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 – SCR NO_x Emissions
Ohio River Clean Fuels, L.L.C.
Permit Number: 02-22896, Facility ID: 0215130393

Dear Mr. Hopkins:

In a recent communication from your office, we were advised that the proposed SCR control efficiency of 80% for NO_x in Module 9, Combined Cycle Plant, may be unacceptable when judged from an incremental cost basis.

Please refer to the BACT Analysis Section 4.1, CTG Nitrogen Oxide. The use of selective catalytic reduction (SCR) was identified as the only technically feasible NO_x control technology for the combustion turbines during normal operations. A cost analysis for SCR was performed to determine the cost-effectiveness of varying levels of control: 70%, 80%, and 90%. The Ohio River Clean Fuels application suggested that the control efficiency for 80% was more cost effective than the 90% control efficiency and taking into account that the 90% control efficiency does not have sufficient operating experience.

We have reviewed these calculations as documented in the table on Page 9C-7 where it is shown that difference in cost for 90% efficiency over 80% efficiency is $80 per ton NO_x abated. Therefore, we accept Ohio EPA's request and propose that the BACT SCR control efficiency to be 90%, as detailed on Page 9C-7 for this parameter.

This will reduce NO_x emissions to 2.5 ppmvd (at 10% O2) with a 10 ppmvd NH3 slip when firing tailgas; the controlled emission rate will be 0.011 lb/MMBtu.

As originally planned, diluent injection of water or steam injection combined with SCR is proposed as BACT to reduce NO_x emissions. However, the SCR control efficiency is now proposed to be 90%. The proposed NO_x BACT emission limit is equivalent to 2.5 ppmvd with a 10 ppmvd NH3 slip (at 15% O2). The nominal gross NO_x emission is 0.011 lb/MMBtu.

This change results in a 246.5 ton per year reduction in allowable NO_x emissions from the CTGs. The 90% control efficiency will result in an estimated hourly NO_x emission rate of 28.53 lb/hr per CTG (compared to the 80% control estimate of 57.06 lb/hr as shown on Page 9B-3 of the PTI application).

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Based on the expected operating duration of 8,640 hours per year per CTG with the balance of time (120 hours) associated with uncontrolled emissions during startup (producing 17.3 tpy as shown on Page 9B-1), annual NO_x emissions will be 263.8 tpy compared to the 80% estimate of 510.3 tpy. Revised Pages 9B-1 and 9B-3 are included along with a revised Table 2 from the Introduction, Actual Criteria Pollutants Summary.

Please let us know if you have any further questions regarding this matter.

Sincerely,

Stephan M. Dopuch
Vice President, Business Development

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

Attachments (3)

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	132.0	80.3	80.3	91.1	116.6
	P019	Combined Cycle Plant 2[2]	121.6	132.0	80.3	80.3	91.1	116.6
		Final Combined Cycle Plant Totals:	**243.1**	**263.9**	**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	**603.2**	**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

December 2007
Revision 1, July 2008
Revision 2, October 27, 2008
Revision 3, November 11, 2008

Actual Criteria Pollutant Emissions Summary (Tons per Year)

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	28.5	123.3	23.1	99.8	26.6	115.0	18.2	78.7	21.1	91.0
Turbine w/Duct Burner	Routine	Controlled	28.5	123.3	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				**263.8**		**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)

Actual Criteria Pollutant Emissions Summary (Tons per Year)

Combustion Turbine Detailed Calculation Sheet

Turbines 1 and 2 have identical emissions. These tables present information for only 1 turbine.

CTG Exhaust Data

CTG Exhaust Composition:		
O_2	11.09	%mole
H_2O	7.77	%mole
CO	10.0	ppmvd @15%O_2
CO	15.3	ppmv
SO_2	2.16	ppmv
NO_x	25.0	ppmvd @15%O_2
NO_x	38.2	ppmv
VOC	10.0	ppmvd @15%O_2
VOC	15.3	ppmv

Mole Flow Rate	
150,318	lb-mole/hr

CTG Exhaust Emission Rates									
NO_x (as NO_2)		CO		VOC		SO_2		PM	
lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr
264.20	1141.37	64.33	277.90	36.76	158.80	20.80	89.85	16.10	69.55

Duct Burners Emissions Data

Burner gas HHV Rate	
211	MMBTU/hr

Duct Burner Emission Rates		
CO	0.06	lb/MMBTU/hr
NO_x	0.10	lb/MMBTU/hr
VOC	0.006	lb/MMBTU/hr
PM	0.01	lb/MMBTU/hr
SO_2	0.60	lb/MMSCF

Duct Burner Emission Rates									
NO_x (as NO_2)		CO		VOC		SO_2		PM	
lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr
21.10	91.15	12.66	54.69	1.27	5.47	0.26	1.14	2.11	9.12

Note: 487.5 btu/scf is the heat content of the tail gas.

8640 hours of Normal Operation. This does not include startup or shutdowns.

Total (CTG + Duct Burner) Potential Emissions

Total Uncontrolled Emissions									
NO_x (as NO_2)		CO		VOC		SO_2		PM	
lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr
285.30	1249.64	76.99	337.21	38.02	166.55	21.06	90.97	18.21	78.67

Total Controlled Emissions									
NO_x (as NO_2)[1]		CO[2]		VOC[3]		SO_2		PM	
lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr
28.53	123.25	23.10	99.78	26.62	114.99	21.06	90.97	18.21	78.67

Note:

[1] NO_x control efficiency is 90%

[2] CO control efficiency is 70%

[3] VOC control efficiency is 30%