EASTERN ILLINOIS UNIVERSITY
Renewable Energy Center - ID Number - 029010AAK
Operating Scenario 6 - two (2) Biomass-Fired Boilers at 65% Operating Capacity and two (2) Natural Gas-Fired Standby Boilers at 20% - Non-Title V Case

Units	FUEL BV-1		APC-1	ROADWAY	DG-1		Boiler No. 1		Boiler No. 1		Boiler No. 2		Boiler No. 2		Boiler No. 3		Boiler No. 3		Boiler No. 4		Boiler No. 4	
	Fuel Bin Fabric Filter		Ash Storage Area	Paved Roadway Emissions	Diesel Generator 1 (note 1)	note	Natural Gas Operation	note	Oil-Fired Operation	note	Natural Gas Operation	note	Oil-Fired Operation	note	Biomass Operations	note	Start-up Operations	note	Biomass Operations	note	Start-up Operations	note
Boiler Heat Input (mmBtu/hr):	NA		NA	NA	5.0		61.5		61.5		61.5		61.5		52.1		NA		62.2		NA	
Fuel Type:	NA		NA	NA	#2 fuel oil-fired		natural gas-fired		#2 fuel oil-fired		natural gas-fired		#2 fuel oil-fired		biomass-fired		biomass-fired		biomass-fired		biomass-fired	
Heat Content (Btu/scf):	NA		NA	NA			1,000				1,000											
Heat Content (Btu/lb):	NA		NA	NA	19,000				19,000				19,000		4,500		4,500		4,500		4,500	
Annual Operating Hours:	8,760		8,760	8,760	500		7,884		876		7,884		876		8,616		144		8,616		144	
Annual Capacity Factor:	100%		100%	100%	50%		20%		20%		20%		20%		65%		100%		65%		100%	
Fuel Usage (lb/hr or mmscf/hr):	NA		NA	NA	168		0.062		3,237		0.062		3,237		11,576		0.0002		13,822		0.0002	
Fuel Usage (tons/mo or mmscf/mo):	NA		NA	NA	2.11		9.70		28.4		9.70		28.4		3,241		0.003		3,870		0.003	
Fuel Usage (tons/yr or mmscf/yr):	NA		NA	NA	21.1		97.0		284		97.0		284		32,414		0.03		38,705		0.03	
Steam Generation Rate (lb/hr):	NA		NA	NA	NA		9,000		1,000		9,000		1,000		26,000		NA		26,000		NA	
NOx Emissions (lbs/mmBtu)	NA		NA	NA	*1.70*	*11*	NA		*0.125*	*5*	NA		*0.125*	*5*	*0.250*	*1*	*0.75*	*1,13*	*0.250*	*1*	*0.75*	*1,13*
SO_2 Emissions (lbs/mmBtu)	NA		NA	NA	*0.0016*	*11*	NA		*0.050*	*2,5*	NA		*0.050*	*2,5*	*0.100*	*2*	*0.100*	*2*	*0.100*	*2*	*0.100*	*2*
PM Emissions (lbs/mmBtu)	NA		NA	NA	*0.021*	*11*	NA		*0.014*	*4*	NA		*0.014*	*4*	*0.047*	*7*	*0.094*	*8, 12*	*0.047*	*7*	*0.094*	*8, 12*
PM_{10} Emissions (lbs/mmBtu)	NA		NA	NA	*0.021*	*11*	NA		*0.008*	*4*	NA		*0.008*	*4*	*0.047*	*8*	*0.094*	*8, 12*	*0.047*	*8*	*0.094*	*8, 12*
$PM_{2.5}$ Emissions (lbs/mmBtu)	NA		NA	NA	*0.021*	*11*	NA		*0.006*	*4*	NA		*0.006*	*4*	*0.043*	*8*	*0.087*	*8, 12*	*0.043*	*8*	*0.087*	*8, 12*
CO Emissions (lbs/mmBtu)	NA		NA	NA	*0.634*	*11*	NA		*0.150*	*5*	NA		*0.150*	*5*	*0.225*	*1*	*2.25*	*1, 14*	*0.225*	*1*	*2.25*	*1, 14*
VOM Emissions (lbs/mmBtu)	NA		NA	NA	*0.028*	*11*	NA		*0.015*	*6*	NA		*0.015*	*6*	*0.017*	*10*	*0.17*	*10, 15*	*0.017*	*10*	*0.17*	*10, 15*
NOx Emissions (lbs/mmscf)	NA		NA	NA	NA		*100*	*1*	NA		*100*	*1*	NA		NA		NA		NA		NA	
SO_2 Emissions (lbs/mmscf)	NA		NA	NA	NA		*0.60*	*4*	NA		*0.60*	*4*	NA		NA		NA		NA		NA	
PM/PM_{10} Emissions (lbs/mmscf)	NA		NA	NA	NA		*7.60*	*4*	NA		*7.60*	*4*	NA		NA		NA		NA		NA	
$PM_{2.5}$ Emissions (lbs/mmscf)	NA		NA	NA	NA		*7.60*	*4*	NA		*7.60*	*4*	NA		NA		NA		NA		NA	
CO Emissions (lbs/mmscf)	NA		NA	NA	NA		*100*	*3*	NA		*100*	*3*	NA		NA		NA		NA		NA	
VOM Emissions (lbs/mmscf)	NA		NA	NA	NA		*5.00*	*4*	NA		*5.00*	*4*	NA		NA		NA		NA		NA	
Hourly NO_x Emission Rate (lb/hr)	NA		NA	NA	8.50		6.15		7.69		6.15		7.69		13.0		39.1		15.6		46.7	
Hourly SO_2 Emission Rate (lb/hr)	NA		NA	NA	0.008		0.037		3.08		0.037		3.08		5.21		5.21		6.22		6.22	
Hourly PM Emission Rate (lb/hr)	0.311		0.073	0.073	0.105		0.467		0.871		0.467		0.871		2.45		4.90		2.92		5.85	
Hourly PM_{10} Emission Rate (lb/hr)	0.311		0.073	0.073	0.105		0.467		0.467		0.467		0.467		2.45		4.90		2.92		5.85	
Hourly $PM_{2.5}$ Emission Rate (lb/hr)	NA		NA	NA	0.105		0.467		0.362		0.467		0.362		2.26		4.52		2.70		5.39	
Hourly CO Emission Rate (lb/hr)	NA		NA	NA	3.17		6.15		9.23		6.15		9.23		11.7		93.8		14.0		112	
Hourly VOM Emission Rate (lb/hr)	NA		NA	NA	0.140		0.308		0.923		0.308		0.923		0.886		8.86		1.06		10.6	
Annual NO_x Emission Rate (tpy)	NA		NA	NA	1.06		4.85		0.673		4.85		0.673		36.5		2.81		43.5		3.36	
Annual SO_2 Emission Rate (tpy)	NA		NA	NA	0.002		0.029		0.269		0.029		0.269		14.6		0.375		17.4		0.448	
Annual PM Emission Rate (tpy)	1.36		0.320	0.320	0.026		0.368		0.076		0.368		0.076		6.86		0.353		8.19		0.421	
Annual PM_{10} Emission Rate (tpy)	1.36		0.320	0.320	0.026		0.368		0.041		0.368		0.041		6.86		0.353		8.19		0.421	
Annual $PM_{2.5}$ Emission Rate (tpy)	NA		NA	NA	0.026		0.368		0.032		0.368		0.032		6.32		0.325		7.55		0.388	
Annual CO Emission Rate (tpy)	NA		NA	NA	0.793		4.849		0.808		4.849		0.808		32.8		6.75		39.2		8.06	
Annual VOM Emission Rate (tpy)	NA		NA	NA	0.035		0.242		0.081		0.242		0.081		2.48		0.638		2.96		0.761	

12-Month Rolling Average Hourly Steam Production with Standby
72,000
Total Potential Hourly Steam Production Biomass only
52,000

Facility Totals (tpy)	Past Actual (tpy)	Net Change (tpy)
98.3	83.1	15.2
33.4	95.5	-62.1
18.7	27.5	-8.74
18.7	26.5	-7.83
15.4	26.5	-11.1
98.9	48.0	50.9
7.52	1.11	6.41

Emission Factor Notations

1 - Emission Factors based on Boiler MFR Specification.
2 - Emission Factors based on Fuel Specification.
3 - Based on AP-42 Table 1.4-1 - Emission Factors for Natural Gas Combustion.
4 - Based on AP-42 Table 1.4-2 - Emission Factors for Natural Gas Combustion.
5 - Based on AP-42 Table 1.3-1 - Emission Factors for Fuel Oil Combustion.
6 - Based on AP-42 Table 1.3-3 - Emission Factors for Fuel Oil Combustion.
7 - Based on AP-42 Table 1.3-7 - Emission Factors for Fuel Oil Combustion.
8 - Based on AP-42 Table 1.6-5 - Emission Factors for Wood Combustion, Assumes $PM_{2.5}/PM_{10}$ ratio of 0.878
9 - Based on AP-42 Table 1.6-2 - NO_x, SO_2, and CO Emission Factors for Wood Combustion
10 - Based on AP-42 Table 1.6-3 - Emission Factors for Wood Combustion
11 - Based on data from Engine Manufacturer's Specification.
12 - Startup multiplier factor equal "2"
13 - Startup multiplier factor equal "3"
14 - Startup multiplier factor equal "8"
15 - Startup multiplier factor equal "10"

The proposed start-up operating hours for each Biomass Boiler System is based on the following assumptions;

Max number of events per month:	2
Max duration of each start-up (hr):	6
Max start-up hours (hr/mo):	12
Max start-up hours (hr/yr):	144

The proposed operating hours for the biomass receiving processes;

Max number of truck loads per day:	12
Max unloading time per truck (hr):	0.30
Max daily unloading hours (hr/day):	3.60
Biomass unloading hours (hr/yr):	1314

PSD Applicability Determination Basis		Pollutant	PSD Applicable	Title V Applicable
Pollutant	Significant			
NO_x	40	NOx Emissions	No	No
SO_2	40	SO_2 Emissions	No	No
PM	25	PM Emissions	No	No
PM_{10}	15	PM_{10} Emissions	No	No
$PM_{2.5}$	10	$PM_{2.5}$ Emissions	No	No
CO	100	CO Emissions	No	No
VOM	40	VOM Emissions	No	No

Note 1: Emissions from Diesel Generator are included in the netting calculations only. The proposed diesel generator is considered to be an insignificant activity per 35 IAC 201.210(a) (xvi). The calculated heat input and emission factors are based on MFR specifications.

Worksheet includes PM10 and PM2.5 emission factors with condensables
Revised July 10, 2009 - Rev1

EASTERN ILLINOIS UNIVERSITY
Renewable Energy Center
ID Number - 029010AAK

Table B-1 – Plantwide Emission Limits

Total Boiler Operation Emissions (all combined boiler operations) shall not exceed the following limitations:

All Modes of Operation Combined

Pollutant	Emission Rate (lb/hr)	Averaging Time *	Annual Emissions (tons/yr)
NO_x	**NA**	**12-Month Rolling Average**	**98.3**
SO_2	**NA**	**12-Month Rolling Average**	**33.4**
CO	**NA**	**12-Month Rolling Average**	**98.9**
PM (filterable)	**NA**	**12-Month Rolling Average**	**13.0**
PM_{10} (filterable)	**NA**	**12-Month Rolling Average**	**12.9**
$PM_{2.5}$ (filterable)	**NA**	**12-Month Rolling Average**	**9.69**
PM (with condensables)	**NA**	**12-Month Rolling Average**	**18.7**
PM_{10} (with condensables)	**NA**	**12-Month Rolling Average**	**18.7**
$PM_{2.5}$ (with condensables)	**NA**	**12-Month Rolling Average**	**15.4**
VOM	**NA**	**12-Month Rolling Average**	**7.52**
Individual HAPs	**NA**	**12-Month Rolling Average**	**<10.0**
Total HAPs	**NA**	**12-Month Rolling Average**	**<25.0**

* Calculated at the end of each calendar month

Table B-2 – Emission Limits for Boiler No. 1 and Boiler No. 2.

The emissions from Boiler No. 1 & Boiler No. 2 shall each not exceed the following limitations:

Mode 1 – Natural Gas Combustion

Pollutant	Emission Factor lb/mmBtu	Emission Rate lb/hour	Averaging Time
NO_x	**0.100**	**6.15**	**Hourly**
SO_2	**0.0006**	**0.037**	**Hourly**
CO	**0.100**	**6.15**	**Hourly**
PM (filterable)	**0.008**	**0.467**	**Hourly**
PM_{10} (filterable)	**0.008**	**0.467**	**Hourly**
$PM_{2.5}$ (filterable)	**0.008**	**0.467**	**Hourly**
VOM	**0.005**	**0.308**	**Hourly**

(cont.) Table B-2 – Emission Limits for Boiler No. 1 and Boiler No. 2.

Mode 2 – #2 Fuel Oil Combustion

Pollutant	Emission Factor lb/mmBtu	Emission Rate lb/hour	Averaging Time
NO_x	0.125	7.69	Hourly
SO_2	0.050	3.09	Hourly
CO	0.150	9.23	Hourly
PM (filterable)	0.014	0.871	Hourly
PM_{10} (filterable)	0.008	0.470	Hourly
$PM_{2.5}$ (filterable)	0.006	0.362	Hourly
VOM	0.015	0.923	Hourly

Table B-3 – Emission Limits for Chiptec Unit Boiler No. 3.

The emissions of Boiler No. 3 shall each not exceed the following limitations:

Biomass Combustion

Pollutant	Emission Factor lb/mmBtu	Emission Rate lb/hour	Averaging Time
NO_x	0.250	13.0	24-Hour Block Average
SO_2	0.100	5.21	24-Hour Block Average
CO	0.225	11.7	24-Hour Block Average
PM (filterable)	0.030	1.56	24-Hour Block Average
PM_{10} (filterable)	0.030	1.56	24-Hour Block Average
$PM_{2.5}$ (filterable)	0.023	1.37	24-Hour Block Average
VOM	0.017	0.886	24-Hour Block Average

Table B-4 – Emission Limits for Chiptec Unit Boiler No. 4.

The emissions of Boiler No. 4 shall each not exceed the following limitations:

Biomass Combustion

Pollutant	Emission Factor lb/mmBtu	Emission Rate lb/hour	Averaging Time
NO_x	0.250	15.6	24-Hour Block Average
SO_2	0.100	6.22	24-Hour Block Average
CO	0.225	14.0	24-Hour Block Average
PM (filterable)	0.030	1.87	24-Hour Block Average
PM_{10} (filterable)	0.030	1.87	24-Hour Block Average
$PM_{2.5}$ (filterable)	0.023	1.64	24-Hour Block Average
VOM	0.017	1.06	24-Hour Block Average

Appendix C

CHIPTEC®

WOOD ENERGY SYSTEMS

Technical Discussion

CHIPTEC PATENTED GASIFICATION SYSTEM

Our patented gasifier is close-coupled to a boiler. Biomass fuel enters a hot refractory lined chamber where it is roasted to the point where the volatile pyrolysis gas (wood gas) is released into an oxygen-deprived environment. Once released, these gases then travel through the burner nozzle where they are superheated and mixed with air for complete combustion leaving little or no waste such as ash, creosote or stack effluent. The average flame temperature in the furnace of the boiler is 2,100F to 2,300F in all-firing modes except pilot. At these elevated temperatures a greater amount of the volatile organic compounds are destroyed. The end result is more complete combustion and lower system emissions. The increased efficiency, safety and cleanliness of this advanced two stage process produces tremendous economical and environmental benefits.

High temperature combustion, a 10:1 (or better) turn down ratio, refractory heat storage and controlled air allows the CHIPTEC gasifier to respond quickly to boiler demand, and also idle efficiently for economic operation during low load conditions.

Over the years this technology has demonstrated the following:

- 10:1 or better turn down capability
- Ability to burn green and dry fuels
- Easy ash removal system.
- High combustion temperature (cleanliness and efficiency)
- Ability to meet the most stringent emission regulations
- High fuel efficiency
- Ability to idle cleanly & efficiently in low load periods
- Minimal daily maintenance
- Operate efficiently through out the entire year
- Save customers thousands of dollars per year.

The gasifier Chiptec are capable of using biomass fuel that has a moisture content of 6% to 55% wet basis. The fuel moisture content, and mineral content will affect the system output and performance. The fuel particle size shall be 2.5” x 2.5” or less and contain the occasional oversize piece up to 12” x1/8” thick. Larger pieces may activate the safety jam switches located in the augers and turn those components off to prevent damage.

Chiptec systems are operating on a wide variety of wood fuel including, green hardwood chips, wood pellets, dry hardwood hogged fuel, dry hogged pallet, dry sawdust & shavings from secondary wood manufactures.

54 Echo Place, Unit #1
Williston VT, 05495
802-658-0956
Fax: 802-660-8904
www.chiptec.com

The following improvements have been made over the past five years.

- Integration of an oxygen sensor into the system controls. The sensor provides real time feedback to the systems controls. The result is excellent combustion, improved efficiency, reduce excess air and lower reduce fuel cost.
- The burner nozzle has been redesign to provide more complete combustion.
- Airflow through the system also has been improved to provide better control.
- The fuel level arm has been upgraded from a castable stainless steel to a high temperature stainless steel alloy that improves the service life of the part.
- The grates have been redesign to improve airflow and minimize plugging of the air holes. Replacement costs of the new grates are much lower than previous design.
- The air distribution system has been simplified, thus eliminating several electrically controlled dampers.
- The PLC control program is continuously being improved to provide better, more precise control of all of the system operations.

The Chiptec gasifier incorporates a number of fire suppression devices into the overall system design. First item is the air lock located on the end of the feed screw. Provides a physical barrier to the fuel. Second is a heat-sensing device located on the feed screw. If excessive heat is sensed, a solenoid will activate a water valve that will introduce sufficient water in the metering auger(before and just above the air lock). The third device is the draft safety switch. This device continuously monitors the system draft, if draft is lost, the system will stop the fuel feed and send out an alarm.

54 Echo Place, Unit #1
Williston VT, 05495
802-658-0956
Fax: 802-660-8904
www.chiptec.com

CHIPTEC AIR CONTROL STRATEGY

General Description:

The gasifier is the burner for the boiler. The PLC in the main Chiptec control panel shall store the burner management program which controls the operation of the gasifier, the fuel storage and delivery system and related equipment.

Basic description of the air flow through the gasifier and boiler system.

All primary & secondary air (combustion air) for the entire gasification process is provided by an induce draft fan (ID fan) located in the flue gas breeching of the system. The ID fan is controlled by the boiler set point. When in automatic operation, the PLC receives a signal from the boiler pressure or temperature sensor and signals the ID fan to increase or decreases as required to maintain the desire boiler set point. As the boiler set point decreases, the plc signals the ID fan to increase. The reverse occurs when boiler set point increases. The gasifier and boiler system both operate under negative draft.

The ID fan draws combustion air in through a duct that directs the air to either the primary air zone or the secondary air zone of the gasifier. The primary air is directed to and introduced into a chamber below the internal grates of the gasifier. It is the primary air that travels through the fuel pile and creates the gas for the process. The secondary air is directed through a second duct to the burner nozzle located on the gasifier. The secondary air completes the combustion process. A balancing valve located in the main air duct is controlled by the oxygen sensor located in the flue gas breeching. The oxygen sensor provides information to the plc and adjusts the balancing valve as required to maintain the desired oxygen set point. The result is clean combustion through out the entire range of operation.

The amount of oxygen in the flue gas has a direct relationship to excess air, fuel consumption and ultimately operating cost. The higher the oxygen levels in the flue gas, the higher the excess air. With high excess air, combustion efficiency is reduced and fuel consumption is increased. The use of an oxygen sensor to maintain a desired O2 level in the flue gas, allows the system to continuously adjust the combustion process, to maintaining the proper level of O2 and excess air. The end result is increased combustion efficiency, a decrease in fuel consumption and a decrease in operating cost.

54 Echo Place, Unit #1
Williston VT, 05495
802-658-0956
Fax: 802-660-8904
www.chiptec.com

The firing rate of the gasifier is determined by the set point of either the hot water or steam pressure of the boiler. The PLC controls are designed to maintain the desired set point that the operator inputs into the controls. As boiler demand increases, the actual water temperature or steam pressure will decrease from the set point. When this occurs, the PLC will signal both fuel and air to increase, thus generating a higher heat input into the boiler. As the actual water temperature or steam pressure increases and approaches the boiler set point, both the fuel and air slow down, therefore reducing the heat input into the boiler. Once the actual water temperature or steam pressure reaches the boiler set point, both fuel and air is operating at a minimum. If the actual water temperature or steam pressure goes above the boiler set point, the fuel feed will stop, while the air continues at minimum output. This scenario is considered to be pilot mode. During pilot mode, the fuel feed shall operate on a duty cycle only delivering a small quantity of wood chips to the gasifier. While in pilot mode there is insufficient fuel entering the system to increase the boiler temperature or steam pressure. Just enough fuel is added to maintain the boiler water temperature or steam pressure. Once the actual water temperature or steam pressure of the boiler drops below the boiler set point, both the fuel and air will increase to generate a greater heat input for the boiler.

Benefits of "True Gasification": Chiptec "True Gasifiers" have a distinctly separate gas producing, and gas oxidation zone. The low temperatures (1000F) in the gas producing zone allow for the use of higher ash content fuel material. It also has a very high temperature combustion zone (2200F+) which leads to very complete oxidation of the combustible hydrocarbons, and therefore, better fuel efficiency, cleaner boiler operation, lower particulate emissions, and better air quality. Stack gas treatment is therefore less expensive.

Low boiler deposits: Many systems with tube cleaning devices are only cleaned a few times a year. This leads to longer, uninterrupted run times than usually possible. You save the cost of load interruptions, and the labor costs of frequent tube cleaning**.**

Extremely fuel-efficient combustion: The carbon is more fully converted and very little carbon residue comes out in the ash or the stack compared to other types of combustion equipment. For example, Dutch ovens and stokers may have 20 to 25 % ash, in their combined bottom ash, fly ash, and stack gasses. That means you throw away 20 % of your fuel purchases. (At $20.00 per ton that is $5.00 per ton wasted.) The Chiptec gasifiers have less than 2% combined ash residue. (This is forty cents per ton unused carbon.) This significantly reduces fuel usage and purchases by thousands of dollars.

10 to 1 turn down ratio: (Or better.) This turn down reduces fuel purchases significantly by using much less fuel during low load periods. You can also avoid using oil backup during most low load periods, again saving money in oil purchases. Systems in use for space heat, or fluctuating process heat loads will find very significant savings in fuel purchases over stoker type systems with lower setbacks. Again, saving thousands of dollars in fuel usage or purchasing, and maintaining air quality.

54 Echo Place, Unit #1
Williston VT, 05495
802-658-0956
Fax: 802-660-8904
www.chiptec.com

Exceptional load maintenance and recovery rates: The Chiptec gasifiers can follow boiler set points precisely, and hover right at designated output. This aspect of load maintenance can save money by running uninterrupted and controlled loads for varying processes.

Exceptional air quality: The combination of the combustion management strategy, a fully programmable P.L.C. control system, and motor speed controllers on all feed and fan systems creates very precise combustion of carbon in the fuel, and eases permitting time and costs, and reduces required air treatment technology and hardware costs. The Chiptec gasifiers can also create a "pollution credit" that can be used to offset increased production.

Fuel Flexibility: The B-Series can combust cleanly and efficiently, fuels from 6% to 55% M.C., (Wet Basis) It can even change fuels on the fly with no degradation in combustion quality or management. High moisture content fuels are very difficult to burn and maintain loads, but the B-series can operate, for example, with green pine sawdust, and maintain loads as specified, while maintaining soot free combustion. (Of course, boiler output varies according to fuel moisture content.)

Steam Generator (i.e. boiler)

Since Chiptec manufactures the gasifier, which is a burner, we have the ability to utilize many different styles and types of boilers. From hot air furnaces to high pressure steam boilers, Chiptec has used them all. For this project, Chiptec shall utilize a shop assembled or packaged, scotch marine wet back boiler configured to work with our gasifier. Chiptec works closely with the boiler manufacture to ensure all components of the systems are integrated. All boilers are constructed to all applicable AMSE codes.

Control System

The Chiptec control panel is built upon the PLC microprocessor, which coordinates the various functions of system with the energy needs of the facility. The ability to maintain accurate "set points" at all firing levels, change parameters via a simple touch screen, have "on line" support, interface with other building control systems and provide dial out alerts are all features that add to efficiency, cleanliness, and ease of operation to the Chiptec system. In addition, we control the induced draft fan, and fuel delivery auger with programmable Variable Frequency Drives (VFD). This feature greatly enhances the performance of the system. The high efficiency motors that we use are all "top of the line" and designed to work with VFDs. The software developed by Chiptec, allows the system to be a fully modulating firing system. All control panels supplied by Chiptec shall be ***UL certified*** .

The Chiptec control panel can be configured to integrate into a buildings' DDC system. All digital and analog output for use by the building DDC can be pre-wired to a terminal strip located in the bottom of the control panel. Other trades will simply have to connect the appropriate wires to the thermals.

54 Echo Place, Unit #1
Williston VT, 05495
802-658-0956
Fax: 802-660-8904
www.chiptec.com

Typically provided digital and or analog I/O:

- Firing level indicator(0-100% of system output)
- Stack temperature
- Steam flow
- Wood chip handling system status
- Boiler temperature set point control
- General alarm output

A standard feature of the control panel is a modem that will allow Chiptec to provide support to the system from a remote location. Additionally, if the facility is connected to a network, the system's HMI can be configured to be accessible from any web browser. The system can also be operated from the web browser. Supply of the network, network connection and related hard ware is not provided by Chiptec.

Emission control system.

The Chiptec gasification system is a very clean burning and efficient system. Due to our very tight air control and advance software, the Chiptec gasification system typically only requires simple mechanical particulate control equipment. The utilization of the oxygen sensor to provide real time feed back to the plc, allows the system to manage the combustion process to maintain a desired flue gas oxygen level (typically 5-6%) which results in low CO, NOx and particulate emissions

Mechanical connections and requirements.

Since the Chiptec gasifier and the boiler are shopped assembled, there are very few mechanical connections to be made in the field. All of the boiler piping and plant piping will be performed by others. Chiptec Wood Energy Systems is not a mechanical contractor and we do not perform piping or other mechanical work. Any interconnect piping will be minimal due to the "package" aspect of the Chiptec system. Each gasifier will require one (1) ¾" water drop, which is use to supply plant water to the gasifiers' fire suppression system. The other mechanical connections will be on the boiler which will include piping of the supply and return lines, blow down, safety relief valves, and chemical feed.

54 Echo Place, Unit #1
Williston VT, 05495
802-658-0956
Fax: 802-660-8904
www.chiptec.com

Fuel storage and delivery.

The system Chiptec is offering is a "live floor" type of system that bottoms scraps the fuel pile and delivers the fuel to the material handling equipment. The system is based upon several modular moving wedge rams that are hydraulically driven. Since the system is made up of several moving wedge assemblies, the system has built in redundancy compare to other systems that utilize a single device for clearing out the fuel bin. If a mechanical failure occurs, the system can still operate on the other components, allowing the plant to continue to operate. Another advantage is all the serviceable items of the system are located out side of the storage bins and are easily accessed. The only maintenance that is required is the yearly service on the hydraulic power unit. The bin unloading system transferred the material into screw augers that transport the fuel to the gasifier. All of the screw augers in the Chiptec system have covers for protection and all access doors contain a safety circuit that will stop the auger if activated. Screw auger are clean (no material spillage), rugged, require low horse power to operate and do not require periodic adjustments as compared to a belt conveyor.

Safety Features.

Combustion Safety Devices

- Water safety valve: A temperature activated valve that supplies water to the top of the metering auger if the temperature in the feed auger is over 190 degree F.
- Air lock: Creates a physical break between fuel source and gasifier.
- Fuel level arm: Prevents the gasifier from being over filled with fuel.
- Feed screw: Feed screw operates until all material is discharged into the gasifier. This creates a second physical break between fuel source and the gasifier.
- Draft proving switch: If the draft fan fails, the fuel feed system stops delivering fuel to the gasifier.

Mechanical Safety Devices

- Gasifier lid safety system: An intergraded system of limit switches that prevents the lid from being opened or closed by mistake.
- Gasifier lid safety bar: Once the lid is opened, a pin is inserted into the safety bar that locks the lid open. The safety bar also acts as a back up to the lid lifter assembly.
- Auger access door limit switches: Turn off augers when access doors are opened to prevent bodily harm.

Boiler Safety Devices

- ASME approved relief valves & components as required by code
- Low boiler water cut off devices as per code
- Hi-limit control: If boiler temperature exceeds the desired temperature the unit shuts down.

54 Echo Place, Unit #1
Williston VT, 05495
802-658-0956
Fax: 802-660-8904
www.chiptec.com

Gasifier Start-Up Procedure

The system controls are placed into manual operation which allows the operator to control the speed of the induce draft fan, percent oxygen, the fuel feed level and fuel feed rate.

The operator fills the gasifier box to a level approximately ½ to ¾ of its capacity. The operator then stops the fuel feed and increases the induce draft fan to 25%. The oxygen control is placed at 100% which directs all combustion air to Primary. At this point, approximately 5 gallons of diesel or kerosene fuel is sprayed on top of the fuel pile. The operator then lights the fuel pile in a manner that protects the operator. During this process, the two rear access doors are open. This is the main source of combustion air for the start up procedure. As the fuel burns the operator monitors the fire through the rear access doors. When the fuel pile is sufficiently ignited the operator can start to close the gasification chamber by first placing the internal refractory blocks or bricks in the access door ways. At this point, all combustion is taking place in the gasifier box. The intent of this process is to establish a sufficient bed of incandescent charcoal that will allow the burner to ignite when the access doors are closed. It should be noted that when the rear access doors are closed, the air is directed to the primary air zone and travels up through the fuel pile. It is at this point, the gasification process starts. Once a sufficient fuel pile and incandescent charcoal bed is established the rear access doors are closed. Once the doors are closed the burner will ignite.

WARNING: Do not attempt to re-open the rear access doors. If ignition is lost, ie. there is no visible flame in the gasification chamber, all settings should remain at current levels until ignition re-establishes.

The operator may need to adjust the oxygen level to help accomplish this task. This processes my take up to 1.5 hours depending on the fuel moisture content and plant conditions.

Once the burner is ignited, and the operator is satisfied with the performance, the operator can start to increase the induce draft fan which will increase the gasifier and boiler output. It is up to the operator to determine how fast and how much to increase the system output. A cold boiler will require more time to bring up to temperature, while a hot boiler will require less time.

Once the boiler is up to temperature and pressure, the system can be placed into automatic operation. During automatic operation, the gasifier will respond to the boiler steam pressure and work to maintain the desired steam pressure set point. As load increases and decreases, the gasifier controls will automatically adjust the induce draft fan speed, fuel feed delivery rate and oxygen trim as required.

54 Echo Place, Unit #1
Williston VT, 05495
802-658-0956
Fax: 802-660-8904
www.chiptec.com

Gasifier Shut-Down Procedure

For a planned system shut down, the operator will place the system into manual operation and turn off the fuel feed to the gasifier. This will allow the gasifier to burn down the fuel pile in the gasifier. During this process, the system will continue to generate steam; therefore it is recommended that a steam load or dump be present to accommodate any steam that is produced. As the fuel is consumed, the flame in the gasifier will become smaller and smaller, eventually leaving the boiler. After approximately one hour the "Stop Firing" button can be pushed. This will decrease the stack fan to minimum and direct all combustion air to the Secondary. The fuel will continue to burn in the gasifier box. It may take several hours to completely burn down the fuel pile. The cool down procedure may take several days. This is dependent on the size of the gasifier.

ATTENTION: At no time during the early stages of shut down and cool down should the rear access hatches be opened. These should remain closed until the gasification chamber has cooled to safe temperatures.

Emergency Shut Down

If the system enters into a fault mode such as low water in the boiler and needs to shut down, a valve in the combustion air duct is activated and closed to allow a minimum amount of air into the system. At the same time, the balancing valve that directs air to the either primary or secondary air zones opens to allow all the air to go to the secondary air zone. This will effectively stop gas production and burn any gas that is remaining. Also at the same time, the induce draft slows down to a minimum speed which slows the production of the gas.

54 Echo Place, Unit #1
Williston VT, 05495
802-658-0956
Fax: 802-660-8904
www.chiptec.com

10-4535/1.8

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY

1021 NORTH GRAND AVENUE EAST, P.O. BOX 19506, SPRINGFIELD, ILLINOIS 62794-9506 – (217) 782-2113

DOUGLAS P. SCOTT, DIRECTOR

217/782-2113

CONSTRUCTION PERMIT -- NSPS

PERMITTEE

Board of Trustees of Eastern Illinois University
Attn: Gary Reed, Facilities Planning and Management
600 Lincoln Avenue
Charleston, Illinois 61920

Application No.: 09070002 I.D. No.: 029010AAK
Applicant's Designation: Date Received: July 1, 2009
Subject: Renewable Energy Center
Date Issued: November 6, 2009
Location: 600 Lincoln Avenue, Charleston, Coles County

Permit is hereby granted to the above-designated Permittee to CONSTRUCT emission source(s) and/or air pollution control equipment consisting of Renewable Energy Center including two biomass gasifier-boiler systems each controlled by multi-tube cyclone and a common electrostatic precipitator (ESP) control (affected gasifier-boiler units), two natural gas/oil fired backup boilers (affected standby boilers), biomass storage and handling system controlled by baghouse (affected units) and ancillary equipment, as described in the above referenced application. This Permit is subject to standard conditions attached hereto and the following special conditions:

1.0 General Provisions

1.1 Description

This permit is for a construction of a new Renewable Energy Center (REC), which will replace existing steam plant for heating and cooling campus building at Eastern Illinois University (EIU). The new facility will have two biomass gasifier-boiler systems. These systems will be designed to use virgin wood chip biomass fuel. The gasifiers will also be capable of using other biomass such as switchgrass, miscanthus, wheat straws, corn stover (leaves, stalks, and cobs), dried grain pellets, and other agri-fuels. Other emission units at the new facility would include two natural gas/oil fired backup boilers, and biomass storage and handling system.

1.2 Applicability of Prevention of Significant Deterioration (PSD)

a. This permit is issued based on this project not constituting a major modification subject to 40 CFR 52.21, Prevention of Significant Deterioration (PSD). The Permittee has addressed the applicability of PSD demonstrating that this project will not result in a significant increase in emissions of PSD pollutants, subject to the limitations and requirements in this permit. For emissions of nitrogen oxides (NO_x), this is because the project will be accompanied by decreases in emissions from

the existing steam plant, which will be replaced by the Renewable Energy Center (See Attachment 1). For other pollutants, the permit does not rely on accompanying decreases in emission from the shutdown of the existing steam plant, as the emissions of the new facility are not projected to be significant.

b. Following the shakedown of the new Renewable Energy Center, the Permittee shall permanently cease operation of the boilers in its existing steam plant. If the shakedown of the REC takes longer than 180 days, the Permittee shall coordinate operation of the steam plant and REC so that combined annual emissions of NO_x do not exceed 97.3 tons, total.

1.3 Emissions Limits for the Proposed Facility

a. Emissions of the proposed facility shall not exceed the following limits:

NO_x	CO	VOM	PM/PM_{10}	$PM_{2.5}$	SO_2
97.3	98.0	7.4	13.1	9.9	33.3

b. This permit is issued based on this project not being a major project for emissions of hazardous air pollutants (HAPs), i.e., the emissions of individual HAPs will each be less than 10 tons per year and the total emissions of HAPs will be less than 25 tons per year. As a result, the provisions of 40 CFR Part 63 and Section 112(g) of the Clean Air Act do not apply to this project.

1.4 Compliance with Annual Limits

Unless otherwise specified in a particular provision, compliance with annual limitations established by this permit shall be determined from a running total of 12 months of data, i.e., from the sum of the data for the current month plus the preceding 11 months (12 month total).

1.5 Good Air Pollution Control Practices

The Permittee shall operate and maintain the emission units at the affected plant, including associated air pollution control equipment, in a manner consistent with good air pollution control practice, as follows:

a. At all times, including periods of startup, shutdown, malfunction or breakdown, operate as practicable to minimize emissions.

b. Conduct routine inspections and perform appropriate maintenance and repairs to facilitate proper functioning of equipment and minimize or prevent malfunctions and breakdowns.

c. Install, calibrate and maintain required monitoring devices and instrumentation in accordance with good monitoring practices, following the manufacturer's recommended operating and maintenance procedures or such other procedures as otherwise necessary to assure reliable operation of such devices.

1.6 Initial Notification Requirements

The Permittee shall furnish the Illinois EPA with written notification as follows with respect to commencement of construction and operation of the affected gasifier-boiler units and the affected standby boilers:

a. The date construction of each affected combustion unit commenced postmarked no later than 30 days after such date, pursuant to 40 CFR 60.7(a)(1).

b. The actual date of initial startup of each affected combustion unit, postmarked within 15 days after such date, pursuant to 40 CFR 60.7(a)(3) and 60.48c(a), which shall be accompanied by the following information:

i. The design heat input capacity of the affected unit and identification of the fuels to be combusted in the unit, pursuant to 40 CFR 60.48c(a)(1).

ii. The annual capacity factor at which the Permittee anticipates operating the affected unit based on fuel fired, pursuant to 40 CFR 60.48c(a)(3).

1.7 Records Retention Requirement

All records required by this permit shall be retained on site for a period of at least five years and shall be readily available for inspection and copying by the Illinois EPA upon request. Any record retained in an electronic format (e.g., computer) shall be capable of being retrieved and printed on paper during normal source office hours so as to be able to respond to an Illinois EPA request for records during the course of a source inspection.

1.8 Two copies of all required notifications shall be sent to:

Illinois Environmental Protection Agency
Division of Air Pollution Control
Compliance Section (#40)
P.O. Box 19276
Springfield, Illinois 62794-9276

Telephone: 217/782-5811 Fax: 217/782-6348

and one copy of all required notifications shall be sent to the Illinois EPA's regional office at the following address, unless otherwise indicated:

Illinois Environmental Protection Agency
Division of Air Pollution Control
Regional Field Office
2009 Mall Street
Collinsville, Illinois 62234

Telephone: 618/346-5120 Fax: 618/346-5155

1.9 Authorization for Operation

a. Under this permit, the affected gasifier-boiler units may be operated for a period that ends 180 days after the units first fired solid fuel to allow for equipment shakedown and required emissions testing. This period may be extended by the Illinois EPA upon request of the Permittee if additional time is needed to complete shakedown or perform emission testing.

b. Upon successful completion of emission testing of the affected gasifier-boiler units, the Permittee may continue to operate the units and other affected units addressed by this construction permit until action is taken to address the units in a revision to or renewal of an operating permit for the source.

c. This condition supersedes Standard Condition 6.

2.0 Biomass Gasifier-Boilers

2.1 Description

The two gasifier-boiler systems (affected gasifier-boiler units) are the principal subject of this permit. The first part of the system, the gasifier, will process biomass fuel or feedstock to produce a hot fuel gas. This fuel gas will be mixed with additional air and combustion will be carried to completion in a separate combustion chamber. The hot combustion gases will pass to a boiler in which the thermal energy of the hot gases will be recovered as steam. The two units, which have been designated B-3 and B-4 by the source are of slightly different size with one being about 10 mmBtu larger than the other.

Particulate emissions from each affected gasifier-boiler unit will be controlled by multi-tube cyclones followed by a common electrostatic precipitator (ESP) control.

2.2-1 Applicable Federal Emission Standards

a. Each affected gasifier-boiler unit is an affected facility under the federal New Source Performance Standard (NSPS) for Small Industrial-Commercial-Institutional Steam Generating Units, 40 CFR 60, Subpart Dc. As an affected facility, the Permittee must comply with applicable requirements of the NSPS, 40 CFR 60 Subpart Dc, and related requirements of 40 CFR 60, Subpart A, General Provisions, for the boiler. The Illinois EPA is administering NSPS in Illinois on behalf of the United States EPA under a delegation agreement.

b. Pursuant to the NSPS, 40 CFR 60.43c(c), opacity from each affected gasifier-boiler unit shall not exceed 20 percent, as measured on a six minute average, except for one six minute period per hour of not more than 27 percent. As provided by 40 CFR 60.43c(d), this limit applies at all times except during periods of startup, shutdown, or malfunction, as defined at 40 CFR 60.2. However, exceedances during such periods shall be reported as deviations.

c. Pursuant to the NSPS, 40 CFR 60.43c(e), the Permittee shall not cause or allow emissions of PM from each affected gasifier-boiler unit in excess of 0.030 lb/mmBtu heat input.

d. Pursuant to the NSPS, 40 CFR 60.11(d), at all times the Permittee shall, to the extent practicable, maintain and operate the affected gasifier-boiler units in a manner consistent with good air pollution control practices for minimizing emissions.

2.2-2 Applicable State Emission Standards

a. Pursuant to 35 IAC, Chapter B, Subchapter c, emissions from each affected gasifier-boiler unit shall not exceed the following standards, which apply on an hourly basis:

Pollutant	Standard	Limit
PM	35 IAC 212.204	0.1 lb/mmBtu
SO_2	35 IAC 214.122(a)	1.8 lb/mmBtu
CO	35 IAC 216.121	200 ppm, @ 50% excess air

b. Pursuant to 35 IAC 212.123(a), the opacity of the exhaust from each affected gasifier-boiler unit shall not exceed 30 percent, except as provided in 35 IAC 212.123(b).

c. Subject to the following terms and conditions, the Permittee is authorized to continue operation of the affected gasifier-boiler units in violation of the applicable state emission standards in Conditions 2.2-2(a) and (b) during startup, pursuant to 35 IAC 201.149, 201.161 and 201.262.

i. The Permittee shall conduct startup of the affected gasifier-boiler units in accordance with the manufacturer's written instructions or other written instructions prepared by the Permittee and maintained on site that are specifically developed to minimize excess emissions from startups and that include, at a minimum, the following measures:

A. Review of the operational condition of the affected gasifier-boiler units prior to initiating startup of the affected gasifier-boiler units.

B. Use of natural gas burners as needed to heat the affected gasifier-boiler units prior to initiating burning of solid fuel.

C. Manage the load of the affected gasifier-boiler units until all control systems are functioning normally.

D. Review of the operational parameters of the affected gasifier-boiler units during each startup as necessary to make appropriate adjustments to the startup to reduce or eliminate excess emissions.

ii. The Permittee shall fulfill applicable recordkeeping requirements of Condition 2.8(e).

iii. Exceedances of applicable emissions standards or limitations during periods of startup shall be considered deviations for purposes of notification and reporting, even if exceedance of the standard or limitation is otherwise provided for by applicable rule or this permit.

iv. As provided by 35 IAC 201.265, an authorization in a permit for excess emissions during startup does not shield a Permittee from enforcement for any violation of applicable emission standard(s) that occurs during startup and only constitutes a prima facie defense to such an enforcement action provided that the Permittee has fully complied with all terms and conditions connected with such authorization.

Note: These provisions are subject to review and revision when an operating permit for the source is revised to address the affected gasifier-boiler units and each time the operating Permit is subsequently renewed.

d. Subject to the following terms and conditions, the Permittee is authorized to continue operation of the affected gasifier-boiler units in violation of the applicable state emission standards in Conditions 2.2-2(a) and (b) in the event of a malfunction or breakdown, pursuant to 35 IAC 201.149, 201.161 and 201.262.

i. This authorization only allows such continued operation as necessary to provide essential service or to prevent injury to personnel or severe damage to equipment and does not extend to continued operation solely for the economic benefit of the Permittee.

ii. Upon occurrence of excess emissions due to malfunction or breakdown, the Permittee shall as soon as practicable reduce load of the affected gasifier-boiler unit(s), repair the affected gasifier-boiler unit(s), remove the affected gasifier-boiler unit(s) from service or undertake other action so that excess emissions cease.

iii. The Permittee shall fulfill applicable recordkeeping and reporting requirements of Conditions 2.8(f) and 2.9-1(d). For these purposes, time shall be measured from the start of a particular incident. The absence of excess emissions for a short period shall not be considered to end the incident if excess emissions resume. In such circumstances, the incident shall be considered to continue until corrective actions are taken so that excess emissions cease or the Permittee takes the affected engine out of service.

iv. Following notification to the Illinois EPA of a malfunction or breakdown with excess emissions, the Permittee shall comply with all reasonable directives of the Illinois EPA with respect to such incident, pursuant to 35 IAC 201.263.

v. Exceedances of applicable emissions standards or limitations during the event of malfunction or breakdown shall be considered deviations for purposes of notification and reporting, even if exceedance of the standard or limitation is otherwise provided for by applicable rule or this permit.

vi. This authorization does not relieve the Permittee from the continuing obligation to minimize excess emissions during malfunction or breakdown. As provided by 35 IAC 201.265, an authorization in a permit for continued operation with excess emissions during malfunction or breakdown does not shield the Permittee from enforcement for any such violation and only constitutes a prima facie defense to such an enforcement action provided that the Permittee has fully complied with all terms and conditions connected with such authorization.

Note: These provisions are subject to review and revision when an operating permit for the source is revised to

address the affected gasifier-boiler units and each time the operating Permit is subsequently renewed.

2.3 Requirements for the Fuel Supply to the Affected Gasifier-Boiler Units

a. Biomass fuels shall be the only solid fuels fired in the affected gasifier-boiler units. For this purpose, biomass means virgin wood/bark chips from forestry, lumber production and tree trimming operations, and other biomass such as switchgrass, miscanthus, wheat straws, corn stover (leaves, stalks, and cobs), dried grain pellets, and other agri-fuels, which may be fired in the affected gasifier-boiler units following notice to the Illinois EPA. Biomass fuels do not include waste, e.g., vegetative material that has been discarded.

b. This Permit does not authorize acceptance of fuel by the Permittee that would qualify as acceptance of waste under the provisions of the Environmental Protection Act or acceptance of hazardous waste under the provisions of the Federal Resource Conservation, the Recovery Act, Environmental Protection Act, or 35 IAC Part 721.

c. This Permit does not authorize processing of fuel feedstocks at the plant to produce fuel, e.g., processing of mixed construction and demolition debris to select clean wood. This does not prohibit final preparation of fuel for use as typically occurs with use of solid fuel, e.g., by final size adjustment and additional magnetic screening for tramp metal in the fuel.

d. The Permittee shall only accept shipments of biomass in which the biomass is clean, that is, the biomass as unloaded at the plant is free of foreign matter and any contaminants that would adversely impact the environment when the Permittee uses the biomass as fuel.

e. The Permittee shall carry out the acceptance of biomass in a manner that ensures that accepted biomass satisfies all applicable criteria for such material.

f. The Permittee shall implement appropriate practices given the nature of particular biomass materials to store and otherwise manage accepted biomass so that it does not degrade or is otherwise damaged such that it can no longer be used as fuel.

2.4 Operational Limitations

a. The nominal rated heat input capacity of affected gasifier-boiler units B-3 and B-4 shall not exceed 62.2 and 52.1 mmBtu/hour, respectively.

b. The usage of biomass fuel by the affected gasifier-boiler units shall not exceed 72,000 tons per year, total.

c. i. After the shakedown period for this project is complete, as addressed by Condition 1.9(a), the operation of the affected gasifier-boiler units in "unit operating hours" on an annual basis (rolling 12 months of operation) shall not exceed the following limits, whichever is more stringent:

A. 12,000

B. 13,500 - 0.4 x Unit operating hours of the affected standby boilers

ii. As an alternative to Condition 2.4(c)(i), the Permittee may install, operate and maintain a continuous emissions monitoring system (CEMS) for NO_x emissions of the affected gasifier-boiler units in accordance with Condition 2.7(b). For this purpose, this alternative shall take effect on the first day of the month following notification from the Permittee that it has elected to conduct and will be beginning such monitoring, on which day such monitoring shall be required. If the Permittee elects to no longer rely on this alternative, the limits in Condition 2.4(c)(i) shall become effective on the first day of the month following notification from the Permittee of this decision, on which day such monitoring shall no longer be required. While the Permittee is required to conduct monitoring in accordance with this alternative, compliance with the NOx emission limits in Condition 2.5(a) shall be determined on a 24-hour average (daily basis).

d. Only one affected standby boiler shall be operated if one or both of the affected gasifier-boiler units are being operated. For this purpose, a unit shall not be considered to be operating if shutdown of the unit is underway.

2.5 Emission Limitations

a. Short-term emissions from each affected gasifier-boiler unit shall not exceed the following limits except during startup operation and malfunction or breakdown event. Compliance with hourly emission limits shall be based on 3-hour block averages for all pollutants, except as provided by Condition 2.4(c)(ii).

	Unit B-3		Unit B-4	
Pollutant	(lb/hour)	(lb/mmBtu)	(lb/hour)	(lb/mmBtu)
NO_x	15.6	0.250	13.0	0.250
CO	14.0	0.225	11.7	0.225
SO_2	6.2	----	5.2	----
PM/PM_{10}[a]	1.9/1.9	0.100/0.030	1.6/1.6	0.100/0.030

$PM_{2.5}$[a]	1.6	0.023	1.4	0.023
VOM	1.1	----	0.9	----

[a] Filterable emissions only.

b. Annual emissions from the affected gasifier-boiler units combined shall not exceed the following limits.

Pollutant	Emissions (Total) (Tons/Year)[a]
NO_x	85.0
CO	85.8
SO_2	32.4
PM/PM_{10}[b]	9.9
$PM_{2.5}$[b]	8.7
VOM	6.7
Hydrochloric Acid (HCl)	6.1
Formaldehyde	1.4
Total HAPs	12.9

[a] Annual emissions include emissions during start-up and malfunction/breakdown.

[b] Filterable emissions only.

2.6 Testing Requirements

a. i. The Permittee shall conduct initial performance tests for the affected gasifier-boiler units:

A. To determine emissions pursuant to NSPS, 40 CFR 60.45c(a) and (b). This test shall be conducted while biomass is being used in the affected units. The Permittee shall follow appropriate procedures of the NSPS for this test, including notification and reporting for the tests in accordance with 40 CFR 60.8.

B. Within 60 days after achieving the maximum rate at which each affected unit will be operated, but not later than 180 days after initial startup to measure emissions of pollutants for which limits are set by Condition 2.5(a) and emissions of other hazardous air pollutants as specified by the Illinois EPA during review of the test plan.

Note: For emission testing required by the NSPS, an extension of this timing for testing can only be provided by USEPA.

ii. In addition to the emission testing required above, the Permittee shall have testing performed for affected gasifier-boiler unit(s) as specified by the Illinois EPA within 45 days of a written request by the Illinois EPA or such later date agreed to by the Illinois EPA. If units are normally using biomass fuels other than wood chips, this testing shall be conducted while units are using a representative mix of fuels, as approved by the Illinois EPA.

b. This testing shall be conducted at the Permittee expense by an approved testing service while the affected units are operating in the maximum load range and other representative operating conditions. The following methods and procedures shall be used for testing of emissions of the boiler, unless another established method is approved by the Illinois EPA.

	Method
Location of Sample Points	Method 1
Gas Flow and Velocity	Method 2
Flue Gas Weight	Method 3 or 3A
Moisture Content	Method 4
Nitrogen Oxides	Method 7, 7E or 19
Opacity	Method 9
Carbon Monoxide	Method 10
Sulfur Dioxide	Method 6C and 19
PM (Filterable)[1]	Methods 5, 201 and 201A
PM (Condensable)[1]	Method 202
Volatile Organic Material[2]	Method 18, 25, 25A or 320
Hydrogen Chloride	Method 19 and 26
Formaldehyde	Method 320

[1] The Permittee may report all PM emissions measured by USEPA method 5 as PM_{10} and $PM_{2.5}$, in which case separate testing using USEPA Method 201 or 201A need not be performed.

[2] Permittee may exclude methane, ethane and other exempt compounds from the results of any VOM test provided that the test protocol to quantify and correct for such compounds is included in the test plan approved by the Illinois EPA.

c. At least 60 days prior to the actual date of initial performance testing, a written test plan shall be submitted to the Illinois EPA for review. This plan shall describe the specific procedures for testing and shall include as a minimum:

i. The person(s) who will be performing sampling and analysis and their experience with similar tests.

ii. The specific conditions under which testing shall be performed including a discussion of why these conditions will be representative of maximum emissions and the means by which the operating parameters for the affected gasifier-boiler unit will be tracked and recorded.

iii. The specific determinations of emissions that are intended to be made, including sampling and monitoring locations; the test method(s) that will be used, with the specific analysis method, if the method can be used with different analysis methods.

iv. If the Permittee proposes to conduct emission test while both units are operating, rather than separate testing of each unit, justification for such "combined testing".

d. The Illinois EPA shall be notified prior to these tests to enable the Illinois EPA to observe these tests. Notification of the expected date of testing shall be submitted a minimum of thirty (30) days prior to the expected date. Notification of the actual date and expected time of testing shall be submitted a minimum of five (5) working days prior to the actual date of the test. The Illinois EPA may, at its discretion, accept notifications with shorter advance notice provided that the Illinois EPA will not accept such notifications if it interferes with the Illinois EPA's ability to observe the testing.

e. Three copies of the final reports for emission tests shall be forwarded to the Illinois EPA, Compliance Section within 30 days after the test results are compiled and finalized and no later than 60 days after the final day of emission testing. The final report from testing shall contain the following as a minimum:

i. A summary of results.

ii. General information.

iii. Description of test method(s), including description of sampling points, sampling train, analysis equipment, and test schedule.

iv. Detailed description of test conditions, including:

A. Description of fuel fired.

B. Fuel consumption.

C. Firing rate (million Btu/hour).

v. Data and calculations, including copies of all raw data sheets and records of laboratory analyses, sample calculations, and data on equipment calibration.

2.7 Monitoring Requirements

a. i. Pursuant to the NSPS, 40 CFR 60.47c(a), the Permittee shall install, calibrate, maintain, and operate a Continuous Opacity Monitoring System (COMS) for the affected gasifier-boiler units, measuring the opacity of the emissions discharged to the atmosphere and record the output of the system.

ii. Pursuant to the NSPS, 40 CFR 60.47c(b), all COMS shall be operated in accordance with the applicable procedures under Performance Specification 1 (40 CFR 60, Appendix B). The span value of the opacity COMS shall be between 60 and 80 percent.

b. If the Permittee elects to monitor NO_x emissions pursuant to Condition 2.4(c)(ii):

i. The Permittee shall install, operate, and maintain a Continuous Emissions Monitoring System (CEMS) on the affected gasifier-boiler units to measure emissions of NO_x in either pounds per hour or pounds per million Btu heat input. This CEMS shall be installed on the combined stack of the units. The relevant procedures under 40 CFR 60.13 shall be followed for the installation, evaluation, and operation of this CEMS. This CEMS shall be designed and operated to meet Performance Specification 2 of 40 CFR 60, Appendix B.

ii. The Permittee shall keep records of data measured by this CEMS. The Permittee shall also keep records of the operation of the CEMS, including performance of calibrations and maintenance activities and periods when the CEMS was operating improperly or out of service.

iii. The Permittee shall submit quarterly reports to the Illinois EPA for this CEMS in accordance with the relevant provisions of 40 CFR 60.8(c) or (d).

iv. At least 60 days before beginning installation of this CEMS, the Permittee shall submit a monitoring plan to the Illinois EPA for review and comment. This plan shall include a diagram of the stack and ductwork for the affected gasifier-boiler units demonstrating that the location of the sampling point for the planned CEMS would meet applicable requirements and the identity of the proposed monitoring units, with their design specifications.

2.8 Recordkeeping Requirements

a. The Permittee shall maintain a file of the following items:

i. A record of the maximum design heat input capacity of each affected gasifier-boiler unit, mmBtu/hour, with supporting documentation.

ii. Heat content of the fuels (Btu/lb or Btu/ft^3) being fired, with supporting documentation.

iii. The Permittee's established operating, maintenance and monitoring procedures for the affected boiler.

b. An operating log or other records for the affected gasifier-boiler units that, at a minimum, shall include the following information:

i. Information for each startup and shutdown, including date, time and duration, as required by 40 CFR 60.7(b).

ii. Information for any incident in which the operation of the boiler continued during malfunction or breakdown, including: date, time, and duration; a description of the incident; whether emissions exceeded or may have exceeded any applicable standard; a description of the corrective actions taken to reduce emissions and the duration of the incident; and a description of the preventative actions taken, as addressed by 40 CFR 60.7(b).

iii. Information documenting that operation of the affected gasifier-boiler unit complied with the operational restrictions of this permit.

iv. Information identifying any deviation from the fuel restriction in Condition 2.3.

v. Information on the availability of each affected gasifier-boiler unit. If the availability of an affected gasifier-boiler unit is less than 64 percent on a 12 month rolling period average, the Permittee shall keep record of detailed explanation of the reasons for less than 64 percent availability and a discussion of action that are planned to improve availability of the unit.

c. The Permittee shall maintain the following operating records for each affected gasifier-boiler unit:

i. Total operating hours.

ii. Daily records of total fuel usage by class (solid, liquid or gas). The daily fuel flow to the individual gasifier-boilers may be calculated based on the proportion of steam produced from each unit.

d. The Permittee shall maintain following records related to fuel supply for the affected gasifier-boiler units:

i. The Permittee shall maintain a file containing the identity and address of each independent company or other entity other than the Permittee that supplies and delivers biomass to the Renewable Energy Center facility, accompanied by the type(s) of biomass supplied and a description of the origin of material, if the party does not produce the material itself.

ii. The Permittee shall maintain records for the amount of biomass accepted (tons).

iii. The Permittee shall maintain records of biomass shipments presented to the plant that are rejected (identification of shipment, amount and type of material, and reason for rejection).

e. Records for Startups:

The Permittee shall maintain records for each startup of the affected gasifier-boiler units. These records shall contain the date and duration of each startup, and note any deviations from normal startup procedures established by the Permittee.

f. Records for continued Operation during Malfunctions or Breakdowns:

The Permittee shall maintain records for each occurrence when operation of the affected gasifier-boiler unit(s) continued during a malfunction or breakdown that acted to increase emissions or affect emission compliance, including the following information:

i. Date and duration of malfunction or breakdown.

ii. A description of the malfunction or breakdown.

iii. The corrective actions used to reduce the quantity of emissions and the duration of the occurrence.

iv. If excess emissions occurred:

A. An explanation why continued operation of the affected boiler was necessary.

B. The preventive measures planned or taken to prevent similar malfunctions or breakdowns or reduce their frequency and severity.

C. An estimate of the magnitude of excess emissions during the occurrence.

g. The Permittee shall keep inspection, maintenance, and repair logs with dates and the nature of such activities for each affected gasifier-boiler unit.

h. i. The Permittee shall keep records for the amount of each fuel used on a monthly basis in the affected gasifier-boiler unit pursuant to 40 CFR 60.48c(g)(3).

ii. The Permittee shall keep records of the usage of biomass fuel, in ton/year.

j. The Permittee shall maintain the following records related to emissions from the affected gasifier-boiler units:

i. Other data, not addressed above, used or relied upon by the Permittee to determine emissions.

ii. A file containing calculations for the maximum hourly emission rates for each unit (lbs/hour and lbs/mmBtu), with supporting calculations.

iii. Monthly and annual emissions of NO_x, CO, $PM/PM_{10}/PM_{2.5}$, VOM, SO_2, and HAP emissions (tons/month and tons/year) with supporting data or calculations.

2.9-1 Reporting and Notification Requirements

a. If there is any deviation of the requirements of this permit for the affected gasifier-boiler units, as determined by the records required by this permit or by other means, the Permittee shall promptly report to the Illinois EPA as specified below until such time the affected gasifier-boiler units are addressed by an operating permit.

i. Deviations from Conditions 2.2 through 2.5 shall be reported with the reports required by the NSPS.

ii. Other deviations shall be reported within 30 days and include a description of the incident, a discussion of the probable cause of such deviation, a description of the corrective actions taken, and a description of the preventative measures taken.

iii. A. Pursuant to 35 IAC 201.263, the Permittee shall immediately report to the Illinois EPA, Regional Office, by telephone or fax upon continued operation of an affected gasifier-boiler unit during a malfunction or breakdown of the unit or associated

control equipment when such continued operation would cause an exceedance or violation of the applicable state emission standard.

B. The Permittee shall submit a written follow-up report to the Illinois EPA within five business days providing a detailed explanation of the event and explanation why continued operation of the affected gasifier-boiler unit was necessary, the length of time during which operation continued under such conditions, the measures by the Permittee to minimize and correct deficiencies with chronology, and when the repairs were completed or the unit was taken out of service.

b. The Permittee shall notify the Illinois EPA before using biomass fuel in the affected gasifier-boiler units other than virgin wood/bark chips from forestry, lumber production and tree trimming operations as specified below. These notifications shall include a description of the biomass fuel, the source of the fuel and the amount of such fuel intended to be used.

i. For research and trial use of a fuel, the notification shall be submitted at least 10 days in advance of use of the fuel.

ii. For routine use of a fuel, the notification shall be submitted at least 30 days in advance of use of the fuel.

2.9-2 Reporting and Notification Requirements During Shakedown

a. The Permittee shall provide the Illinois EPA 30 days advance notification prior to initial start-up of the affected gasifier-boiler units.

b. The Permittee shall provide the Illinois EPA with prompt notification of any event(s) that disrupts the orderly shakedown of the affected gasifier-boiler units.

c. The Permittee shall provide the Illinois EPA with periodic progress reports on a calendar quarter basis, commencing with the first quarter in which the affected gasifier-boiler units initially commenced operation and terminating in the final quarter that shakedown was completed. These reports shall include the following:

i. Overall operating level (heat input and maximum biomass usage).

ii. Activities accomplished/significant events.

iii. Current schedule for emission testing.

iv. A summary of any emission measurements conducted.

v. Outreach activities planned/provided for local communities or interested parties.

d. The Permittee shall provide the Illinois EPA notice as to when it considered shakedown of the affected boiler was complete.

3.0 Natural Gas/Oil-Fired Boilers

3.1. Description

As a part of new Renewable Energy Center, EIU will install two natural gas/oil fired boilers (B-1 and B-2) that are planned to be used primarily as back-up for the biomass gasifier-boiler units (the affected standby boilers). Affected Boiler B-2 will be relocated from the existing steam plant, where it was recently installed as Boiler #4 pursuant to Construction Permit 09040010. Affected standby boilers will replace existing gas/oil-fired Boiler #4 and #5 at the existing steam plant. Boiler B-1 will be a new boiler.

3.2 Applicable Federal Emission Standards

a. Each affected standby boiler is an affected facility under the federal New Source Performance Standard (NSPS) for Small Industrial-Commercial-Institutional Steam Generating Units, 40 CFR 60, Subparts Dc. As an affected facility, the Permittee must comply with applicable requirements of the NSPS, 40 CFR 60 Subpart Dc, and related requirements of 40 CFR 60, Subpart A, General Provisions, for the boiler. The Illinois EPA is administering NSPS in Illinois on behalf of the United States EPA under a delegation agreement.

b. Pursuant to the NSPS, 40 CFR 60.42c(d), the Permittee shall not cause or allow emissions of SO_2 from each affected standby boiler in excess of 0.5 lb/mmBtu or the sulfur content of the fuel oil burned in the affected boiler shall be less than 0.5 percent by weight.

Note: The SO_2 emissions from the affected standby boilers are subject to more stringent standard pursuant to 35 IAC 214.122.

c. Pursuant to the NSPS, 40 CFR 60.43c(c), opacity from each affected standby boiler shall not exceed 20 percent, as measured on a six minute average, except for one six minute period per hour of not more than 27 percent. As provided by 40 CFR 60.43c(d), this limit applies at all times except during periods of startup, shutdown, or malfunction, as defined at 40 CFR 60.2. However, exceedances during such periods shall be reported as deviations.

d. Pursuant to the NSPS, 40 CFR 60.11(d), at all times the Permittee shall, to the extent practicable, maintain and operate each affected standby boiler in a manner consistent with good air pollution control practices for minimizing emissions.

3.3 Applicable State Emission Standards

a. Pursuant to 35 IAC, Chapter B, Subchapter c, emissions from the affected standby boiler shall not exceed the following standards, which apply on an hourly basis:

Pollutant	Standard	Limit
PM	35 IAC 212.206	0.10 lb/mmBtu*
SO_2	35 IAC 214.122(b)(2)	0.3 lb/mmBtu*
CO	35 IAC 216.121	200 ppm, @ 50% excess air

* Limit is applicable to emissions attributable to burning of oil.

b. Pursuant to 35 IAC 212.123(a), the opacity of the exhaust from each affected standby boiler shall not exceed 30 percent, except as provided in 35 IAC 212.123(b).

3.4 Continuous Monitoring Exemptions

a. This permit is issued based on the Permittee using fuel supplier certifications, as described under 40 CFR 60.48c(f)(1), to demonstrate compliance with the standard in Condition 3.2(b) for sulfur content of fuel, rather than continuous emissions monitoring for SO_2, as allowed by the NSPS, 40 CFR 60.46c(e).

b. This permit is issued based on the Permittee not being required to operate a continuous opacity monitor for the affected standby boilers pursuant to the NSPS. This is because the distillate fuel oil burned in the boiler will have a sulfur content less than 0.5 percent by weight and other fuels will have a potential SO_2 emission rate of no more than 0.06 lb/mmBtu, and the boiler will not use post-combustion technology to reduce SO_2 or PM emissions, as provided by the NSPS, 40 CFR 60.47c(c).

3.5 Operational Limitations

a. Natural gas and distillate oil (including biodiesel) shall be the only fuels fired in the affected standby boilers.

b. The nominal rated heat input capacity of each affected standby boiler shall not exceed 62 mmBtu/hour.

c. The usage of distillate fuel oil by the affected standby boiler shall not exceed 152,800 gallons per year.

3.6 Emission Limitations

a. Short-term emissions from each affected standby boiler shall not exceed the following limits.

Pollutant	Natural Gas (Lbs/Hour)	Distillate Oil (Lbs/Hour)
NO_x	6.2	7.7
CO	6.2	9.2
$PM/PM_{10}/PM_{2.5}$	0.5	0.9/0.5/0.4
VOM	0.3	0.9
SO_2	0.1	3.1
Individual HAP[a]	0.15	0.45
Total HAP	0.3	0.9

[a] Individual HAP refers to individual pollutants, such as formaldehyde, benzene, toluene, hexane, etc. Individual HAP emission rate is conservatively assumed to be half of the VOM emission rate.

b. Annual emissions from the affected standby boilers shall not exceed the following limits, total.

Pollutant	Total Emissions (Tons/year)	
	After Project Shakedown Period	During Project Shakedown Period
NO_x	22.4	56.0
CO	22.8	57.0
$PM/PM_{10}/PM_{2.5}$	2.0	5.0
VOM	1.2	3.0
SO_2	1.6	4.0
Individual HAP	0.6	1.5
Total HAP	1.2	3.0

Note: Combined emissions from operation of the affected standby boilers and the gasifier-boiler systems are limited by Conditions 1.3(a) and (b).

3.7 Testing Requirements

a. The Permittee shall conduct initial performance test to determine compliance with the opacity standard of 40 CFR 60.43c(c) (see Condition 3.2(c)) pursuant to NSPS, 40 CFR 60.45c(a). This test shall be conducted while distillate oil is being fired in the affected standby boilers. The Permittee shall follow appropriate procedures of the NSPS for this test, including notification and reporting for the tests in accordance with 40 CFR 60.8.

b. The NO_x, CO, VOM, PM, and HAP emissions and opacity of the affected standby boilers shall be measured by an independent

testing service approved by the Illinois EPA, as follows, within 90 days after a written request from the Illinois EPA for such pollutants and/or opacity, as specified by the request.

i. At least 60 days prior to the actual date of initial performance testing, a written test plan shall be submitted to the Illinois EPA for review. This plan shall describe the specific procedures for testing and shall include as a minimum:

   A. The person(s) who will be performing sampling and analysis and their experience with similar tests.

   B. The specific conditions under which testing shall be performed including a discussion of why these conditions will be representative of maximum emissions and the means by which the operating parameters for the affected standby boilers will be tracked and recorded.

   C. The specific determinations of emissions that are intended to be made, including sampling and monitoring locations; the test method(s) that will be used, with the specific analysis method, if the method can be used with different analysis methods.

ii. The Illinois EPA shall be notified prior to these tests to enable the Illinois EPA to observe these tests. Notification of the expected date of testing shall be submitted a minimum of thirty (30) days prior to the expected date. Notification of the actual date and expected time of testing shall be submitted a minimum of five (5) working days prior to the actual date of the test. The Illinois EPA may, at its discretion, accept notifications with shorter advance notice provided that the Illinois EPA will not accept such notifications if it interferes with the Illinois EPA's ability to observe the testing.

iii. Three copies of the final reports for emission tests shall be forwarded to the Illinois EPA, Compliance Section within 30 days after the test results are compiled and finalized and no later than 60 days after the final day of emission testing. The final report from testing shall contain the following as a minimum:

   A. A summary of results.

   B. General information.

C. Description of test method(s), including description of sampling points, sampling train, analysis equipment, and test schedule.

D. Detailed description of test conditions, including:

I. Type of fuel fired.

II. Fuel consumption.

III. Firing rate (million Btu/hour).

E. Data and calculations, including copies of all raw data sheets and records of laboratory analyses, sample calculations, and data on equipment calibration.

3.8 Recordkeeping Requirements

a. The Permittee shall maintain a file of the following items:

i. A record of the maximum design heat input capacity of each affected standby boilers, mmBtu/hour, with supporting documentation.

ii. Heat content of the fuels (Btu/ft^3 or Btu/gallon) being fired, with supporting documentation.

iii. Records for all opacity measurements made in accordance with USEPA Method 9 for the affected standby boilers that it conducts or that are conducted on its behest by individuals who are qualified to make such observations. For each occasion on which such measurements are made, these records shall include the formal report for the measurements if conducted pursuant to Condition 3.7(a) or (b), or otherwise the identity of the observer, a description of the measurements that were made, the operating condition of the boiler, the observed opacity, and copies of the raw data sheets for the measurements.

b. An operating log or other records for the affected standby boilers that, at a minimum, shall include the following information:

i. Information for each startup and shutdown, including date, time and duration, as required by 40 CFR 60.7(b).

ii. Information for any incident in which the operation of the boiler continued during malfunction or breakdown, including: date, time, and duration; a description of the incident; whether emissions exceeded or may have exceeded any applicable standard; a description of the corrective.

actions taken to reduce emissions and the duration of the incident; and a description of the preventative actions taken, as addressed by 40 CFR 60.7(b).

iii. Information documenting that operation of the affected standby boilers complied with the operational restrictions of this permit.

iv. Information identifying any deviation from the fuel restriction in Condition 3.5.

c. The Permittee shall keep inspection, maintenance, and repair logs with dates and the nature of such activities for the affected standby boilers.

d. Pursuant to the NSPS, 40 CFR 60.48c, the Permittee shall keep records of the following information related to the oil supply and SO_2 emissions of the affected standby boilers:

i. Records of distillate oil supplier certification used to demonstrate compliance with SO_2 standard in Condition 3.2(b), including the information described under 40 CFR 60.48c(f)(1).

ii. Records for each shipment of distillate oil received for the affected standby boilers, including date, supplier, type of oil, quantity (in gallons), sulfur content in lbs/mmBtu (or data on maximum sulfur content and minimum heat content as guaranteed by the supplier, and the calculated sulfur content in lbs/mmBtu), and whether the SO_2 emission rate from the burning of such fuel would meet the SO_2 emission limit in Condition 3.3(a).

iii. A. Records for any period of time when the distillate oil fired in the affected standby boilers had a sulfur content that resulted in SO_2 emissions that exceeded the SO_2 emission limit in Condition 3.3(a) or 3.4(b), if applicable, and whether the hourly emission rate during such period exceeded the SO_2 limit of Condition 3.6(a), with explanation.

B. For the above incidents, a detailed explanation of the cause(s) of noncompliance with the emission standards and detailed description of corrective actions taken.

e. i. The Permittee shall keep records for the amount of each fuel used on a monthly basis in the affected standby boilers pursuant to 40 CFR 60.48c(g).

ii. The Permittee shall keep records of total fuel usage, in million scf equivalent per year, to show compliance with total fuel usage limit of Condition 3.5(c)(i).

f. The Permittee shall maintain the following records related to emissions from the affected standby boilers:

i. Other data, not addressed above, used or relied upon by the Permittee to determine emissions.

ii. A file containing calculations for the maximum hourly emission rates (lbs/hour), with supporting calculations.

iii. Monthly and annual emissions of NO_x, CO, $PM/PM_{10}/PM_{2.5}$, VOM, SO_2, and HAP emissions (tons/month and tons/year) with supporting data or calculations.

3.9 Deviation Reporting Requirements

If there is any deviation of the requirements of this permit, as determined by the records required by this permit or by other means, the Permittee shall promptly report to the Illinois EPA as specified below until such time the affected standby boilers are addressed by an operating permit.

a. Deviations from Conditions 3.2 through 3.6 shall be reported with the reports required by the NSPS.

b. Other deviations shall be reported within 30 days and include a description of the incident, a discussion of the probable cause of such deviation, a description of the corrective actions taken, and a description of the preventative measures taken.

4.0 Biomass Storage and Handling

4.1 Description

The affected units for the purpose of these unit-specific conditions are the facilities for handling biomass fuels, including receiving, transfer, screening and grinding, and storage operations. Operation of wood screening and grinding will be controlled by a baghouse.

Emissions of PM from affected units must be controlled by appropriate measures given the nature of the material. In particular, units handling dry materials must be enclosed and aspirated to control equipment. For receiving and storage of fuel, for which total enclosure is not practicable, measures must be used to very effectively reduce the generation of emissions.

4.2 Applicable Federal Emission Standards

None

4.3 Applicable State Emission Standards

a. The emission of smoke or other PM from the affected units shall not have an opacity greater than 30 percent, except as allowed by 35 IAC 212.124. Compliance with this limit shall be determined by 6-minute averages of opacity measurements in accordance with USEPA Reference Method 9. [35 IAC 212.109 and 212.123(a)]

b. With respect to emissions of fugitive PM, affected units shall comply with 35 IAC 212.301, which provides that emissions of fugitive PM shall not be visible from any process, including any material handling or storage activity, when looking generally toward the zenith at a point beyond the property line of the source, except when the wind speed exceeds 25 miles per hour, as provided by 35 IAC 212.314.

c. The emissions of PM from the affected units other than storage piles for biomass fuels and associated operations excluded by 35 IAC 212.323 (see Condition 4.4) shall comply with the applicable limit pursuant to 35 IAC 212.321, which rule limits emissions based on the process weight rate of emission units and allows a minimum emission rate of 0.55 lb/hour for any individual unit.

4.4 Non-Applicability of Regulations of Possible Concern

This permit is issued based on the storage piles for biomass fuel and associated operations not being subject to 35 IAC 212.321 pursuant to 35 IAC 212.323, which provides that 35 IAC 212.321 shall not apply to emission units, such as stock piles, to which, because of the disperse nature of such emission units, such rules cannot reasonably be applied.

4.5 Operating Requirements

a. PM emissions from handling of biomass fuel shall be controlled by application of water or other dust suppressants so as to minimize fugitive emissions to the extent practicable. For this purpose, there shall either:

i. Be no visible emissions from the affected unit, as determined in accordance with USEPA Method 22, or

ii. A nominal control efficiency of 80 percent shall be achieved from the uncontrolled emission rate, as follows, as determined using appropriate USEPA emission factors for particulate emissions from handling of material dry, in the absence of any control of emissions, and engineering analysis and calculations for the control measures that are actually present.

b. PM emissions from an affected unit handling a wet material shall be controlled by maintaining the material with adequate moisture to prevent visible emissions directly from such unit during the handling, storage or load out of the material. For this purpose, wet material is a material that has sufficient moisture during normal operation to minimize the potential for direct emissions.

4.6 Emission Limitations

Annual emissions of PM/PM_{10} from the affected units shall not exceed 1.5 ton/year. Compliance with this limit shall be calculated from the material handled and other, operating information for the affected units, and appropriate emission factors.

4.7-1 Emissions Testing

a. Upon written request by the Illinois EPA, the Permittee shall have emissions testing for particulate matter conducted at its expense by an approved testing service, which testing shall be completed within 90 calendar days of the request or on the date agreed upon by the Illinois EPA, whichever is later. Unless otherwise specified by this permit or a request from the Illinois EPA for the performance of emission testing, emission testing shall be conducted while affected unit(s) are operating at maximum rate(s) and during other representative operating conditions of the unit(s) and associated control system(s).

b. i. USEPA test methods and procedures shall be used for measurement of emissions, including the following methods, unless other methods are specified in unit-specific condition of this permit or are approved by the Illinois EPA as part of the approval of a test plan. Refer to 40 CFR 60, Appendix A and 40 CFR 51, Appendix M for USEPA test methods.

PM (Filterable)	Method 5
PM (Condensable)	Methods 5 or 202

Notes:

Unless otherwise specified, PM tests shall include measurements of condensable particulate, as collected in the back half of the Method 5 sampling train or by separate measurements using USEPA Method 202 (40 CFR Part 51, Appendix M). For emission units for which the average stack gas temperature is less than 250°F, testing may be conducted at actual stack gas temperature without heating of the probe or filter holders.

ii. During measurements of PM or PM_{10} emissions, observations of opacity shall also be conducted in accordance with USEPA Method 9.

4.7-2 Opacity Observations

a. Upon written request by the Illinois EPA, the Permittee shall conduct opacity observations for specific affected operation(s) or unit(s) within 45 calendar days of the request or on the date agreed upon by the Illinois EPA, whichever is later.

b. Opacity of emissions shall be determined during representative weather and operating conditions by a qualified observer in accordance with USEPA Test Method 9, as further specified below.

c. The duration of opacity observations for each test shall be at least 30 minutes (five 6-minute averages) unless the average opacities for the first 12 minutes of observations (two six-minute averages) are both no more than half of the most stringent requirement applying to opacity.

4.8 Inspections

a. i. The Permittee shall conduct inspections of affected units on at least a monthly basis with personnel who are not directly responsible for the day-to-day operation of these units, for the specific purpose of verifying that the measures identified in the operating program and other measures required to control emissions from affected units are being properly implemented.

ii. These inspections shall include observation for the presence of visible emissions, performed in accordance with USEPA Method 22, from buildings in which affected units are located and from units from which the Permittee has elected to demonstrate no visible emissions.

b. The Permittee shall perform detailed inspections of the dust collection equipment for the affected units while the units are out of service, with an initial inspection performed before any maintenance and repair activities are conducted during the period the unit is out of service and a follow-up inspection performed after any such activities are completed. These inspections shall be conducted at least every 15 months.

4.9 Recordkeeping

a. The Permittee shall maintain file(s), which shall be kept current, that contain:

i. The maximum operating capacity of each affected unit or group of related units (tons/hour).

ii. A. For the baghouse and other filter devices associated with affected units, design specifications for each device (type of unit, maximum design exhaust flow (acfm and scfm), filter area, type of filter cleaning, performance guarantee for particulate exhaust loading in gr/scf, etc.), the manufacturer's recommended operating and maintenance procedures for the device, and design specification for the filter material in each device (type of material, surface treatment(s) applied to material, weight, performance guarantee, warranty provisions, etc.).

B. For the baghouse, the normal range of pressure drop across the device and the minimum and maximum safe pressure drop for the device, with supporting documentation.

iii. For affected units that are not controlled by baghouse or other filter-type devices, a detailed description of the work practices used to control emissions of PM pursuant to Condition 4.5(b). These control measures are referred to as the "established control measures" in this subsection of this permit.

iv. The designated PM and PM_{10} emission rate, in pounds/hour and tons/year, from affected units, either individually or grouped by related units, with supporting calculations and documentation, including detailed documentation for the level of emissions control achieved through the work practices that are used to control PM emissions. The sum of these annual emission rates shall not exceed the limit in Condition 4.6.

b. The Permittee shall keep records for the amount of bulk materials received by or loaded out from the plant by category or type of material (tons/month).

c. i. The Permittee shall keep inspection and maintenance log(s) or other records for the control measures associated with the affected units, including buildings and enclosures, dust suppression systems and control devices.

ii. These records shall include the following information for the inspections required by Condition 4.8(a):

A. Date and time the inspection was performed and name(s) of inspection personnel.

B. The observed condition of the control measures for each affected unit, including the presence of any visible emissions.

C. A description of any maintenance or repair associated with established control measures that are recommended as a result of the inspection and a review of outstanding recommendations for maintenance or repair from previous inspection(s), i.e., whether recommended action has been taken, is yet to be performed or no longer appears to be required.

D. A summary of the observed implementation or status of actual control measures, as compared to the established control measures.

iii. These records shall include the following information for the inspections required by Condition 4.8(b):

A. Date and time the inspection was performed and name(s) of inspection personnel.

B. The observed condition of the dust collection equipment.

C. A summary of the maintenance and repair that is to be or was conducted on the equipment.

D. A description of any maintenance or repair that is recommended as a result of the inspection and a review of outstanding recommendations for maintenance or repair from previous inspection(s), i.e., whether recommended action has been taken, is yet to be performed or no longer appears to be required.

E. A summary of the observed condition of the equipment as related to its ability to reliably and effectively control emissions.

d. The Permittee shall maintain records of the following for each incident when any affected unit operated without the control measures required by Condition 4.5(b):

i. The date of the incident and identification of the unit(s) that were involved.

ii. A description of the incident, including: the established control measures that were not present or implemented; the established control measures that were present, if any; and other control measures or mitigation measures that were implemented, if any.

iii. The time at and means by which the incident was identified, e.g., scheduled inspection or observation by operating personnel.

iv. The corrective action(s) taken and the length of time after the incident was identified that the unit(s) continued to operate before established control measures were in place or the operations were shutdown (to resume operation only after established control measures were in place) and, if this time was more than one hour, an explanation why this time was not shorter, including a detailed description of any mitigation measures that were implemented during the incident.

v. The estimated total duration of the incident, i.e., the total length of time that the unit(s) ran without established control measures and the estimated amount of material processed during the incident.

vi. A discussion of the probable cause of the incident and any preventative measures taken.

vii. An estimate of any additional emissions of PM or PM_{10} (pounds) above the emissions associated with normal operation that resulted from the incident, if any, with supporting calculations.

viii. A discussion whether any applicable emission standard, as listed in Condition 4.3, or any applicable emission rate, as identified in the records pursuant to Condition 4.9(a), may have been violated during the incident, with an estimate of the amount of any excess PM emissions (lbs) and supporting explanation.

e. The Permittee shall maintain the following records for the emissions of the affected units:

i. A file containing the standard emission factors used by the Permittee to determine PM emissions from the units, with supporting documentation.

ii. Records of PM and PM_{10} emissions based on operating data for the unit(s) and appropriate emission factors, with supporting documentation and calculations.

4.10 Deviation Reporting

If there is any deviation of the requirements of this permit, as determined by the records required by this permit or by other means, the Permittee shall promptly report to the Illinois EPA as specified below until such time the affected standby boilers are addressed by an operating permit.

a. Deviations from Conditions 4.3, 4.5 and 4.6 shall be reported with the reports required by Condition 2.9-1(a)(i) or 3.9(a) of this permit.

b. Other deviations shall be reported within 30 days and include a description of the incident, a discussion of the probable cause of such deviation, a description of the corrective actions taken, and a description of the preventative measures taken.

5.0 Fly Ash Handling

5.1 Description

The affected units are all fly ash handling, transfer and storage units. Ash collected from the affected gasifier-boiler units will be stored at the facility pending shipment off-site.

5.2 Applicable Federal Emission Standards

None

5.3 Applicable State Emission Standards

a. The emission of smoke or other PM from the affected units shall not have an opacity greater than 30 percent, except as allowed by 35 IAC 212.124. Compliance with this limit shall be determined by 6-minute averages of opacity measurements in accordance with USEPA Reference Method 9. [35 IAC 212.109 and 212.123(a)]

b. With respect to emissions of fugitive PM, affected units shall comply with 35 IAC 212.301, which provides that emissions of fugitive PM shall not be visible from any process, including any material handling or storage activity, when looking generally toward the zenith at a point beyond the property line of the source, except when the wind speed exceeds 25 miles per hour, as provided by 35 IAC 212.314.

c. The emissions of PM from the affected units shall comply with the applicable limit pursuant to 35 IAC 212.321, which rule limits emissions based on the process weight rate of emission units and allows a minimum emission rate of 0.55 lb/hour for any individual unit.

5.4 Operating Requirements

There shall be no visible emissions, as determined in accordance with USEPA Method 22, from the affected units.

5.5 Emission Limitations

Annual emissions of PM/PM_{10} from the affected units shall not exceed 0.3 ton/year. Compliance with this limit shall be calculated from the material handled and other, operating information for the affected units, and appropriate emission factors.

5.6 Inspections

a. i. The Permittee shall conduct inspections of affected units on at least a monthly basis with personnel who are not directly responsible for the day-to-day operation of these units, for the specific purpose of verifying measures required to control emissions from affected units are being properly implemented.

ii. These inspections shall include observation for the presence of visible emissions, performed in accordance with USEPA Method 22, from buildings in which affected units are located and from units from which the Permittee has elected to demonstrate no visible emissions.

5.7 Recordkeeping

a. The Permittee shall keep records for the amount of bulk materials loaded out from the plant by category or type of material (tons/month).

b. i. The Permittee shall keep inspection and maintenance log(s) or other records for the control measures associated with the affected units, including buildings and enclosures, dust suppression systems and control devices, if any.

ii. These records shall include the following information for the inspections required by Condition 5.6(a):

A. Date and time the inspection was performed and name(s) of inspection personnel.

B. The observed condition of the control measures for each affected unit, including the presence of any visible emissions.

C. A description of any maintenance or repair associated with established control measures that are recommended as a result of the inspection and a review of outstanding recommendations for maintenance or repair from previous inspection(s), i.e., whether recommended action has been taken, is yet to be performed or no longer appears to be required.

D. A summary of the observed implementation or status of actual control measures, as compared to the established control measures.

c. The Permittee shall maintain the following records for the emissions of the affected units:

i. A file containing the standard emission factors used by the Permittee to determine PM emissions from the units, with supporting documentation.

ii. Records of PM and PM_{10} emissions based on operating data for the unit(s) and appropriate emission factors, with supporting documentation and calculations.

5.8 Deviation Reporting

If there is any deviation of the requirements of this permit, as determined by the records required by this permit or by other means, the Permittee shall promptly report to the Illinois EPA as specified below until such time the affected standby boilers are addressed by an operating permit.

a. Deviations from Conditions 5.3 through 5.5 shall be reported with the reports required by Condition 2.9-1(a)(i) or 3.9(a) of this permit.

b. Other deviations shall be reported within 30 days and include a description of the incident, a discussion of the probable cause of such deviation, a description of the corrective actions taken, and a description of the preventative measures taken.

6.0 Roadways and Other Open Areas

6.1 Description of Emission Units

The affected units for the purpose of these unit-specific conditions are roadways, parking areas, and other open areas associated with the operation of the Renewable Energy Center facility, which may be sources of fugitive particulate matter due to vehicle traffic or windblown dust. These emissions are controlled by paving and implementation of work practices to prevent the generation and emissions of particulate matter.

6.2 Control Measures

a. Good air pollution control practices shall be implemented to minimize dust emissions from affected units. After construction of the plant is complete, these practices shall provide for treatment (flushing, vacuuming, dust suppressant application, etc.) of roadways and areas that are routinely subject to vehicle traffic as necessary to prevent nuisance dust.

b. The handling of material collected from any affected unit associated with the plant by sweeping or vacuuming trucks shall be enclosed or shall utilize spraying, pelletizing, screw conveying or other equivalent methods to control PM emissions.

6.3 Applicable State Emission Standards

All affected units shall comply with 35 IAC 212.301, which provides that emissions of fugitive particulate matter shall not be visible from any process, including material handling or storage activity, when looking generally toward the zenith at a point beyond the property line of the source, except when the wind speed is greater than 25 miles per hour, as provided by 35 IAC 212.314.

6.4 Non-Applicability of Regulations of Concern

The emissions from affected units are not used to determine PSD applicability because they are considered fugitive emissions and the source is not in one of the source categories listed in 40 CFR 52.21(b)(1)(iii).

6.5 Operational and Production Limits and Work Practices

Upon request of the Illinois EPA, the Permittee shall carry out control of fugitive particulate matter emissions from affected units in accordance with a written operating program describing the measures being implemented in accordance with Condition 6.2 to control emissions at each unit with the potential to generate significant quantities of such emissions, which program shall be kept current.

a. The written operating program shall include:

i. Good air pollution control practices shall be implemented to minimize dust emissions from affected units. These practices shall provide for pavement on all regularly traveled roads and treatment (flushing, vacuuming, dust suppressant application, etc.) of paved and unpaved roadways and areas that are routinely subject to vehicle traffic for very effective and effective control of dust, respectively (nominal 90 percent control for paved roads and areas and 85 percent control for unpaved roads and areas).

ii. For this purpose, roads that serve the office building, employee parking areas or are used on a daily basis by operating and maintenance personnel for the source in the course of their typical duties shall all be considered to be subject to regular travel and are required to be paved. Regularly traveled roads shall be considered to be subject to routine vehicle traffic except as they are used

primarily for periodic maintenance and are currently inactive or as traffic has been temporarily blocked off. Other roads shall be considered to be routinely traveled if activities are occurring such that they are experiencing significant vehicle traffic.

b. Upon request of the Illinois EPA, the Permittee shall submit copies of the written operating program to the Illinois EPA for review.

c. A revised operating program shall be submitted to the Illinois EPA for review within 90 days of a request from the Illinois EPA for revision to address observed deficiencies in control of fugitive particulate matter emissions.

6.6 Emission Limitations

The emissions of PM from affected units, as PM_{10}, shall not exceed 0.3 ton/year. Compliance with these limits shall be determined by appropriate emission factors and engineering calculations.

6.7 Opacity Observations

None

6.8 Inspection Requirements

The Permittee shall conduct inspections of affected units on at least a monthly basis with personnel not directly responsible for the day-to-day implementation of the fugitive dust control program, for the specific purpose of verifying that the measures identified in the operating program and other measures required to control emissions from affected units are being properly implemented.

6.9 Records

a. The Permittee shall keep a file that contains:

i. The operating factors, if any, used to determine the amount of activity associated with the affected units or the PM emissions from the affected units, with supporting documentation.

ii. The designated PM emission rate, in ton/year, from each category of affected units (e.g., traffic associated with receiving of wood), with supporting calculations and documentation. The sum of these rates shall not exceed the annual limit on emissions in Condition 6.6.

b. The Permittee shall maintain records documenting implementation of the operating program required by Condition 6.5, including:

i. Records for each treatment of an affected unit or units:

A. The identity of the affected unit(s), the date and time, and the identification of the truck(s) or treatment equipment used.

B. For application of dust suppressant by truck: target application rate or truck speed during application, total quantity of water or chemical used and, for application of a chemical or chemical solution, the identity of the chemical and concentration, if applicable.

C. For sweeping or cleaning: Identity of equipment used and identification of any deficiencies in the condition of equipment.

D. For other type of treatment: A description of the action that was taken.

ii. Records for each incident when control measures were not implemented and each incident when additional control measures were implemented due to particular activities, including description, date, a statement of explanation, and expected duration of such circumstances.

c. The Permittee shall record any period during which an affected unit was not properly controlled as required by this permit, which records shall include at least the following information: the date, time and estimated duration of the event; a description of the event; the applicable requirement(s) that were not met; the manner in which the event was identified, if not readily apparent; the probable cause for deviation, if known, including a description of any equipment malfunction/breakdown associated with the event; information on the magnitude of the deviation, including actual emissions or performance in terms of the applicable standard if measured or readily estimated; confirmation that standard procedures were followed or a description of any event-specific corrective actions taken; and a description of any preventative measures taken to prevent future occurrences, if appropriate; and an estimate of the additional PM emissions that resulted, if any, with supporting calculations.

d. The Permittee shall maintain records for the PM emissions of the affected units to verify compliance with the limits in Condition 6.6, based on operating data for the affected units and other activities at the plant (the above records for the affected units include data for implementation of the operating program, and appropriate USEPA emission estimation methodology and emission factors, with supporting calculations).

6.10 Reporting Requirements

a. The Permittee shall submit quarterly reports to the Illinois EPA for affected units stating the following: the dates any necessary control measures were not implemented; a listing of those control measures; the reasons that the control measures were not implemented; and any corrective actions taken. This information includes, but is not limited to, those dates when controls were not implemented based on a belief that implementation of such control measures would have been unreasonable given prevailing weather conditions.

b. The Permittee shall notify the Illinois EPA of deviations from applicable requirements for affected units. These notifications shall include the information specified by Condition 6.9(c) and be submitted with the reports required by Condition 6.10(a).

If you have any questions on this, please call Manish Patel at 217/782-2113.

Edwin C. Bakowski

Edwin C. Bakowski, P.E.
Manager, Permit Section
Division of Air Pollution Control

Date Signed: November 6, 2009

ECB:MNP:psj

cc: FOS - Region 3, Illinois EPA
CAAPP Permit File, Illinois EPA