



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

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

Subject: SNM-1107/70-1151
 NRC Semi-Annual Discharge Report
 January – June 2017

Our ref: LTR-RAC-17-38

September 8, 2017

Dear Sir:

The following report fulfills regulatory requirements as listed in 10 CFR 40.65 and 10 CFR 70.59 "Effluent Monitoring Requirements." For the six-month period January 1, 2017, through June 30, 2017, the following quantities of radionuclides were released to the unrestricted area by the Westinghouse Electric Company's Columbia, South Carolina Nuclear Fuel Plant:

Discharge	uCi	Parameter
Gaseous	167.8	Uranium (analyzed as gross alpha)
Liquid Effluent	1821.3	U-234
	90.9	U-235
	323.8	U-238
	2146.6	Tc-99

Gaseous effluent results were obtained from point source gross alpha analysis of stack gas effluent, and the individual radionuclide activity composition (85.04% U-234, 3.38% U-235, and 11.43% U-238) is inferred from the calculated average enrichment. A summary report by stack is provided as Attachment "A."

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. A numerical summary liquid discharge report is provided as Attachment "B."

Also, to meet the requested dosage information outlined in Regulatory Guide 4.16, section 6.1, the internal Westinghouse letter LTR-EHS-17-65 entitled "2017 Semi-Annual Assessment of Public Dose from Liquid and Gaseous Effluents" has been provided as Attachment "C."

Sincerely,

John Howell, Manager, Environment, Health and Safety

cc: USNRC, Region II
 245 Peachtree Center Ave, NE, Suite 1200
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WESTINGHOUSE NON-PROPRIETARY CLASS 3

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SEMI ANNUAL AVERAGE STACK EFFLUENT REPORT

Westinghouse Electric Company Nuclear Fuel, Columbia 01/01/2017 to 06/30/2017

SAMPLING STATION	LOCATION DESCRIPTION	GRS ALPHA CONCTR uCi/ml	QUANTITY RELEASED uCi URANIUM	ERROR	LLD. uCi/ml	FLOW RATE METERS/SEC	DERIVED ISOTOPIC CONCENTRATION uCi/ml			DERIVED ISOTOPIC DISCHARGE uCi			sum 1st			
							U234	U235	U238	U234	U235	U238				
1201	FURNACE EX LINE 1	8.02E-14	3.46	+/-	8.00E-14	2.78	6.82E-14	2.41E-15	9.62E-15	2.94	0.1	0.42	3.46			
1202	FURNACE EX LINE 2	8.02E-14	3.46	+/-	8.00E-14	2.78	6.82E-14	2.41E-15	9.62E-15	2.94	0.1	0.42	3.46			
1203	FURNACE EX LINE 3	8.01E-14	3.46	+/-	8.00E-14	2.78	6.81E-14	2.40E-15	9.61E-15	2.94	0.1	0.42	3.46			
1204	FURNACE EX LINE 4	8.00E-14	3.46	+/-	8.00E-14	2.78	6.80E-14	2.40E-15	9.60E-15	2.94	0.1	0.41	3.45			
1205	FURNACE EX LINE 5	8.00E-14	3.46	+/-	8.00E-14	2.78	6.80E-14	2.40E-15	9.60E-15	2.94	0.1	0.41	3.45			
1206	NEW DECON ROOM	8.61E-14	2.19	+/-	8.00E-14	1.64	7.31E-14	2.58E-15	1.03E-14	1.86	0.07	0.26	2.19			
1207	MET LAB EXHAUST	2.34E-13	2.02	+/-	8.00E-14	0.56	1.99E-13	7.02E-15	2.81E-14	1.72	0.06	0.24	2.02			
1208	INCINERATOR EX	1.82E-13	5.36	+/-	8.00E-14	1.89	1.55E-13	5.47E-15	2.19E-14	4.55	0.16	0.64	5.35			
1209	SUPPL INCIN EX	1.02E-13	1.5	+/-	8.00E-14	0.94	8.67E-14	3.06E-15	1.22E-14	1.27	0.04	0.18	1.49			
1210	CONV 1-A EX	9.00E-14	5.83	+/-	8.00E-14	4.17	7.65E-14	2.70E-15	1.08E-14	4.96	0.17	0.7	5.83			
1211	CONV 1-B EX	2.23E-13	0	+/-	8.00E-14	4.17	1.90E-13	6.70E-15	2.68E-14	0	0	0	0			
1212	S1030 A	9.93E-14	11.11	+/-	8.00E-14	7.56	8.44E-14	2.98E-15	1.19E-14	9.44	0.33	1.33	11.1			
1213	S1030 B	2.41E-13	1.34	+/-	8.00E-14	7.56	2.05E-13	7.22E-15	2.89E-14	1.14	0.04	0.16	1.34			
1216	MAINT ENCL EX 4-B	3.92E-13	0	+/-	8.00E-14	3.89	3.33E-13	1.18E-14	4.70E-14	0	0	0	0			
1217	CONV ENCL EX 4-C	1.53E-13	9.23	+/-	8.00E-14	3.89	1.30E-13	4.58E-15	1.83E-14	7.84	0.28	1.11	9.23			
1218	CONV ENCL EX 4-D	1.46E-13	0	+/-	8.00E-14	3.89	1.24E-13	4.37E-15	1.75E-14	0	0	0	0			
1219	CONV EMERG EX 4E	2.09E-13	0.6	+/-	8.00E-14	3.89	1.78E-13	6.28E-15	2.51E-14	0.51	0.02	0.07	0.6			
1220	CHEM LAB FILT EX	8.66E-14	7.48	+/-	8.00E-14	5.56	7.36E-14	2.60E-15	1.04E-14	6.36	0.22	0.9	7.48			
1221	DECON ROOM EX	2.41E-13	5.32	+/-	8.00E-14	1.42	2.05E-13	7.24E-15	2.90E-14	4.52	0.16	0.64	5.32			
1222	CALC COMB GAS LN 1	2.27E-13	0.58	+/-	8.00E-14	0.16	1.93E-13	6.80E-15	2.72E-14	0.49	0.02	0.07	0.58			
1223	CALC COMB GAS LN 2	4.37E-13	1.11	+/-	8.00E-14	0.16	3.71E-13	1.31E-14	5.24E-14	0.95	0.03	0.13	1.11			
1224	CALC COMB GAS LN 3	1.45E-13	0.37	+/-	8.00E-14	0.16	1.23E-13	4.36E-15	1.74E-14	0.31	0.01	0.04	0.36			
1225	CALC COMB GAS LN 4	1.27E-13	0.32	+/-	8.00E-14	0.16	1.08E-13	3.82E-15	1.53E-14	0.28	0.01	0.04	0.33			
1226	CALC COMB GAS LN 5	2.17E-13	0.55	+/-	8.00E-14	0.16	1.84E-13	6.51E-15	2.60E-14	0.47	0.02	0.07	0.56			
1227	CHEM LAB EX #2	2.77E-13	2.51	+/-	8.00E-14	0.58	2.35E-13	8.30E-15	3.32E-14	2.13	0.08	0.3	2.51			
1228	CHEM LAB EX #3	9.26E-14	0.46	+/-	8.00E-14	0.64	7.87E-14	2.78E-15	1.11E-14	0.39	0.01	0.06	0.46			
1229	HP LAB EX	8.53E-14	0.77	+/-	8.00E-14	0.58	7.25E-14	2.56E-15	1.02E-14	0.66	0.02	0.09	0.77			
1230	DEV LAB EX #1	2.07E-13	3.04	+/-	8.00E-14	0.94	1.76E-13	6.21E-15	2.48E-14	2.58	0.09	0.36	3.03			
1231	DEV LAB EX #2	2.20E-13	3.24	+/-	8.00E-14	0.94	1.87E-13	6.61E-15	2.64E-14	2.75	0.1	0.39	3.24			
1232	PELLET COMBINED EX	9.18E-14	6.74	+/-	8.00E-14	4.72	7.81E-14	2.75E-15	1.10E-14	5.73	0.2	0.81	6.74			
1233	SOLVENT EXT N EX	8.76E-14	3.89	+/-	8.00E-14	3.33	7.45E-14	2.63E-15	1.05E-14	3.31	0.12	0.47	3.9			
1234	SOLVENT EXT S EX	2.44E-13	1.8	+/-	8.00E-14	3.33	2.07E-13	7.31E-15	2.92E-14	1.53	0.05	0.22	1.8			
1236	MAP COMBINED	1.69E-13	0	+/-	8.00E-14	2.78	1.44E-13	5.08E-15	2.03E-14	0	0	0	0			
1237	ABF HOOD TORIT EX	8.56E-14	1.89	+/-	8.00E-14	1.42	7.28E-14	2.57E-15	1.03E-14	1.6	0.06	0.23	1.89			
1238	IFBA EXHAUST	8.60E-14	6.32	+/-	8.00E-14	4.72	7.31E-14	2.58E-15	1.03E-14	5.37	0.19	0.76	6.32			
1239	MAINT WELD EX	2.18E-13	3.2	+/-	8.00E-14	0.94	1.85E-13	6.54E-15	2.62E-14	2.72	0.1	0.38	3.2			
1240	AC-3	8.12E-14	4.77	+/-	8.00E-14	3.78	6.90E-14	2.44E-15	9.75E-15	4.06	0.14	0.57	4.77			
1241	PELLET LINE 6	8.38E-14	3.62	+/-	8.00E-14	2.78	7.12E-14	2.51E-15	1.01E-14	3.08	0.11	0.43	3.62			
1242	AC-5	8.63E-14	5.07	+/-	8.00E-14	3.78	7.34E-14	2.59E-15	1.04E-14	4.31	0.15	0.61	5.07			
1243	AC-8	8.49E-14	4.99	+/-	8.00E-14	3.78	7.22E-14	2.55E-15	1.02E-14	4.24	0.15	0.6	4.99			
1244	AMMON FUME SCR 1008A	9.85E-14	2.89	+/-	8.00E-14	1.89	8.38E-14	2.96E-15	1.18E-14	2.46	0.09	0.35	2.9			
1245	AMMON FUME SCR 1008B	1.43E-13	0	+/-	8.00E-14	1.89	1.22E-13	4.30E-15	1.72E-14	0	0	0	0			
1246	AC-4	8.85E-14	5.35	+/-	8.00E-14	3.89	7.52E-14	2.65E-15	1.06E-14	4.55	0.16	0.64	5.35			
1247	HOT OIL RM EX	1.55E-13	9.39	+/-	8.00E-14	3.89	1.32E-13	4.66E-15	1.86E-14	7.98	0.28	1.13	9.39			
1248	ERBIA FURNACE EX	1.10E-13	14.01	+/-	8.00E-14	8.17	9.38E-14	3.31E-15	1.32E-14	11.91	0.42	1.68	14.01			
1249	ERBIA SCRUBBER EX	8.23E-14	5.55	+/-	8.00E-14	4.33	7.00E-14	2.47E-15	9.88E-15	4.72	0.17	0.67	5.56			
1250	ERBIA CHANGE ROOM	8.82E-14	2.61	+/-	8.00E-14	1.9	7.50E-14	2.65E-15	1.06E-14	2.22	0.08	0.31	2.61			
1251	WATERGLASS SCR S1190	9.57E-14	3.49	+/-	8.00E-14	2.36	8.13E-14	2.87E-15	1.15E-14	2.97	0.1	0.42	3.49			
Total																Total
							6.04E-12	2.13E-13	8.52E-13	143	5.01	20.1	167.79			

Total derived isotopic release

Jan-Jun 17 sum iso U uCi/mL

7.10E-12 total

2017 avg iso U uCi/mL

3.92E-14 per day

ATTACHMENT "B"
LIQUID EFFLUENT DISCHARGES
FIRST HALF 2017

- A. Report Period: January 1, 2017, through June 30, 2017
 B. Sample Location: Composite Sampler at Waste Treatment, prior to discharge to Congaree River
 C. Total Liquid Flow: 7.09E+07liters
 D. Sample Collection: Effluent Composite Sampler

FIRST HALF LIQUID DISCHARGES

Radionuclide	LLD (uCi/ml)	Quantity Released (uCi)	Error		Average Concentration Released (uCi/ml)
U234	6.00E-10	1821.3	+/-	186	2.57E-08
U235	6.00E-10	90.9	+/-	49	1.28E-09
U238	6.00E-10	323.8	+/-	79	4.57E-09
<i>Total U</i>		2236.0			3.15E-08
Tc-99	6.00E-10	2146.6	+/-	9993	3.03E-08
Total (Jan-June)		4382.7			9.34E-08

Note:

- Liquid effluent composites were analyzed by alpha spectroscopy, and significant quantities of U-236 were not detected using this method.
- Tc-99 is not reported for gaseous effluents, as significant quantities of Tc-99 were not detected during benchmark testing of gaseous emissions.



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Your ref:

Our ref: LTR-EHS-17-65

Cc: John Howell, Nancy Parr, Anna Pearson,
 Diana Joyner, Sherrie Culler

September 8, 2017

2017 Semi-Annual Assessment of Public Dose from 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 dose models developed by the NRC and EPA to estimate the 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 #1248 (ERBIA Furnace Ex), 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 (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."

The inhalation dose is determined at the nearest site boundary at a distance of 595 meters. 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 48 stacks (Attachment 1). The release rates for liquid effluent are determined by isotopic analysis of liquid effluent samples taken monthly (Attachment 3). Based on these results, the following quantities were released in the 1st half of calendar year 2017:

- 167.81 μ Ci of Uranium in gaseous effluent
- 2.24 mCi of Uranium in liquid effluent
- 2.15 mCi 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 2017 resulted in a potential whole body dose of 0.08 mrem and a lung dose of 0.60 mrem to an individual present at the nearest site boundary. The dose to the bone is negligible. These doses are well below the 12.5 mrem (1/2 of the 25 mrem annual dose limit) and the 0.5 mrem ALARA limit (1/2 of 1 mrem annual ALARA limit) for a member of the public.

Table 1. 2017 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	2.27E-03	0.60
Liquid Effluents			
Potable Water	2.69E-05	3.94E-04	-
Aquatic Food (Fish)	1.60E-06	2.27E-05	-
Shoreline Deposition	9.12E-10	-	-
<i>Total (mrem/6 months)</i>	<i>0.08</i>	<i>2.67E-03</i>	<i>0.60</i>

* Assumes 80 % residence time

There were no significant changes in source material or chemical form between 2016 and the 1st half of 2017. 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 2017 Gaseous Effluent Discharges
- Attachment 2: Lung/Bone Organ Dose due to Gaseous Effluent
- Attachment 3: 1st Half 2017 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: 2017 Isotopic Fractions
- Attachment 10: Comply Results



David Wagoner
Radiation Safety Engineer
EH&S Operations



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

Attachment 1 1st Half 2017 Gaseous Effluent Discharges

Sampling Station	Location Description	Stack Height (m)	Flow Rate (m/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	2.34E-13	4.34E-15	1.09E-13	1.47E-14	2.02
1238	IFBA EXHAUST	10	4.72	8.60E-14	1.36E-14	3.42E-13	4.59E-14	6.32
1239	MAINT WELD EX	11	0.94	2.18E-13	6.88E-15	1.73E-13	2.33E-14	3.20
1243	AC-8	11	3.78	8.49E-14	1.07E-14	2.70E-13	3.63E-14	4.99
1222	CALC COMB GAS IN 1	12	0.16	2.27E-13	1.25E-15	3.14E-14	4.22E-15	0.58
1223	CALC COMB GAS IN 2	12	0.16	4.37E-13	2.39E-15	6.00E-14	8.07E-15	1.11
1224	CALC COMB GAS IN 3	12	0.16	1.45E-13	7.95E-16	2.00E-14	2.69E-15	0.37
1225	CALC COMB GAS IN 4	12	0.16	1.27E-13	6.88E-16	1.73E-14	2.33E-15	0.32
1226	CALC COMB GAS IN 5	12	0.16	2.17E-13	1.18E-15	2.97E-14	4.00E-15	0.55
1228	CHEM LAB EX #3	12	0.64	9.26E-14	9.89E-16	2.49E-14	3.34E-15	0.46
1231	DEV LAB EX #2	12	0.94	2.20E-13	6.96E-15	1.75E-13	2.36E-14	3.24
1237	ABF HOOD TORIT EX	12	1.42	8.56E-14	4.06E-15	1.02E-13	1.37E-14	1.89
1241	PELLET LINE 6	12	2.78	8.38E-14	7.78E-15	1.96E-13	2.63E-14	3.62
1247	HOT OIL-RM EX	12	3.89	1.55E-13	2.02E-14	5.08E-13	6.83E-14	9.39
1201	FURNACE EX LINE 1	13	2.78	8.02E-14	7.44E-15	1.87E-13	2.51E-14	3.46
1202	FURNACE EX LINE 2	13	2.78	8.02E-14	7.44E-15	1.87E-13	2.51E-14	3.46
1203	FURNACE EX LINE 3	13	2.78	8.01E-14	7.44E-15	1.87E-13	2.51E-14	3.46
1204	FURNACE EX LINE 4	13	2.78	8.00E-14	7.44E-15	1.87E-13	2.51E-14	3.46
1205	FURNACE EX LINE 5	13	2.78	8.00E-14	7.44E-15	1.87E-13	2.51E-14	3.46
1206	NEW DECON ROOM	13	1.64	8.61E-14	4.71E-15	1.18E-13	1.59E-14	2.19
1208	INCINERATOR EX	13	1.89	1.82E-13	1.15E-14	2.90E-13	3.90E-14	5.36
1209	SUPPL INCIN EX	13	0.94	1.02E-13	3.22E-15	8.11E-14	1.09E-14	1.50
1216	MAINT ENCL EX 4-B	13	3.89	3.92E-13	0.00E+00	0.00E+00	0.00E+00	0.00
1217	CONV ENCL EX 4-C	13	3.89	1.46E-13	0.00E+00	4.99E-13	6.71E-14	9.23
1218	CONV ENCL EX 4-D	13	3.89	1.46E-13	0.00E+00	4.99E-13	6.71E-14	9.23
1219	CONV EMERG EX 4E	13	3.89	2.09E-13	0.00E+00	3.24E-14	4.36E-15	0.60
1221	DECON ROOM EX	13	1.42	2.41E-13	1.14E-14	2.88E-13	3.87E-14	5.32
1230	DEV LAB EX #1	13	0.94	2.07E-13	6.53E-15	1.64E-13	2.21E-14	3.04
1232	PELLET COMBINED EX	13	4.72	9.18E-14	1.45E-14	3.65E-13	4.90E-14	6.74
1233	SOLVENT EXT N EX	13	3.33	8.76E-14	8.36E-15	2.10E-13	2.83E-14	3.89
1234	SOLVENT EXT S EX	13	3.33	2.44E-13	3.87E-15	9.73E-14	1.31E-14	1.80
1229	HP LAB EX	15	0.58	8.53E-14	1.66E-15	4.16E-14	5.60E-15	0.77
1236	MAP COMBINED	15	2.78	1.69E-13	0.00E+00	0.00E+00	0.00E+00	0.00
1240	AC-3	15	3.78	8.12E-14	1.03E-14	2.58E-13	3.47E-14	4.77
1246	AC-4	15	3.89	8.85E-14	1.15E-14	2.89E-13	3.89E-14	5.35
1251	WATERGLASS SCR S1190	15	2.36	9.57E-14	7.50E-15	1.89E-13	2.54E-14	3.49
1210	CONV 1-A EX	16	4.17	9.00E-14	1.25E-14	3.15E-13	4.24E-14	5.83
1211	CONV 1-B EX	16	4.17	2.23E-13	0.00E+00	0.00E+00	0.00E+00	0.00
1212	S1030 A	16	7.56	9.93E-14	2.39E-14	6.01E-13	8.08E-14	11.11
1213	S1030 B	16	7.56	2.41E-13	2.88E-15	7.25E-14	9.74E-15	1.34
1227	CHEM LAB EX #2	16	0.58	2.77E-13	5.40E-15	1.36E-13	1.82E-14	2.51
1220	CHEM LAB FILT EX	17	5.56	8.66E-14	1.61E-14	4.05E-13	5.44E-14	7.48
1242	AC-5	17	3.78	8.63E-14	1.09E-14	2.74E-13	3.69E-14	5.07
1244	AMMON FUME SCR 1008A	17	1.89	9.85E-14	6.21E-15	1.56E-13	2.10E-14	2.89
1245	AMMON FUME SCR 1008B	17	1.89	1.43E-13	0.00E+00	0.00E+00	0.00E+00	0.00
1248	ERBIA FURNACE EX	18	8.17	1.10E-13	3.01E-14	7.58E-13	1.02E-13	14.01
1249	ERBIA SCRUBBER EX	18	4.33	8.23E-14	1.19E-14	3.00E-13	4.03E-14	5.55
1250	ERBIA CHANGE ROOM	18	1.9	8.82E-14	5.61E-15	1.41E-13	1.90E-14	2.61
Total				9.08E-12	3.61E-13	1.22E-12	1.67E-11	

* Concentration LLD is 8E-14 uCi/ml

Attachment 1
1st Half 2017 Gaseous Effluent Discharges

Height (m)	Ci/s/6mo		Building Ht Meter	Width Meter	Nearest Receptor Meter
	U234	U235			
10	4.51E-13	1.79E-14	6.06E-14	9	137
11	4.43E-13	1.76E-14	5.95E-14	9	137
12	1.16E-12	4.63E-14	1.56E-13	9	137
13	3.08E-12	1.22E-13	4.14E-13	9	137
15	7.78E-13	3.09E-14	1.05E-13	9	137
16	1.12E-12	4.47E-14	1.51E-13	9	137
17	8.35E-13	3.32E-14	1.12E-13	9	137
18	1.20E-12	4.77E-14	1.61E-13	9	137

Attachment 2
Lung/Bone Organ Dose due to Gaseous Effluents

	1st half (Jan-Jun) uCi Uranium 14.01	2nd half (Jul-Dec) uCi Uranium N/A	Total uCi released 14.01	EPA Comply Run Results Dose (mrem/yr) Stack height (m) Release Rate (Ci/s)		
STACK IDENTIFICATION						
ERBIA Furnace Ex use highest release to calculate X/Q used by COMPLY				1.50E-02 18 U-234 7.58E-13		U-235 3.01E-14 U-238 1.02E-13
Dose from comply release quantity	0.00750 14.01 1.40E-05	mrem/6 mo uCi Ci				
App E table E-5 Effective Dose conversion	4000.00	m3/6 mo				
EPA FGR 11 p150-151						
U-234	3.58E-05	Sv/Bq	85.04%			
U-235	3.32E-05	Sv/Bq	3.38%			
U-238	3.20E-05	Sv/Bq	11.43%			
weighted dose conversion	3.52E-05	Sv/Bq				
conversion factor	3700.00	mrem/pCi= factor* Sv/Bq				
weighted dose conversion	0.1303	mrem/pCi				
			equations			
Dose (mrem) = R(a)*3.17e4*Q*(X/Q)*effective Dose conversion			see RG1, 109-25			
Dose (mrem)/(R(a)*3.17e4*Q*effective Dose conversion)=(X/Q)						
	3.24E-05	X/Q				
Estimate Lung Dose using X/Q and semi-annual releases for 2017				Estimate Bone Dose using X/Q and semi-annual releases for 2017		
App E table E-5 Lung Organ Dose conversion						
EPA FGR 11 p150-151						
U-234	2.98E-04	Sv/Bq	85.04%	1.13E-06 Sv/Bq		
U-235	2.76E-04	Sv/Bq	3.38%	1.05E-06 Sv/Bq		
U-238	2.66E-04	Sv/Bq	11.43%	1.01E-06 Sv/Bq		
weighted dose conversion	2.93E-04	Sv/Bq		1.11E-06 Sv/Bq		
conversion factor	3700.00	mrem/pCi= factor* Sv/Bq		3700.00 mrem/pCi= factor* Sv/Bq		
weighted dose conversion	1.0847	mrem/pCi		4.11E-03 mrem/pCi		
release quantity	167.81 1.68E-04	uCi/6 mo Ci/6 mo		167.81 1.68E-04 uCi/6 mo Ci/6 mo		
Lung * assume 80% residence	0.60	mrem/6 mo	Bone *	2.27E-03 mrem/6 mo		

Attachment 3 - 1st HALF LIQUID EFFLUENT RADIOACTIVITY DISCHARGES

Month	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			
	Average kg/day	Actual kg/month	Actual g/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)	
JAN	120.873	3747.076	3,747.076	18.9	0.785	3.15	22.835	34.4	57.235	268.053	11.133	44.675	487.884	2.24	0.555	0.932	141	31.769	7.871	13.218	1999.756	
FEB	84.715	2372.024	2,372.024	15.9	1.08	2.25	19.230	60.3	79.530	142.752	9.696	20.201	541.380	2.38	0.742	0.918	142	21.368	6.662	8.242	1274.892	
MAR	87.840	2723.042	2,723.042	36.1	1.93	6.95	44.980	82.6	127.580	372.072	19.892	71.632	851.335	2.88	0.765	1.127	143	29.683	7.885	13.090	1473.860	
APR	112.071	3250.064	3,250.064	31.4	1.12	5.98	38.500	0.0	38.500	386.267	13.778	73.563	0.000	3.27	0.748	1.44	152	40.226	9.202	17.714	1863.827	
MAY	131.362	3940.857	3,940.857	20.9	0.842	4.22	25.962	0.0	25.962	311.747	12.559	62.946	0.000	1.93	0.504	0.904	121	28.788	7.518	13.484	1804.853	
JUNE	107.721	2693.033	2,693.033	33.4	2.34	4.98	40.720	26.1	66.820	340.450	23.852	50.762	266.041	3.32	0.999	1.29	154	33.841	10.183	13.149	1569.742	
Total (Jan-June)		18,726.096	18,726.096							1821.342	90.911	323.779	2146.640					186	49	79	9993	
Liters (L)										uCi Uranium for 6-month period				2236.0								
Milliliters (ml)										uCi Uranium & Tc-99 for 6-month period				4382.7								

FIRST HALF LIQUID DISCHARGES

Radionuclide	LLD (uCi/ml)	Quantity Released (uCi)	Error	Average Concentration Released (uCi/ml)
U234	6.00E-10	1821.3	+/- 186	2.57E-08
U235	6.00E-10	90.9	+/- 49	1.28E-09
U238	6.00E-10	323.8	+/- 79	4.57E-09
Total U		2236.0		3.19E-08
Tc-99	6.00E-10	2146.6	+/- 9993	3.03E-08
Total (Jan-June)		4382.7		9.34E-08

Attachment 4 Whole Body Dose from Liquid Effluent Pathways - Potable Water

Whole Body-Ingestion			Usage by adult/6 m U		Dilution at diffuser M		Average discharge F		EPA Limiting Values of Radioisotope Intake		Effective S/bq		Bone S/bq		Effective S/bq		Bone S/bq		Effective S/bq		Bone S/bq								
Activity Released	Q	% of activity based on current nominal uranium isotopic (see U activity tab)	summation of liquid effluent alpha activity	URANIUM234	URANIUM235	URANIUM236	URANIUM238	TC-99	reg guide 1, 109	table E-15	T(1/2) yr	T(1/2) hr	λ	U-234	U-235	U-236	U-238	TC-99	7.66E-08	7.19E-08	7.26E-08	6.88E-08	3.95E-10	6.04E-11	1.46E-06	2.29E-07			
365 liters									10CFR20	7.3 x 10 ⁷ (m) which is the annual water intake of "Reference Man."																			
31293 mixing - dilution									Congaree Flow	9388 cubic feet/sec																			
0.3 cubic ft/sec									Effluent Flow	3.00E-01 cubic feet/sec																			
2.83E-04 U-234	mRem/pCi																												
2.66E-04 U-235	mRem/pCi																												
3.38075E-12 U-236	mRem/pCi																												
2.55E-04 U-238	mRem/pCi																												
1.46E-06 Tc-99	mRem/pCi																												
12 hrs	transit time																												
3.23557E-10 U-234	decay const																												
1.12404E-13 U-235	decay const																												
3.38075E-12 U-236	decay const																												
1.77058E-14 U-238	decay const																												
3.71407E-10 Tc-99	decay const																												
0.999999996 U-234	exp(-λt)p																												
1.000000000 U-235	exp(-λt)p																												
1.000000000 U-236	exp(-λt)p																												
1.000000000 U-238	exp(-λt)p																												
0.999999995 Tc-99	exp(-λt)p																												
2.236E-03 total uranium(Ci)	Q																												
1.901E-03 U-234 release fraction	Ci																												
7.588E-05 U-235 release fraction	Ci																												
3.354E-06 U-236 release fraction	Ci																												
2.566E-04 U-238 release fraction	Ci																												
2.147E-03 Tc-99 release fraction	Ci																												
check U sum	0.00224																												
5.39E-07 U-234	release fraction *dose factor*exp(-λt)p																												
2.01E-08 U-235	release fraction *dose factor*exp(-λt)p																												
9.01E-10 U-236	release fraction *dose factor*exp(-λt)p																												
6.51E-08 U-238	release fraction *dose factor*exp(-λt)p																												
3.14E-09 Tc-99	release fraction *dose factor*exp(-λt)p																												
6.28E-07 all nuclides	sum of nuclides																												
42.76736 usage	1100*(usage/dilution)/flow																												
2.89E-05 mRem	see regulatory guide 1, 109 page 1, 109-2 and 1, 109-3 for formula and definition of terms.																												

Attachment 5 Dose to the Bone Surface from Liquid Effluent Pathways - Potable Water

Bone Surface-Ingestion		10CFR20 7.3 x 10 ⁷ (ml) which is the annual water intake of "reference Man."		9388 cubic feet/sec 3.00E-01 cubic feet/sec		see Nureg-1118 Environmental Assessment for renewal SNM-1107 May 1985			
365 liters	Usage by adult/6 mU								
31293 mixing - dilution	Dilution at difuser M								
0.3 cubic ft/sec	Average discharge F								
4.18E-03 U-234	mRem/pCi								
3.88E-03 U-235	mRem/pCi								
3.96E-03 U-236	mRem/pCi								
3.74E-03 U-238	mRem/pCi								
2.23E-07 Tc-99	mRem/pCi								
12 hrs	transit time t-p								
3.23557E-10 U-234	decay const λ								
1.12404E-13 U-235	decay const λ								
3.38075E-12 U-236	decay const λ								
1.77058E-14 U-238	decay const λ								
3.71407E-10 Tc-99	decay const λ								
0.9999999961 U-234	exp(-λt-p)								
1.0000000000 U-235	exp(-λt-p)								
1.0000000000 U-236	exp(-λt-p)								
1.0000000000 U-238	exp(-λt-p)								
0.9999999955 Tc-99	exp(-λt-p)								
Activity Released									
2.236E-03 total uranium(Ci)	Q								
1.9015E-03 U-234 release fraction	Ci	summation of liquid effluent alpha activity							
7.5577E-05 U-235 release fraction	Ci	% of activity based on current nominal uranium isotopic (see U activity tab)							
3.3540E-06 U-236 release fraction	Ci	URANIUM234 85.04%							
2.5557E-04 U-238 release fraction	Ci	URANIUM235 3.38%							
2.147E-03 Tc-99 release fraction	Ci	URANIUM236 0.15%							
check U sum	0.00224	URANIUM238 11.43%							
		TC-99							
7.95E-06 U-234	release fraction *dose factor*exp(λ*tp)								
2.94E-07 U-235	release fraction *dose factor*exp(λ*tp)								
1.33E-08 U-236	release fraction *dose factor*exp(λ*tp)								
9.55E-07 U-238	release fraction *dose factor*exp(λ*tp)								
4.80E-10 Tc-99	release fraction *dose factor*exp(λ*tp)								
9.21E-06 all nuclides	sum of nuclides								
42.76736 usage	1100*(usage *dilution)/flow								
3.94E-04 mRem	see regulatory guide 1.109 page 1.109-2 and 1.109-3 for formula and definition of terms.								

Attachment 9 2017 Isotopic Fractions

Based on the plant nominal enrichment for 2017

Nuclide	Average wt%	Specific Activity Ci/g	Weighted Activity	% Activity
U-234	0.04	6.220E-03	2.388E-04	85.04
U-235	4.40	2.160E-06	9.504E-06	3.38
U-236	0.01	6.470E-05	4.076E-07	0.15
U-238	95.57	3.360E-07	3.211E-05	11.43
Total	100.0		2.809E-04	100.00

COMPLY: V1.6.

9/ 7/2017 8:46

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

2017 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	4.510E-13
U-235	Y	1.790E-14
U-238	Y	6.060E-14

RELEASE RATES FOR STACK 2.

Nuclide		Release Rate (curies/SECOND)
U-234	Y	4.430E-13
U-235	Y	1.760E-14
U-238	Y	5.950E-14

RELEASE RATES FOR STACK 3.

Nuclide		Release Rate (curies/SECOND)
U-234	Y	1.160E-12
U-235	Y	4.630E-14
U-238	Y	1.560E-13

RELEASE RATES FOR STACK 4.

Nuclide		Release Rate (curies/SECOND)
U-234	Y	3.080E-12
U-235	Y	1.220E-13
U-238	Y	4.140E-13

RELEASE RATES FOR STACK 5.

Nuclide		Release Rate (curies/SECOND)
U-234	Y	7.780E-13
U-235	Y	3.090E-14
U-238	Y	1.050E-13

RELEASE RATES FOR STACK 6.

Nuclide		Release Rate (curies/SECOND)
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U-234	Y	1.120E-12
U-235	Y	4.470E-14
U-238	Y	1.510E-13

RELEASE RATES FOR STACK 7.

Nuclide		Release Rate (curies/SECOND)
U-234	Y	8.350E-13
U-235	Y	3.320E-14
U-238	Y	1.120E-13

RELEASE RATES FOR STACK 8.

Nuclide		Release Rate (curies/SECOND)
U-234	Y	1.200E-12
U-235	Y	4.770E-14
U-238	Y	1.610E-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.

9/ 7/2017 8:38

40 CFR Part 61
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Prepared for:

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

ERBIA Furnace Exhaust

SCREENING LEVEL 2

DATA ENTERED:

Nuclide		Release Rate (curies/SECOND)
U-234	Y	7.580E-13
U-235	Y	3.010E-14
U-238	Y	1.020E-13

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: 1.5E-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 *****