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September 18, 2007
NTH Project No. 16-060504

Mr. David Riddle
Senior Environmental Engineer
Michigan Dept. of Environmental Quality
AQD - Thermal Process Unit
P.O. Box 30260
Lansing, MI 48909

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SEP 21 2007
AIR QUALITY DIV.

**RE: Addendum to Application No. 60-07 to Update SO₂ Emission Limit
Northern Michigan University – Ripley Heating Plant**

Dear Mr. Riddle:

Northern Michigan University (NMU) submitted an application for an air use permit on February 5, 2007 as part of their proposed project to install a new solid fuel-fired circulating fluidized bed (CFB) boiler at the Ripley Heating Plant. The primary fuel for this boiler will be virgin wood waste. However, for fuel stability and financial concerns, the CFB will also be capable of utilizing coal as fuel.

In the original application, NMU proposed an SO₂ emission limit of 0.478 lb/MMBtu based on using 3.5% S coal utilizing in-situ flue gas desulfurization (FGD) with direct limestone injection into CFB boiler combustion zone. Using in-situ FGD processes has been shown at effectively reducing SO₂ emissions by 90%. The 3.5% S coal was based upon a wide-range of fuel suppliers. Since the time of the application, NMU has determined that it can secure shipments of coal with sulfur content not greater than 1.5%.

The in-situ FGD system will be capable of removing between 91% and 92% of the SO₂ formed inside the boiler. Assuming 91.5% removal efficiency from 1.5% S coal will yield SO₂ emissions of 0.20 lb/MMBtu. This emission limit is consistent with 40 CFR 60.42(b) and also with other recently issued permits for CFB boilers much larger than the estimated 10 MW unit proposed by NMU.

BEST AVAILABLE CONTROL TECHNOLOGY (BACT) ANALYSIS FOR SO₂

I have reviewed the RACT/BACT/LAER Clearinghouse (RBLC) as well as the power plant spreadsheet that U.S. EPA Region 7 maintains to compare this newly proposed SO₂ emission limit of 0.20 lb/MMBtu with other recent BACT limits for CFB boilers. I have included an updated summary of the RBLC as an attachment to this letter but have also summarized some of the recently issued permits below.

Cargill, Inc. (Blair, NE)

Cargill, Inc. received permit number CP06-0008 for the construction of a new Wet Corn Milling and Ethanol Production Facility in August 2007 and includes a new 1,500 MMBtu/hr coal-fired CFB boiler. The SO₂ limit contained in this permit is defined as 0.11 – 0.20 lb/MMBtu based upon sulfur content of the fuel. Cargill is permitted to burn fuel with an uncontrolled SO₂

Exhibit 7



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emission limit ranging from 2.0 lb/MMBtu to 1.1 lb/MMBtu. Based on the calculation provided in the permit to use for determining the SO₂ emissions, Cargill is permitted to burn up to coal with a sulfur content of 1.25%. Additionally, Cargill is using limestone injection to achieve an SO₂ control efficiency of 90%.

NEVCO Energy Company, LLC (Sigurd, UT)

NEVCO Energy Company, LLC received permit number DAQE-AN2529001-04 on October 12, 2004 for the construction of a new 270 MW (2,531.5 MMBtu/hr) CFB boiler. The boiler will utilize low sulfur (0.25% - 0.9%) coal and include limestone injection control of SO₂ emissions and a spray dryer for trimming and acid gas control. Specifically, the BACT analysis was designed around 0.4% sulfur coal and 0.022 lb/MMBtu for a 30-day rolling compliance period and 0.9% sulfur coal and 0.05 lb/MMBtu for a 24-hour average.

Therefore, to meet a SO₂ limit of 0.022 lb/MMBtu with 0.4% S coal and 0.05 lb/MMBtu with 0.9% S coal equates to 96.5% control with the performance coal specified in the application. This level of control on low sulfur coal is extremely aggressive and few, if any, vendors would guarantee such high removal rates.

Red Trail Energy, LLC - Richardton Plant (Richardton, IA)

Red Trail Energy, LLC received permit number PTC04004 for a corn-based ethanol production facility with a coal-fired CFB boiler. The CFB boiler is to be fired primarily on lignite with subbituminous coal allowed as well. Lignite has a lower sulfur content as compared to many other ranks of coals. Specifically, the sulfur content of the lignite proposed for this project will be 0.808%. RTE has proposed both limestone injection and a spray dry absorber. However, the BACT analysis for this project states that BACT for lignite boilers is 0.25 lb/MMBtu but this boiler will meet an SO₂ emission limit of 0.09 lb/MMBtu.

The SO₂ emission limit was calculated assuming 1.2% S in coal with uncontrolled emissions at 3.55 lb/MMBtu. This is equivalent to a heating value of approximately 6,900 Btu/lb. Further, RTE is assuming that the limestone injection technology will only control SO₂ emissions to a level of 75%, or 0.87 lb/MMBtu and that the spray dryer will deliver an additional 90% control of the remaining SO₂. In summary, RTE is assuming that the combination of limestone injection into the boiler with an add-on spray dryer will deliver an SO₂ control of 97.5% for low sulfur lignite. Based on recent discussions with vendors and other vendor guarantees, this level of control for SO₂ emissions is unlikely.

Included with this letter is an updated emission spreadsheet that has only been changed to reflect the new proposed bituminous coal. Note that the bituminous coal proposed has a sulfur content of 1.5% at 12,500 Btu/lb. This is because it is expected that the coal will come from the Marquette Board of Light and Power with We Energies Presque Isle facility as a backup supplier.

We have reviewed the option of including an add-on technology to further control emissions of SO₂. Specifically, the use of a lime spray dryer upstream of the fabric filter. It is expected that the lime spray dryer could remove an additional 40% of the SO₂ remaining in the flue gas to a level of 0.12 lb/MMBtu. I have also included the cost effectiveness spreadsheet for a spray dryer that shows a cost of \$15,980 per ton to control SO₂ to 0.12 lb/MMBtu, which is much higher than recent BACT cost-effectiveness determinations of \$7,500 per ton. The cost effectiveness



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recent BACT cost-effectiveness determinations of \$7,500 per ton. The cost effectiveness represents the incremental cost to get from 0.20 lb/MMBtu to 0.12 lb/MMBtu, which would represent 95% control for SO₂. However, it is unlikely that any SDA vendor would guarantee an additional 40% removal of SO₂ above the 92% removal that will be obtained through the use of limestone injection.

Should you have any questions regarding the information presented, please do not hesitate to contact me.

Sincerely,

NTH Consultants, Ltd.

A handwritten signature in black ink, appearing to read 'JPJ', is written over the typed name of Jeffrey P. Jaros.

Jeffrey P. Jaros
Project Manager

cc: Mr. Mike Hellman, Northern Michigan University
Mr. Steve Yambor, Cummins & Barnard, Inc.
Mr. Randy Russell, Cummins & Barnard, Inc.

Enclosures

JPJ/mjb

NMU Control Technology Cost Basis for Spray Dryer for SO₂ Control
10 MW Circulating Fluidized Bed (CFB) Boiler

Cost Item	Cost Description	Cost Factor	Cost 2007 \$
DIRECT CAPITAL INVESTMENTS (DCI)			
	Buildings		\$ 500,000.00
	Site Preparation		\$ 200,000.00
	Installation Cost		\$ 3,000,000.00
	Purchased Equipment		\$ 1,750,000.00
	Taxes	6% on 50% of buildings and foundations	\$ 15,000.00
	TOTAL DCI		\$ 5,465,000.00
INDIRECT CAPITAL INVESTMENT (ICI)			
	Engineering		\$ 250,000.00
	Construction & Field Expenses		\$ 200,000.00
	Contractor Fees		\$ 200,000.00
	Start-up	Included with Field Expense	\$ -
	Performance Test	Included with Field Expense	\$ -
	Contingencies		\$ 100,000.00
	TOTAL ICI		\$ 750,000.00
TOTAL CAPITAL INVESTMENT (TCI)	DCI + ICI		\$ 6,215,000.00
DIRECT OPERATING COSTS (DOC)			
	Labor		
	- Operator	1 operators @ \$65,000/year	\$ 65,000.00
	- Supervisory	20% of Operator Labor Cost	\$ 13,000.00
	- Maintenance	1 technicians @ \$40,000/year	\$ 40,000.00
	Materials		
	- Maintenance Materials		\$ -
	- Reagent (Lime)	\$60.00 per ton	\$ 1,800.00
	- Limestone		\$ -
	- Water		\$ -
	Utilities		
	- Electricity	1 MW/yr	\$ 10,000.00
	- Fuel		\$ -
	- Pressure Drop		\$ -
	- Waste Disposal	13.33 per ton	\$ -
	TOTAL DOC		\$ 129,800.00
INDIRECT OPERATING COSTS (IOC)			
	Overhead	60% of Operator labor & Maintenance	\$ 70,800.00
	Property Taxes	1% of TCI	\$ 62,150.00
	Insurance	1% of TCI	\$ 62,150.00
	Administrative Charges	2% of TCI	\$ 124,300.00
	Capital Recovery	20 years; 7% interest = 0.0944 CRF	\$ 586,896.00
	TOTAL IOC		\$ 906,896.00
RECOVERY CREDITS (RC)			
	Materials		\$ -
	Energy		\$ -
	TOTAL RC		\$ -
TOTAL ANNUALIZED COSTS (TAC)	DOC + IOC - RC		\$ 1,035,896.00
SO₂ EMISSIONS			
	Uncontrolled	0.20 lb/MMBtu	162.06
	Controlled	0.12 lb/MMBtu	97.24
	TOTAL REDUCTION		64.82
	Cost-Effectiveness	\$ per ton of SO ₂ removed	\$ 15,980.13