radioactivity released is summarized semi-annually and annually and input into models developed by the NRC and EPA to estimate the potential dose to the public.

The whole body and organ dose via the following pathways is determined in this assessment:

Dose due to Gaseous Effluents by Direct Inhalation

- The whole body dose was estimated using EPA's COMPLY Code at level 2 complexity. The organ dose was estimated by calculating the X/Q factor using the results of the COMPLY analysis for stack #1212 (S1030A), the measured release quantity, and the dose conversion factors from Federal Guidance Report No 11, "Limiting Values of Radionuclide Intake and Air concentration Factors for Inhalation, Submersion, and Ingestion" (FGR 11).

Dose due to Liquid Effluents by Ingestion of Potable Water

- Estimated using equations and recommended values in Regulatory Guide 1.109, Doses from Liquid Effluent Pathways (RG 1.109). Dose conversion factors are referenced from FGR 11.

Dose due to Liquid Effluents by Ingestion of Fish

- Estimated using equations and recommended values in RG 1.109. Dose conversion factors are referenced from FGR 11.

Dose due to Liquid Effluents by Irradiation from Shoreline Deposition

- Estimated using equations and recommended values in RG 1.109. Dose conversion factors are referenced from Federal Guidance report No 12, "External Exposure to Radionuclides in Air, Water, and Soil."

Bounding dose assessments for direct inhalation and for ingestion are performed using conservative assumptions to determine the maximum potential dose to a hypothetical individual member of the public. The inhalation dose is determined for the hypothetical individual standing at the nearest site

boundary (595 meters) for six months. The ingestion dose from liquid effluent and external dose from sediment deposition is determined at the point at which the liquid effluent leaves the diffuser in the Congaree River.

The release rates for gaseous effluent are determined by gross alpha measurements performed on daily air samples, one per stack for 47 stacks (Attachment 1). The release rates for liquid effluent are determined by isotopic analysis of composite liquid effluent samples taken monthly (Attachment 3). Based on these results, the following quantities were released in the 1st half of calendar year 2020:

- 182.8 μCi of Uranium in gaseous effluent
- 2,056 μCi of Uranium in liquid effluent
- 2,935 μCi of Technetium in liquid effluent

Using these results and the methods previously mentioned the whole body dose, dose to the bone, and dose to the lung were determined for an individual present at the nearest site boundary. Table 1 provides a summary of the results for each pathway. The gaseous and liquid effluents released during the 1st half of 2020 resulted in a potential whole body dose of 0.08 mrem, 0.66 mrem to the lung, and 0.003 mrem to the bone for an individual present at the nearest site boundary. The estimated whole body dose is well below the 12.5 mrem annual dose limit (1/2 of the 25 mrem annual dose limit) and the 0.5 mrem ALARA goal (1/2 of 1 mrem annual ALARA goal) for a member of the public.

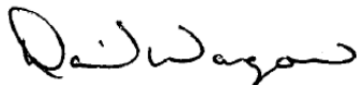
Table 1. 2020 Semi-Annual Dose to the Public from Liquid and Gaseous Effluents

	Whole Body Dose (mrem/6 months)	Organ Dose - Bone (mrem/6 months)	Organ Dose - Lung (mrem/6 months)
Gaseous Effluents			
Direct inhalation*	0.08	2.51E-03	0.66
Liquid Effluents			
Potable Water	2.47E-05	3.61E-04	-
Aquatic Food (Fish)	1.49E-06	2.08E-05	-
Shoreline Deposition	9.16E-10	-	-
<i>Total (mrem/6 months)</i>	<i>0.08</i>	<i>2.89E-03</i>	<i>0.66</i>

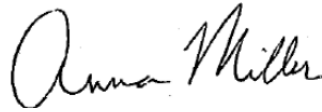
* Assumes 80 % residence time

There were no changes in source material and no release points were added or removed during the 1st half of 2020. The attachments below illustrate the method used to calculate each result listed in Table 1. The annual dose calculation will be completed when the data is available for the entire calendar year.

- Attachment 1: 1st Half 2020 Gaseous Effluent Discharges
- Attachment 2: Lung/Bone Organ Dose due to Gaseous Effluent
- Attachment 3: 1st Half 2020 Liquid Effluent Discharges
- Attachment 4: Whole Body Dose from Liquid Effluent Pathways - Potable Water
- Attachment 5: Dose to the Bone Surface from Liquid Effluent Pathways - Potable Water
- Attachment 6: Whole Body Dose from Liquid Effluent Pathways - Aquatic Foods
- Attachment 7: Dose to the Bone Surface from Liquid Effluent Pathways - Aquatic Foods
- Attachment 8: Whole Body Dose from Liquid Effluent Pathways – Shoreline Deposits
- Attachment 9: 2020 Isotopic Fractions
- Attachment 10: Comply Results



David Wagoner, CHP
Radiation Safety Engineer
EH&S Operations



Review by: Anna Miller
Manager, RSO
EH&S Operations

Attachment 1
1st Half 2020 Gaseous Effluent Discharges

Sampling Station	Location Description	Stack Height (m)	Flow Rate (m ³ /s)	Gross Alpha Concentration* (uCi/mL)	Release Rate (Ci/s)			1st Half (Jan-Jun) uCi Uranium Released
					U234	U235	U238	
1207	MET LAB EXHAUST	10	0.56	1.92E-13	9.05E-14	3.48E-15	1.22E-14	1.67
1239	MAINT WELD EX	11	0.94	1.67E-13	1.34E-13	5.15E-15	1.80E-14	2.47
1243	AC-8	11	3.78	8.01E-14	2.56E-13	9.87E-15	3.45E-14	4.73
1222	CALC COMB GAS LN 1	12	0.16	2.03E-13	2.82E-14	1.08E-15	3.80E-15	0.52
1223	CALC COMB GAS LN 2	12	0.16	1.58E-13	2.22E-14	8.55E-16	2.99E-15	0.41
1224	CALC COMB GAS LN 3	12	0.16	1.41E-13	1.95E-14	7.51E-16	2.63E-15	0.36
1225	CALC COMB GAS LN 4	12	0.16	9.85E-14	1.36E-14	5.21E-16	1.83E-15	0.25
1226	CALC COMB GAS LN 5	12	0.16	2.02E-13	2.82E-14	1.08E-15	3.80E-15	0.52
1228	CHEM LAB EX #3	12	0.64	1.33E-13	2.11E-14	8.13E-16	2.85E-15	0.39
1237	ABF HOOD TORIT EX	12	1.42	8.58E-14	1.03E-13	3.96E-15	1.39E-14	1.90
1241	PELLET LINE 6	12	2.78	8.10E-14	1.91E-13	7.34E-15	2.57E-14	3.52
1247	HOT OIL RM EX	12	3.89	1.50E-13	4.94E-13	1.90E-14	6.65E-14	9.11
1201	FURNACE EX LINE 1	13	2.78	8.11E-14	1.91E-13	7.34E-15	2.57E-14	3.52
1202	FURNACE EX LINE 2	13	2.78	8.03E-14	1.89E-13	7.28E-15	2.55E-14	3.49
1203	FURNACE EX LINE 3	13	2.78	9.64E-14	2.27E-13	8.74E-15	3.06E-14	4.19
1204	FURNACE EX LINE 4	13	2.78	8.00E-14	1.89E-13	7.26E-15	2.54E-14	3.48
1205	FURNACE EX LINE 5	13	2.78	8.01E-14	1.89E-13	7.26E-15	2.54E-14	3.48
1206	NEW DECON ROOM	13	1.64	9.16E-14	1.27E-13	4.90E-15	1.72E-14	2.35
1208	INCINERATOR EX	13	1.89	2.75E-13	4.41E-13	1.70E-14	5.94E-14	8.13
1209	SUPPL INCIN EX	13	0.94	1.19E-13	9.54E-14	3.67E-15	1.28E-14	1.76
1217	CONV ENCL EX 4-C	13	3.89	1.62E-13	5.33E-13	2.05E-14	7.18E-14	9.83
1218	CONV ENCL EX 4-D	13	3.89	1.42E-13	0.00E+00	0.00E+00	0.00E+00	0.00
1219	CONV EMERG EX 4E	13	3.89	2.16E-13	3.36E-14	1.29E-15	4.53E-15	0.62
1221	DECON ROOM EX	13	1.42	3.25E-13	3.90E-13	1.50E-14	5.25E-14	7.19
1230	DEV LAB EX #1	13	0.94	1.57E-13	1.26E-13	4.84E-15	1.69E-14	2.32
1231	DEV LAB EX #2	13	0.94	2.23E-13	1.78E-13	6.86E-15	2.40E-14	3.29
1232	PELLET COMBINED EX	13	4.72	8.25E-14	3.30E-13	1.27E-14	4.45E-14	6.09
1229	HP LAB EX	15	0.58	8.81E-14	4.34E-14	1.67E-15	5.84E-15	0.80
1236	MAP COMBINED	15	2.78	2.45E-13	0.00E+00	0.00E+00	0.00E+00	0.00
1240	AC-3	15	3.78	8.29E-14	2.66E-13	1.02E-14	3.58E-14	4.90
1246	AC-4	15	3.89	8.20E-14	2.70E-13	1.04E-14	3.64E-14	4.98
1251	WATERGLASS SCR S1190	15	2.36	1.53E-13	3.05E-13	1.17E-14	4.11E-14	5.63
1210	CONV 1-A EX	16	4.17	1.03E-13	3.65E-13	1.40E-14	4.91E-14	6.73
1211	CONV 1-B EX	16	4.17	1.72E-13	0.00E+00	0.00E+00	0.00E+00	0.00
1212	S1030 A	16	7.56	1.80E-13	1.10E-12	4.22E-14	1.48E-13	20.21
1213	S1030 B	16	7.56	2.06E-13	6.29E-14	2.42E-15	8.47E-15	1.16
1227	CHEM LAB EX #2	16	0.58	6.44E-13	3.19E-13	1.23E-14	4.29E-14	5.88
1233	SOLVENT EXT N EX	16	3.33	8.13E-14	1.97E-13	7.57E-15	2.65E-14	3.63
1234	SOLVENT EXT S EX	16	3.33	2.10E-13	8.46E-14	3.25E-15	1.14E-14	1.56
1220	CHEM LAB FILT EX	17	5.56	8.56E-14	4.03E-13	1.55E-14	5.43E-14	7.44
1242	AC-5	17	3.78	8.09E-14	2.59E-13	9.97E-15	3.49E-14	4.78
1244	AMMON FUME SCR 1008A	17	1.89	8.82E-14	1.41E-13	5.44E-15	1.91E-14	2.61
1245	AMMON FUME SCR 1008B	17	1.89	1.76E-13	0.00E+00	0.00E+00	0.00E+00	0.00
1238	IFBA EXHAUST	18	4.72	8.31E-14	3.33E-13	1.28E-14	4.48E-14	6.14
1248	ERBIA FURNACE EX	18	8.17	9.80E-14	6.79E-13	2.61E-14	9.14E-14	12.52
1249	ERBIA SCRUBBER EX	18	4.33	8.09E-14	2.97E-13	1.14E-14	4.00E-14	5.48
1250	ERBIA CHANGE ROOM	18	1.9	9.39E-14	1.51E-13	5.82E-15	2.04E-14	2.79
Total					9.91E-12	3.81E-13	1.33E-12	182.83

*Concentration LLD is 8E-14 uCi/mL

Lung/Bone Organ Dose due to Gaseous Effluents

[illegible]

2020

Attachment 3 - 1st HALF 2020 LIQUID EFFLUENT RADIOACTIVITY DISCHARGES

	Liquid Effluent Discharges		Isotopic Uranium Measured Concentrations				Tc-99 Measured Concentrations	Sum U & Tc-99	Total uCi/month Released (based on monthly GEL discharge samples)				Measurement Uncertainty / Error				Uncertainty / Error				
Month	Actual kgal/month	Actual gal/month	U234 pCi/L	U235 pCi/L	U238 pCi/L	Total U pCi/L	Tc-99 pCi/L	Total U & Tc-99 pCi/L	U234	U-235	U-238	Tc-99	U234 pCi/L	U235 pCi/L	U238 pCi/L	Tc-99 pCi/L	U234 (uCi)	U-235 (uCi)	U-238 (uCi)	Tc-99 (uCi)	
January	3667.702	3,667,702	20.2	1.15	3.34	24.7	0.00	24.7	280.421	15.965	46.367	0.000	1.70	0.469	0.697	25.4	23.600	6.511	9.676	352.609	
February	3511.279	3,511,279	24.2	0.888	4.61	29.7	6.89	36.6	321.623	11.802	61.268	91.569	1.89	0.416	0.830	20.6	25.118	5.529	11.031	273.778	
March	3273.403	3,273,403	21.3	0.935	4.01	26.2	23.5	49.7	263.903	11.584	49.683	291.161	1.78	0.426	0.777	22.6	22.054	5.278	9.627	280.010	
April	2800.576	2,800,576	23.9	0.953	4.10	29.0	71.3	100.3	253.344	10.102	43.461	755.793	1.15	0.257	0.476	3.76	12.190	2.724	5.046	39.857	
May	2999.495	2,999,495	22.5	1.05	3.59	27.1	63.2	90.3	255.444	11.921	40.758	717.515	1.61	0.399	0.649	4.96	18.278	4.530	7.368	56.311	
June	3050.455	3,050,455	26.7	1.31	4.82	32.8	93.5	126.3	308.277	15.125	55.652	1079.548	1.76	0.441	0.754	4.18	20.321	5.092	8.706	48.262	
Total (Jan-Jun)	19302.910	19,302,910								1683.014	76.499	297.188	2935.587					122	30	51	1051
Liters (L)		7.31E+07							2056.7												
									uCi Uranium for 6-month period (all types)												
Milliliters (ml)		7.31E+10							4992.3												
									uCi Uranium & Tc-99 for 6-month period												

FIRST HALF LIQUID DISCHARGES

Radionuclide	LLD (uCi/ml)	Quantity Released (uCi)	Error		Average Concentration Released (uCi/ml)
U234	6.00E-10	1683.0	+/-	122	2.30E-08
U235	6.00E-10	76.5	+/-	30	1.05E-09
U238	6.00E-10	297.2	+/-	51	4.07E-09
Total U		2056.7			2.82E-08
Tc-99	6.00E-10	2935.6	+/-	1051	4.02E-08
Total (Jan-Jun)		4992.3			9.65E-08

Attachment 4

Whole Body Dose from Liquid Effluent Pathways - Potable Water

[illegible]

Attachment 5

Dose to the Bone Surface from Liquid Effluent Pathways - Potable Water

[illegible]

Attachment 6

Whole Body Dose from Liquid Effluent Pathways - Aquatic Foods

[illegible]

Attachment 7

Dose to the Bone Surface from Liquid Effluent Pathways - Aquatic Foods

[illegible]

Attachment 8
Whole Body Dose from Liquid Effluent Pathways - Shoreline Deposits

[illegible]

Attachment 9

2020 Isotopic Fractions

Based on the plant nominal enrichment for 2020

Nuclide	Average wt%	Specific Activity Ci/g	Weighted Activity	% Activity
U-234	0.04	6.220E-03	2.388E-06	85.25
U-235	4.25	2.160E-06	9.180E-08	3.28
U-238	95.70	3.360E-07	3.216E-07	11.48
Total	100.0		2.802E-06	100.00

Attachment 10 - Comply Results

COMPLY: V1.6.

8/13/2020 4:43

40 CFR Part 61
National Emission Standards
for Hazardous Air Pollutants

REPORT ON COMPLIANCE WITH
THE CLEAN AIR ACT LIMITS FOR RADIONUCLIDE EMISSIONS
FROM THE COMPLY CODE - V1.6.

Prepared by:

WESTINGHOUSE ELECTRIC CO.
COLUMBIA FUEL FABRICATION FACILITY
5801 BLUFF RD. HOPKINS, SC 29061

DAVID WAGONER
803.647.1919

Prepared for:

U.S. Environmental Protection Agency
Office of Radiation and Indoor Air
Washington, DC 20460

2020 SEMI-ANNUAL DOSE TO THE PUBLIC DUE TO GASEOUS EFFLUENT

SCREENING LEVEL 2

DATA ENTERED:

RELEASE RATES FOR STACK 1.

Nuclide		Release Rate (curies/SECOND)
-----		-----
U-234	Y	9.050E-14
U-235	Y	3.480E-15
U-238	Y	1.220E-14

RELEASE RATES FOR STACK 2.

Nuclide		Release Rate (curies/SECOND)
-----		-----
U-234	Y	3.900E-13
U-235	Y	1.500E-14
U-238	Y	5.260E-14

RELEASE RATES FOR STACK 3.

Nuclide		Release Rate (curies/SECOND)
-----		-----
U-234	Y	9.210E-13
U-235	Y	3.540E-14
U-238	Y	1.240E-13

RELEASE RATES FOR STACK 4.

Nuclide		Release Rate (curies/SECOND)
-----		-----
U-234	Y	3.240E-12
U-235	Y	1.250E-13
U-238	Y	4.360E-13

RELEASE RATES FOR STACK 5.

Nuclide		Release Rate (curies/SECOND)
-----		-----
U-234	Y	8.840E-13
U-235	Y	3.400E-14
U-238	Y	1.190E-13

RELEASE RATES FOR STACK 6.

Nuclide		Release Rate (curies/SECOND)
U-234	Y	2.120E-12
U-235	Y	8.170E-14
U-238	Y	2.860E-13

RELEASE RATES FOR STACK 7.

Nuclide		Release Rate (curies/SECOND)
U-234	Y	8.040E-13
U-235	Y	3.090E-14
U-238	Y	1.080E-13

RELEASE RATES FOR STACK 8.

Nuclide		Release Rate (curies/SECOND)
U-234	Y	1.460E-12
U-235	Y	5.620E-14
U-238	Y	1.970E-13

SITE DATA FOR STACK 1.

Release height 10 meters.

Building height 9 meters.

The source and receptor are not on the same building.

Distance from the source to the receptor is 595 meters.

Building width 137 meters.

SITE DATA FOR STACK 2.

Release height 11 meters.

Building height 9 meters.

The source and receptor are not on the same building.

Distance from the source to the receptor is 595 meters.

Building width 137 meters.

SITE DATA FOR STACK 3.

Release height 12 meters.

Building height 9 meters.

The source and receptor are not on the same building.

Distance from the source to the receptor is 595 meters.

Building width 137 meters.

SITE DATA FOR STACK 4.

Release height 13 meters.

Building height 9 meters.

The source and receptor are not on the same building.

Distance from the source to the receptor is 595 meters.

Building width 137 meters.

SITE DATA FOR STACK 5.

Release height 15 meters.

Building height 9 meters.

The source and receptor are not on the same building.

Distance from the source to the receptor is 595 meters.

Building width 137 meters.

SITE DATA FOR STACK 6.

Release height 16 meters.

Building height 9 meters.

The source and receptor are not on the same building.

Distance from the source to the receptor is 595 meters.

Building width 137 meters.

SITE DATA FOR STACK 7.

Release height 17 meters.

Building height 9 meters.

The source and receptor are not on the same building.

Distance from the source to the receptor is 595 meters.

Building width 137 meters.

SITE DATA FOR STACK 8.

Release height 18 meters.

Building height 9 meters.

The source and receptor are not on the same building.

Distance from the source to the receptor is 595 meters.

Building width 137 meters.

Default mean wind speed used (2.0 m/sec).

NOTES:

Input parameters outside the "normal" range:

Building (width) is unusually WIDE.
Receptor is unusually FAR.

RESULTS:

Effective dose equivalent: 0.2 mrem/yr.

*** Comply at level 2.

This facility is in COMPLIANCE.

It may or may not be EXEMPT from reporting to the EPA.

You may contact your regional EPA office for more information.

***** END OF COMPLIANCE REPORT *****

COMPLY: V1.6.

8/13/2020 4:33

40 CFR Part 61
National Emission Standards
for Hazardous Air Pollutants

REPORT ON COMPLIANCE WITH
THE CLEAN AIR ACT LIMITS FOR RADIONUCLIDE EMISSIONS
FROM THE COMPLY CODE - V1.6.

Prepared by:

WESTINGHOUSE ELECTRIC CO.
COLUMBIA FUEL FABRICATION FACILITY
5801 BLUFF RD. HOPKINS, SC 29061

DAVID WAGONER
803.647.1919

Prepared for:

U.S. Environmental Protection Agency
Office of Radiation and Indoor Air
Washington, DC 20460

S1030A

SCREENING LEVEL 2

DATA ENTERED:

Nuclide		Release Rate (curies/SECOND)
U-234	Y	1.100E-12
U-235	Y	4.220E-14
U-238	Y	1.480E-13

Release height 16 meters.

Building height 9 meters.

The source and receptor are not on the same building.

Distance from the source to the receptor is 595 meters.

Building width 137 meters.

Default mean wind speed used (2.0 m/sec).

NOTES:

Input parameters outside the "normal" range:

Building (width) is unusually WIDE.
Receptor is unusually FAR.

RESULTS:

Effective dose equivalent: 2.2E-02 mrem/yr.

*** Comply at level 2.

This facility is in COMPLIANCE.

It may or may not be EXEMPT from reporting to the EPA.

You may contact your regional EPA office for more information.

***** END OF COMPLIANCE REPORT *****