Ohio River Clean Fuels, LLC

Baard Energy, LLC

Michael E. Hopkins
Assistant Chief, Permitting
Division of Air Pollution Control, Permitting Section
Ohio EPA
50 West Town Street
Suite 700
Columbus, Ohio 43215

November 11, 2008

SUBJECT: Ohio EPA Permit to Install Revisions
Ohio River Clean Fuels, L.L.C.
Permit Number: 02-22896, Facility ID: 0215130393

Dear Mr. Hopkins:

We have made the corrections Table 2, Revision 2 and the table, below, as requested by Ken Djukic's email last week (CO, NOx, VOC and PM emissions for Module 3). Please set aside the October 27 letter.

The following amendments to the Subject permit are provided according to our recent discussions since the Draft Permit was published:

MODULE 3: Gasification

After consultation with our engineering and technology provider for the gasification trains, we developed more detailed understanding and subsequent procedures under which the High Pressure Flares would be utilized during start ups and shut downs. As a result, the estimated criteria pollutant emissions have been changed and are in the attached revisions to the module 3 calculations (Page 3B-2).

The operating procedures advised by our engineering and technology providers which result in these changes are:

1. The gasifiers will not require flaring during normal, non-emergency shut downs and these emissions are now eliminated from the calculations.
2. The engineers advise that we will need approximately 90 start ups per year for the six gasifiers.
3. The gasifiers will be started up and only allowed to be flared during a one-hour period during start up. The flare emissions will be reduced by limiting the flow rate to the flares during this period of time to no more than 80% of the designed maximum flow rate and the feedstock feed rate will be limited to not exceed 50% of the designed feed rate capacity of the gasifier.
4. During the gasifier start up, the gasifiers will use low-sulfur feedstocks, no more than 0.63 wt percent Sulfur.

As detailed in the attached Amended Table 2, the resultant emissions changes are shown, below:

Amended Flare Emissions Estimates

Module 3 Gasification	Emission Unit	CO	NO_x	PE (total)	PM10	SO_x	VOC
Original Flare Emissions	Gasifiers (6) Startup/Shutdown Flaring	65.8	10.1	0.3	0.3	732.3	4.1
Amended Flare Emissions	Gasifiers (6) Startup/Shutdown Flaring	113.5	17.0	0.4	0.4	78.3	7.1

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Hazardous Air Pollutant Emissions – Table 3

Ohio River Clean Fuels (ORCF) has reviewed the operating parameters for several of the control processes in order to address questions related to Hazardous Air Pollutants (HAP) and submits the changes identified in the attached Revised Table 3 of Attachment B in the Application Introduction. Based on the following revisions to the HAP emissions inventory, ORCF will not be a major source of HAP emissions.

1. **Feedstock Processing (P001 to P010):** ORCF originally reported its potential to emit (PTE) for HAP as an uncontrolled emission rate (combined HAP emissions of 8.466 tpy, the largest of which was hexane at 8.07 tpy). In accordance with OEPA Engineering Guide #67, ORCF should have reported its PTE considering controls. In this case, the actual (controlled) emission rate at full operating capacity (PTE) is 2.193 tpy (total HAP) and 2.09 tpy (hexane).
2. **F-T Catalyst Regeneration and Process Vents (P029):** ORCF originally reported its potential to emit (PTE) for HAP as an uncontrolled emission rate (combined HAP emissions of 2.476 tpy, the largest of which was hexane at 2.36 tpy). In accordance with OEPA Engineering Guide #67, ORCF should have reported its PTE considering controls. In this case, the actual (controlled) emission rate at full operating capacity (PTE) is 0.067 tpy (total HAP) and 0.056 tpy (hexane).
3. **Phase 1 Boiler (B001):** ORCF originally reported its potential to emit (PTE) for HAP as an uncontrolled emission rate (combined HAP emissions of 27.902 tpy, the largest of which was hexane at 26.6 tpy). In accordance with OEPA Engineering Guide #67, ORCF should have reported its PTE considering controls. The controls include the increase in control efficiency from 30% to 98%. With this, the actual (controlled) emission rate at full operating capacity (PTE) is 0.779 tpy (total HAP) and 0.0532 tpy (hexane). See Table 9B-2, Amended.
4. **Combustion Turbine Generators (P018 and P019):** ORCF originally reported its potential to emit (PTE) for HAP as an uncontrolled emission rate (combined HAP emissions of 19.752 tpy, the largest of which is formaldehyde at 13.6 tpy. In accordance with OEPA Engineering Guide #67, ORCF should have reported its PTE considering controls. The controls include an increase in control efficiency from 30% to 90%. With this, the actual (controlled) emission rate at full operating capacity (PTE) is 1.599 tpy total HAP and 1.36 tpy formaldehyde. See Table 9B-1, Amended.

If there are any questions regarding these changes, please feel free to contact us.

Regards,

Steve Dopuch

Stephan M. Dopuch
Vice President, Business Development

Copy: K. Macoskey, Civil & Environmental Consultants, Inc
N. Petricoff, Baard Energy, L.L.C.

Attachments (4)

Actual Criteria Pollutant Emissions Summary (Tons per Year)

Module	Emission Unit	Description	CO	NO_x	PE	PM10	SO_x	VOC
1 - Feedstock Storage	F001	Coal Storage			25.7	12.3		
	F002	Biomass Storage			2.7	1.0		
		Module Totals:	**0.0**	**0.0**	**28.4**	**13.3**	**0.0**	**0.0**
2 - Feedstock Processing	F003	Coal & Biomass Hopper Bldg.			0.6	0.6		
	F004 to F008	Transfer Towers (5)			19.5	19.5		
	F009	Coal Crusher House			5.1	5.1		
	F010	Biomass Crusher House			5.1	5.1		
	F011	Coal Silos 1 & 2			3.0	3.0		
	F012	Coal Silos 3 & 4			3.8	3.8		
	F013	Coal Silos 5 & 6			3.8	3.8		
	F014	Biomass Silos 1 & 2			3.8	3.8		
	P001	Coal Milling and Drying Line 1	9.8	5.8	4.8	4.8	1.1	0.6
	P002	Coal Milling and Drying Line 2	9.8	5.8	4.8	4.8	1.1	0.6
	P003	Coal Milling and Drying Line 3	9.8	5.8	4.8	4.8	1.1	0.6
	P004	Coal Milling and Drying Line 4	9.8	5.8	4.8	4.8	1.1	0.6
	P005	Coal Milling and Drying Line 5	9.8	5.8	4.8	4.8	1.1	0.6
	P006	Coal Milling and Drying Line 6	9.8	5.8	4.8	4.8	1.1	0.6
	P007	Coal Milling and Drying Line 7	9.8	5.8	4.8	4.8	1.1	0.6
	P008	Biomass Milling and Drying Line 1	9.8	5.8	4.9	4.9	1.1	0.6
	P009	Biomass Milling and Drying Line 2	9.8	5.8	4.9	4.9	1.1	0.6
	P010	Biomass Milling and Drying Line 3	9.8	5.8	4.9	4.9	1.1	0.6
		Module Totals:	**97.5**	**58.0**	**93.2**	**93.2**	**10.6**	**6.4**
3 - Gasification	P020 to P025	Gasifiers (6) Startup/Shutdown Flaring	113.5	17.0	0.4	0.4	78.3	7.1
		Module Totals:	**113.5**	**17.0**	**0.4**	**0.4**	**78.3**	**7.1**
4 - Material Handling	F015 to F020	Fly Ash Handling Systems (6)			1.2	1.2		
	F021 to F026	Slag Dewatering Silos (6)			22.8	22.8		
	F027	Slag Storage Pile			2.0	1.0		
		Module Totals:	**0.0**	**0.0**	**26.0**	**25.0**	**0.0**	**0.0**
5 - Syngas Cleanup	P011	Sulfur Recovery Train 1	9.6	12.9	0.9	0.9	142.7	0.6
	P012	Sulfur Recovery Train 2	9.6	12.9	0.9	0.9	142.7	0.6
	P026	Syngas Cleanup Train 1	1,351.7					
	P027	Syngas Cleanup Train 2	1,351.7					
	P028	Syngas Cleanup Train 3	1,351.7					
		Module Totals:	**4,074.4**	**25.8**	**1.7**	**1.7**	**285.4**	**1.2**
6 - Fischer Tropsch & Product Upgrade	B002	F-T Catalyst Reduction Gas Heater	4.2	4.9	0.4	0.4	0.0	0.3
	B003	F-T Catalyst Oxidation Gas Heater	4.2	4.9	0.4	0.4	0.0	0.3
	B004	F-T Hydrogen Stripping Heater	4.2	4.9	0.4	0.4	0.0	0.3
	B005	Product Upgrade Heaters (3)	227.3	73.6	20.7	20.7	1.6	14.9
	B006	F-T System Fractionator Heater						
	P029	F-T Catalyst Regen and Process Vents	110.3	131.4	10.0	10.0	0.8	0.1
	P030	F-T Rotary Dryer and Heaters (2)	8.4	9.8	0.8	0.8	0.1	0.6
	P031	Equipment Leaks						1.7
		Module Totals:	**358.6**	**229.5**	**32.7**	**32.7**	**2.6**	**18.2**
7 - Tank Farm	T001 to T008	F-T Diesel Tanks (8)						6.4
	T009 to T011	F-T Naphtha Tanks (3)						2.6
	T012	Off-Spec Internal Floating Roof Tank						0.9
		Module Totals:	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**9.9**
8 - Product Loading	J001	Loading Rack						1.7
		Module Totals:	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**1.7**
9 - Combined Cycle Plant	B001	Phase 1 Boiler[1]	157.6	530.0	81.9	81.9	8.9	57.1
	P018	Combined Cycle Plant 1[2]	121.6	255.1	80.3	80.3	91.1	116.6
	P019	Combined Cycle Plant 2[2]	121.6	255.1	80.3	80.3	91.1	116.6
		Final Combined Cycle Plant Totals:	**243.1**	**510.3**	**160.5**	**160.5**	**182.2**	**233.1**
10 - Cooling Towers	P013	Cooling Tower 1			10.5	10.5		
	P014	Cooling Tower 2			10.5	10.5		
		Module Totals:			**21.0**	**21.0**		
11 - Emergency Generator & Fire Pumps	P015	Emergency Generator	3.8	6.6	0.2	0.2	0.0	0.4
	P016	Emergency Fire Pump 1	0.4	1.2	0.1	0.1	0.2	0.1
	P017	Emergency Fire Pump 2	0.4	1.2	0.1	0.1	0.2	0.1
		Module Totals:	**4.7**	**9.1**	**0.4**	**0.4**	**0.3**	**0.5**
12 - Roadways & Parking	F028	Paved Roadways and Parking			79.0	15.4		
		Module Totals:			**79.0**	**15.4**		
		FACILITY TOTALS:	**CO**	**NO_x**	**PE**	**PM10**	**SO_x**	**VOC**
			4,891.7	**849.6**	**443.3**	**363.5**	**559.4**	**278.0**

Notes:
1) Phase 1 Boiler operation will be discontinued after the first CTG is brought on line.
2) Includes startup/shutdown emissions (tpy): CO: 21.8, NOx: 8.6, PE/PM10: 1.6, SOx: 0.08, VOC: 1.6

Module[1, 2]	2	3	5	5	6	6	6	7	8	9	9	10	11	11		
Emission Unit → / Hazardous Air Pollutant ↓	Feedstock Processing (P001 to P010)	Gasification (P020 to P025)	Sulfur Recovery Trains (P011 & P012)	Syngas Cleanup Trains (P026 to P028)	Process Heaters (B002 to B006 and P030)	F-T Catalyst Regen and Process Vents (P029)	Equipment Leaks (P031)[3]	F-T Naphtha Tanks (T009 to T012)[4]	F-T Naphtha Loading (J001)[5]	Phase 1 Boiler (B001)[6]	Combined Cycle CTGs (P018 & P019)	Cooling Towers (P013 & P014)[7]	Emergency Generator (P015)	Emergency Fire Pumps (P016 & P017)	PHASE 1 TOTAL	PHASE 2 TOTAL
Acetaldehyde											1.54E-02		1.17E-04	8.05E-04	0.001	0.016
Acrolein											2.46E-03		3.65E-05	9.71E-05	0.000	0.003
Antimony Compounds															0.000	0.000
Arsenic Compounds	2.32E-04	5.07E-07	4.44E-05		5.91E-04	2.63E-04				2.96E-03		3.70E-06			0.004	0.001
Benzene	2.44E-03	5.33E-06	4.66E-04		6.20E-03	6.53E-05				6.21E-04	4.61E-03		**3.60E-03**	9.80E-04	0.014	0.018
Beryllium Compounds	1.39E-05	3.04E-08	2.66E-06		3.54E-05	1.58E-05				1.77E-04					0.000	0.000
1,3-Butadiene											1.65E-04			4.11E-05	0.000	0.000
Cadmium Compounds	1.28E-03	2.79E-06	2.44E-04		3.25E-03	1.45E-03				1.63E-02					0.023	0.006
Carbonyl Sulfide		**9.00E-02**		**8.57E+00**											8.660	8.660
Chromium Compounds	1.62E-03	3.55E-06	3.11E-04		4.13E-03	1.84E-03				2.07E-02		5.80E-06			0.029	0.008
Cobalt Compounds	9.75E-05	2.13E-07	1.86E-05		2.48E-04	1.10E-04				1.24E-03					0.002	0.000
Dichlorobenzene	1.39E-03	3.04E-06	2.66E-04		3.54E-03	3.73E-05				1.77E-03					0.007	0.005
Ethyl benzene											6.14E-02				0.000	0.061
Formaldehyde	8.70E-02	1.90E-04	1.66E-02		2.21E-01	2.33E-03				1.11E-01	**1.36E+00**		3.66E-04	**1.24E-03**	0.440	1.693
Hexane	**2.09E+00**	4.56E-03	3.99E-01		**5.31E+00**	**5.60E-02**	**2.00E-01**	**5.00E-01**	**3.60E-01**	**5.32E-01**					**9.452**	**8.920**
Lead Compounds	5.80E-04	1.27E-06	1.11E-04		1.52E-03	6.57E-04						4.22E-06			0.003	0.003
Manganese Compounds	4.41E-04	9.64E-07	8.43E-05		1.12E-03	4.99E-04				5.62E-03		**8.96E-04**			0.009	0.003
Mercury Compounds	3.02E-04	6.59E-07	5.77E-05		7.68E-04	3.42E-04				3.84E-03	1.37E-02	2.10E-08			0.005	0.015
Methyl Chloride															0.000	0.000
Naphthalene	7.08E-04	1.55E-06	1.35E-04		1.80E-03	1.90E-05				9.02E-04	2.50E-03			8.90E-05	0.004	0.005
Nickel Compounds	2.44E-03	5.33E-06	4.66E-04		6.20E-03	2.76E-03				3.10E-02		3.06E-05			0.043	0.012
POM/PAH	1.02E-04	2.23E-07	1.95E-05		2.60E-04	2.74E-06				1.30E-04	4.22E-03		9.81E-04	3.52E-05	0.002	0.006
Propylene Oxide											5.58E-02				0.000	0.056
Selenium Compounds	2.79E-05	6.09E-08	5.33E-06		7.09E-05	3.15E-05				3.55E-04		9.38E-06			0.001	0.000
Toluene	3.95E-03	8.62E-06	7.55E-04		1.00E-02	1.06E-04				5.03E-02	4.99E-02		1.30E-03	4.29E-04	0.067	0.066
Xylenes											2.46E-02		8.95E-04	2.99E-04	0.001	0.026
TOTAL HAP	2.193	0.095	0.419	8.570	5.571	0.067	0.200	0.500	0.360	0.779	1.599	0.001	0.007	0.004	**18.764**	**19.584**
	A	H	G	G	G	B	G	C	C	D	E	F	G	G		
Air Toxics																
Ammonia		0.01								224	224				224.010	224.010
Hydrogen sulfide		0.49	10.5	12											22.990	22.990

Notes:

1) There are no HAP emissions associated with Modules 1, 4, & 12.
2) **Bold** values indicate the highest HAP for each Module.
3) Module 6 equipment leak estimate includes BACT controls for VOC emissions.
4) Module 7 F-T naphtha tanks are subject to 40 CFR 63, Subpart EEEE and therefore reflect the use of federally-enforceable controls (internal floating roof tanks).
5) Module 8 (loading rack) is subject to 40 CFR 63, Subpart EEEE and therefore reflect the use of federally-enforceable controls (vapor recovery system).
6) Phase 1 Boiler HAP emissions will not be produced after Phase 1 (Phase 2 CTGs reflect long-term operations).
7) Module 10 emission estimates reflect use of high-efficiency drift eliminators.

A Controlled emissions reflect control of 74% based on FGR (26% is emitted uncontrolled).
B Controlled emissions reflect 98% control efficiency of flare for VOC and VHAP, as reported in application.
C Application already reflected controlled rate.
D Reflects increased control efficiency for CatOx of VOC/VHAP of 98% for hexane, benzene, and toluene. 90% control for other VHAPs.
E Reflects increased control efficiency for CatOx of VOC/VHAP of 90%
F Note that NRDC has challenged these calcs and claim that VOC would be emitted.
G No change from application (e.g., process heaters are assumed to be uncontrolled).
H Carbonyl sulfide emissions have been reduced to reflect the use of 0.63% sulfur (maximum) during startups. This change also affects hydrogen sulfide.
Indicates HAP emission estimates have been revised to reflect changes as noted.

Revision to Module 3 - Gasification **Revisions**

High Pressure Flare Emissions

Reduced SO_2 emisisons through controlled startup procedures and use of low-sulfur feedstock during the one-hour start up period.

Assumptions

1256 MMBtu/hr flared gas HHV for single gasifier (per engineering design)
487.5 HHV of raw syngas to flare (Btu/scf)
98% flare destruction efficiency of VOC emissions
Annual emissions based on a total of **90** startups per year: Worst Case Scenerio
One-hour start up event with flaring:
- Feedstock feed rate during startup reduced to 50% of designed feed rate during flaring,
- Flow rate of flared gases limited to <80% of maximum flow rate
- Use of low-sulfur feedstock during startup period where flaring will occur (<0.63 wt% Sulfur)
- No flare emissions occur during non-emergency shutdowns

Emissions Calculations

Flare emission factors remain the same and are based on the engineering design of the system and characteristics of flared syngas.
Maximum hourly emission rates assumen that one event occurs in one hour.
Annual average (lb/hr) emission estimates assume that the total annual emissions occur continuously for 8760 hr/yr.

	Emission Factor	Actual Emissions (Controlled)			Potential Emissions (Uncontrolled)		
Pollutant	(lb/MMBtu)	Maximum lb/hr	Annual Avg (lb/hr)	TPY	Maximum lb/hr	Annual Avg (lb/hr)	TPY
Carbon Monoxide	2.008	2521.42	25.91	113.46	2521.42	25.91	113.46
Sulfur Dioxide	1.384	1738.93	17.87	78.25	1738.93	17.87	78.25
Nitrogen Dioxide	0.300	376.80	3.87	16.96	376.80	3.87	16.96
Lead (no data available)							
PE, PM10	0.008	9.42	0.10	0.42	9.42	0.10	0.42
VOC	0.125	157.00	1.61	7.07	7850.00	80.65	353.25
Toxic Air Contaminants (TAC)				0.00			0.00
Ammonia	2.39E-04	0.300	0.003	0.014	0.300	0.003	0.014
Hydrogen Sulfide	0.009	10.826	0.111	0.487	10.826	0.111	0.487
Carbonyl Sulfide (also HAP)	0.002	2.067	0.021	0.093	2.067	0.021	0.093
Total TACs		13.19			13.19		

Exhaust flow rate calculation:

1256 MMBtu/hr = flared syngas maximum
487.5 Btu/cf - flared gas (syngas) HHV
107,350 cfm x 80% x 50% = flared gas flow rate
5.9 assumed ratio of syngas combustion products to syngas fuel combustion (unitless, a.k.a. F-Factor)
633,368 cfm x 80% x 50% = exhaust flow rate from flare (assume 650,000 cfm as basis)

Combined Power Block Criteria Pollutant Emissions Resulting from Normal Operations and Startup/Shutdown

Source	Mode	Notes	NO_x		CO		VOC		PM_{10}		SO_2	
			lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
Phase 1 Boiler	Routine	Controlled	120.0	524.2	36.0	157.2	13.0	56.9	18.7	81.8	2.0	8.9
Startup Emission	SU/SD	SCR off line	473.8	5.7	36.0	0.4	13.0	0.2	18.7	0.2	2.0	0.0
Phase 1 Totals				**529.8**		**157.7**		**57.1**		**82.0**		**8.9**
Turbine w/Duct Burner	Routine	Controlled	57.1	246.5	23.1	99.8	26.6	115.0	18.2	78.7	21.1	91.0
Turbine w/Duct Burner	Routine	Controlled	57.1	246.5	23.1	99.8	26.6	115.0	18.2	78.7	21.1	91.0
Startup Emission	SU/SD	SCR off line	370.0	17.3	870.0	43.5	65.0	3.1	65.0	3.1	2.5	0.1
CTG Total				**510.3**		**243.1**		**233.1**		**160.5**		**182.1**

Emissions in this table are a summary from the detailed calculations in tables: Phase I Boiler Detailed Calculation, Combustion Turbine Detailed Calculation, and the Combustion Turbine Start-up Emissions Detailed Calculation.

Combined Power Block Hazardous Air Pollutant Emissions

		Phase 1 Boiler		2 CTGs	
Hazardous Air Pollutant	CAS Number	lb/hr	tpy	lb/hr	tpy
Total POM	NA	0.000	0.000	0	0.00E+00
1,3-Butadiene	106-99-0	0	0	0.000	1.65E-04
Acetaldehyde	75-07-0	0	0	0.004	1.54E-02
Acrolein	107-02-8	0	0	0.001	2.46E-03
Benzene	71-43-2	0.000	0.001	0.001	4.61E-03
dichlorobenzene	95-50-1	0.000	0.002	0	0.00E+00
Ethylbenzene	100-41-4	0	0	0.003	1.23E-02
Formaldehyde	50-00-0	0.025	0.111	0.311	1.36E+00
hexane	110-54-3	0.122	0.532	0	0.00E+00
Naphthalene	91-20-3	0.000	0.001	0.001	2.50E-03
PAH	7784-49-2	0	0	0.001	4.23E-03
Propylene Oxide	75-56-9	0	0	0.013	5.57E-02
toluene	108-88-3	0.000	0.001	0.011	4.99E-02
Xylenes	1330-20-7	0	0	0.006	2.46E-02
arsenic	7440-38-2	0.001	0.003	0	0.00E+00
beryllium	7440-41-7	0.000	0.000	0	0.00E+00
cadmium	7440-43-9	0.004	0.016	0	0.00E+00
chromium	7440-47-3	0.005	0.021	0	0.00E+00
cobalt	7440-48-4	0.000	0.001	0	0.00E+00
manganese	7439-96-5	0.001	0.006	0	0.00E+00
mercury	7439-97-6	0.001	0.004	0.003	1.37E-02
nickel	7440-02-0	0.007	0.031	0	0.00E+00
selenium	74482-49-2	0.000	0.000	0	0.00E+00
Total HAPs		**0.167**	**0.730**	**0.354**	**1.550**

Power Block Other Emissions

Ammonia emissions (assume 10 ppmvd SCR NH3 slip) =	51.11 lb/hr (2 CTGs)
	224 tpy (total)

Phase I Boiler Detailed Calculation Sheet

BACT Limits for Phase 1 Boiler Criteria Pollutants

NO_x[1]	0.10	lb/MMBtu
CO [2]	0.03	lb/MMBtu
VOC[3]	3.9	lb/MMSCF
PE/PM10[3]	0.0156	lb/MMBtu
SO_x[3]	0.6	lb/MMSCF

Emission Factors provided by AP-42 1.4-1 & 1.4-2 (7/1998)

Heater Efficiency[4] =	0.7273	%	
Operating days =	365	Days	
Annual Operating hours =	8736	Hours	(plus 24 hrs startup/shutdown)
Fuel Heating Value	487.5	MMBTU/MMSCF	
Annual Fuel use =	29,568.00	MMSCF	

Phase 1 Boiler Uncontrolled Routine Operating Emission Limits

Unit Type	Fuel Rate	NO_x		CO		VOC		PE/PM10		SO_x	
	MMBTU/hr	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
Phase 1 Boiler	1,200	473.8	2069.8	120.0	524.2	18.6	81.3	18.7	81.8	2.0	8.9

Phase 1 Boiler BACT (Controlled) Routine Operating Emission Limits

Unit Type	Fuel Rate	NO_x		CO		VOC		PE/PM10		SO_x	
	MMBTU/hr	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
Phase 1 Boiler	1,200	120.0	524.2	36.0	157.2	13.0	56.9	18.7	81.8	2.0	8.9

Proposed BACT Limit - Phase 1 Boiler (Startup/Shutdown with SCR offline, CatOx operating)

Unit Type	Fuel Rate	NO_x		CO		VOC		PE/PM10		SO_x	
	MMBTU/hr	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
Phase 1 Boiler	1,200	473.8	5.7	36.0	0.4	13.0	0.2	18.7	0.2	2.0	0.0
Total Routine + Startup/Shutdown Controlled Annual Emissions			529.8		157.7		57.1		82.0		8.9

Hazardous Air Pollutant Emissions

Pollutant	Emission Factor[5] (lb/MMSCF)	Uncontrolled Emissions (lb/hr)	Uncontrolled Emissions (tpy)	Controlled Emissions (lb/hr)	Controlled Emissions (tpy)	% Control Efficiency
Total POM	8.80E-05	0.00	1.30E-03	0.00	1.30E-04	90
benzene	2.10E-03	0.01	3.10E-02	0.00	6.21E-04	98
dichlorobenzene	1.20E-03	0.00	1.77E-02	0.00	1.77E-03	90
formaldehyde	7.50E-02	0.25	1.11E+00	0.03	1.11E-01	90
hexane	**1.80E+00**	**6.08**	**2.66E+01**	**0.12**	**5.32E-01**	98
naphthalene	6.10E-04	0.00	9.02E-03	0.00	9.02E-04	90
toluene	3.40E-03	0.01	5.03E-02	0.00	1.01E-03	98
arsenic	2.00E-04	0.00	2.96E-03	0.00	2.96E-03	
beryllium	1.20E-05	0.00	1.77E-04	0.00	1.77E-04	
cadmium	1.10E-03	0.00	1.63E-02	0.00	1.63E-02	
chromium	1.40E-03	0.00	2.07E-02	0.00	2.07E-02	
cobalt	8.40E-05	0.00	1.24E-03	0.00	1.24E-03	
manganese	3.80E-04	0.00	5.62E-03	0.00	5.62E-03	
mercury	2.60E-04	0.00	3.84E-03	0.00	3.84E-03	
nickel	2.10E-03	0.01	3.10E-02	0.01	3.10E-02	
selenium	2.40E-05	0.00	3.55E-04	0.00	3.55E-04	
Total		6.37	27.9	0.17	0.7	
Largest Single HAP		6.08	26.6	0.12	0.5	

Assume 98% for VHAPS except chlorinated = 90%

Emission Factors provided by AP-42 Tables 1.4-3 & 1.4-4 (7/1998)

Notes:

1. Per agreement with Ohio EPA, ORFC has accepted a 0.1 lb/MMBtu emissions limit for NOx via installation of SCR. Uncontrolled emission estimates are based on the AP-42 Section 1.4 factor for low-NOx burners (140 lb/MMscf).
2. ORCF agrees to accept the 0.1 lb/MMBtu CO limit per Ohio EPA request, and will perform further feasibility analysis during the FEED study. An additional estimated 70% control will be achieved through use of the catalytic oxidation system that will als
3. Factors from AP-42, Table 1.4-2, (PE/PM10 factor converted from 7.6 lb/MMscf based on fuel characteristics). 30% control efficiency is assumed for use of catalytic oxidation.
4. Fired Heater Efficiency includes 10% Excess Fired Heater Duty
5. Unless otherwise stated, controlled organic HAP emission rates assume 30% control via use of catalytic oxidation.