STATE OF MAINE
DEPARTMENT OF ENVIRONMENTAL PROTECTION
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DEPARTMENT ORDER

Standard Biocarbon Corporation **Penobscot County** **East Millinocket, Maine** **A-1158-71-A-N**	**Departmental** **Findings of Fact and Order** **Air Emission License**

FINDINGS OF FACT

After review of the air emission license application, staff investigation reports, and other documents in the applicant's file in the Bureau of Air Quality, pursuant to 38 Maine Revised Statutes (M.R.S.) § 344 and § 590, the Maine Department of Environmental Protection (Department) finds the following facts:

I. REGISTRATION

A. Introduction

Standard Biocarbon Corporation (SBC) has applied for an Air Emission License for the operation of emission sources associated with their new biocarbon (also called biochar) production and distribution facility.

SBC is proposing to build, own, and operate a new biocarbon (biochar) production and distribution facility to be located at the site of the former Great Northern Paper Mill (GNP) in East Millinocket, Maine. Biochar is produced by the pyrolysis of biomass in the absence of oxygen, also known as "carbonization," yielding a stable, porous material that is comprised of nearly pure carbon. Biochar can be used as an animal feed additive, as an industrial filling additive, or as a soil amendment, which is the anticipated market for biochar produced by SBC. As a soil amendment, biochar improves the quality of soil through enhanced storage of nutrients and water in the humus layer, reducing the need for fertilizers. Once operating at design capacity, SBC will be the largest producer of biochar on the East Coast and one of the largest producers in North America.

The equipment addressed in this license is located at 50 Main Street, East Millinocket, Maine.

SBC plans to install PYREG Carbon Technology units in a renovated warehouse (formerly GNP's paper warehouse) in spring of 2022 with initial startup of PYREG units 1 and 2 occurring in the first and/or second quarter of 2022. Installation and startup of PYREG units 3 and 4 is anticipated in the latter part of 2022.

B. Title, Right, or Interest

In SBC's Chapter 115 Air Emission License Application (Appendix D), the facility submitted copies of a 20-year-lease of the property demonstrating interest in the property.

SBC has provided sufficient evidence of title, right, or interest in the facility for purposes of this air emission license.

C. Emission Equipment

The following equipment is addressed in this air emission license:

Fuel Burning Equipment

Equipment	Max. Capacity (MMBtu/hr)	Maximum Firing Rate	Fuel Type, % sulfur	Date of Manuf.	Date of Install.	Stack #
PYREG Unit #1	5.2	~1,370 lb/hr	Syngas (negligible %S)	2022	2022	#1
	1.4 (Startup only)	15.3 gph	Propane (negligible %S)			
PYREG Unit #2	5.2	~1,370 lb/hr	Syngas (negligible %S)	2022	2022	#2
	1.4 (Startup only)	15.3 gph	Propane (negligible %S)			
PYREG Unit #3	5.2	~1,370 lb/hr	Syngas (negligible %S)	2022	2022	#3
	1.4 (Startup only)	15.3 gph	Propane (negligible %S)			
PYREG Unit #4	5.2	~1,370 lb/hr	Syngas (negligible %S)	2022	2022	#4
	1.4 (Startup only)	15.3 gph	Propane (negligible %S)			

SBC may also operate stationary engines smaller than 0.5 MMBtu/hr. These engines are considered insignificant activities and are not required to be included in this license. However, they are still subject to applicable State and Federal regulations. More information regarding requirements for small stationary engines is available on the Department's website at the link below.

http://www.maine.gov/dep/air/publications/docs/SmallRICEGuidance.pdf

Additionally, SBC may operate portable engines used for maintenance or emergency-only purposes. These engines are considered insignificant activities and are not required to be included in this license. However, they may still be subject to applicable State and Federal regulations.

D. Definitions

Biomass means any biomass-based solid fuel that is not a solid waste. This includes, but is not limited to, wood residue and wood products (*e.g.*, trees, tree stumps, tree limbs, bark, lumber, sawdust, sander dust, chips, scraps, slabs, millings, and shavings). This definition also includes wood chips and processed pellets made from wood or other forest residues. Inclusion in this definition does not constitute a determination that the material is not considered a solid waste. SBC should consult with the Department before adding any new biomass type to its fuel mix.

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Records or *Logs* mean either hardcopy or electronic records.

Torrified means to dry by using intense heat.

TPY means tons per year.

E. Application Classification

All rules, regulations, or statutes referenced in this air emission license refer to the amended version in effect as of the date this license was issued.

A new source is considered a major source based on whether or not total licensed annual emissions exceed the "Significant Emission" levels as defined in the Department's *Definitions Regulation*, 06-096 Code of Maine Rules (C.M.R.) ch. 100.

Pollutant	Total Licensed Annual Emissions (TPY)	Significant Emission Levels
PM	10.9	100
PM_{10}	10.9	100
$PM_{2.5}$	10.9	100
SO_2	0.2	100
NO_x	20.0	100
CO	7.5	100
VOC	0.5	50

The Department has determined the facility is a minor source, and the application has been processed through *Major and Minor Source Air Emission License Regulations*, 06-096 C.M.R. ch. 115.

F. Facility Classification

The facility is licensed as follows:

- As a natural minor source of air emissions, because no license restrictions are necessary to keep facility emissions below major source thresholds for criteria pollutants; and
- As an area source of hazardous air pollutants (HAP), because the licensed emissions are below the major source thresholds for HAP.

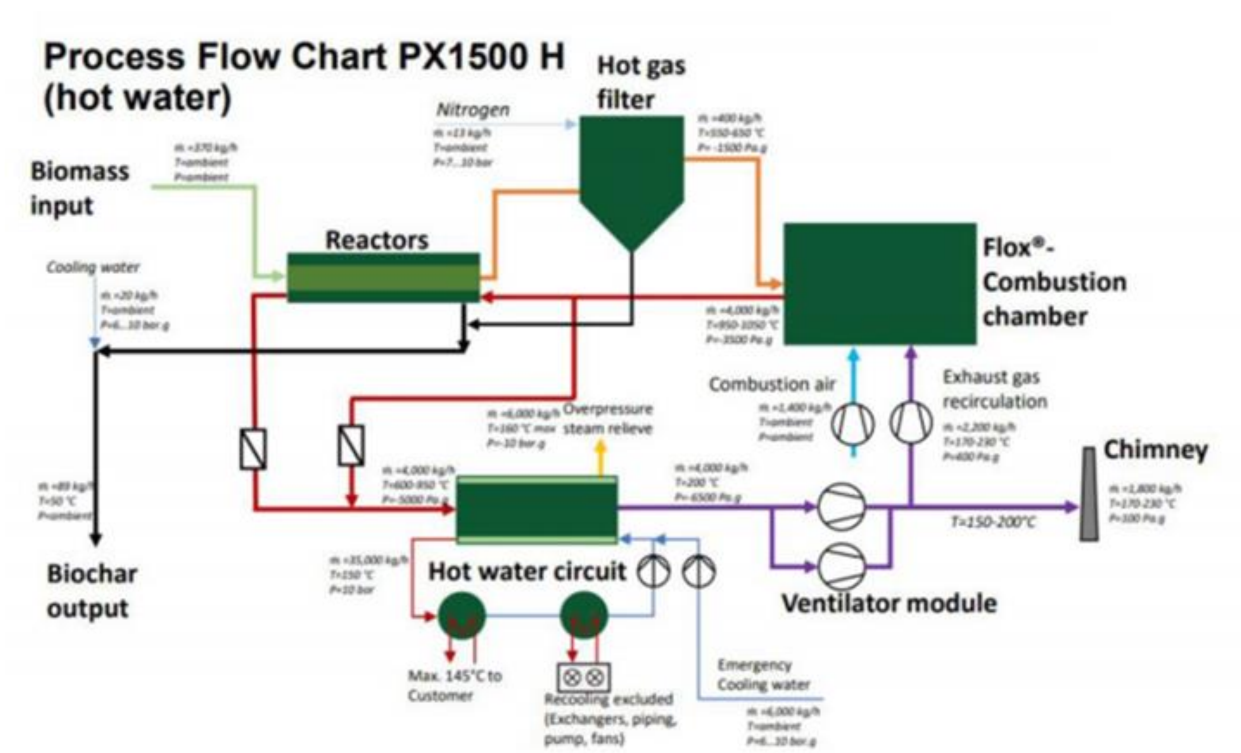
II. BEST PRACTICAL TREATMENT (BPT)

A. Introduction

In order to receive a license, the applicant must control emissions from each unit to a level considered by the Department to represent Best Practical Treatment (BPT), as defined in *Definitions Regulation*, 06-096 C.M.R. ch. 100. Separate control requirement categories exist for new and existing equipment.

BPT for new sources and modifications requires a demonstration that emissions are receiving Best Available Control Technology (BACT), as defined in *Definitions Regulation*, 06-096 C.M.R. ch. 100. BACT is a top-down approach to selecting air emission controls considering economic, environmental, and energy impacts.

B. Process Description



The proposed layout of the facility is depicted in the figure above with emission units and emission points identified. Dry woodchips (approximately 20% moisture) will be delivered to the SBC facility in live-floor containers which will be located outside the Paper Warehouse. Each container will hold approximately 300 cubic yards of woodchips which will be fed onto covered conveyors that will transfer the woodchips to the Train Shed. Within the Train Shed, the woodchips will undergo grinding and screening to appropriately size the material for the biochar production process. Following screening, woodchips will be conveyed to the Paper Warehouse to be processed in one of four (4) PYREG carbonization units, each capable of converting approximately 3,000 TPY of woodchips into 750 TPY of biochar. All four carbonization units combined will process up to 12,000 TPY (approximately 33 tons per day) of woodchips, producing 3,000 TPY (approximately 8 tons per day) of biochar. The final biochar product will be cooled, bagged, and stored for transport. Each PYREG unit shall exhaust through its own stack having a height of at least 60 feet above ground level (AGL).

PYREG Reactors

Woodchips are continuously fed via screw conveyor through the PYREG reactor where the biomass is slowly heated, degassed, and carbonized via pyrolysis at temperatures of 930 to 1,300 degrees Fahrenheit (^oF). Pyrolysis produces a solid (biochar) and vaporized organic compounds and water. The process is conducted in an oxygen-starved environment.

As the temperature within the PYREG reactor increases, moisture in the biomass evaporates and the woodchips begin to soften, releasing chemically bound water and small amounts of carbon dioxide (CO_2) and volatile organic compounds (VOC). As the woodchips are further heated to 390 to 530 ^oF, the chips become torrefied as chemical bonds within the biomass begin to break, releasing methane (CH_4), VOC, CO_2, and carbon monoxide (CO) from the breakdown of cellulose and hemicellulose. As temperatures approach 570 ^oF, further thermal decomposition of the biomass occurs, releasing a combustible mixture of hydrogen (H_2), CO, CH_4, CO_2, and other hydrocarbons and tars. At this point in the process, the biochar created contains appreciable amounts of VOC, and further heating up to 1,100 ^oF is required to increase the stable carbon content, surface area, and porosity of the char by decomposing more of the volatile organics. Once the temperature reaches 1,300 ^oF, more volatile organics are released, increasing the carbon content of the biochar to approximately 90 percent.

Syngas

The synthesis gas, or syngas, is the collection of gases generated in the PYREG reactors containing primarily CO, CO_2, H_2, nitrogen (N_2) from small amounts of air that enters into the PYREG reactor with the woodchips, water vapor, and less than 10 percent by volume of short-chained hydrocarbons (such as methane, ethane, propane, and butane) that add calorific value. The higher heating value of the syngas is approximately 3,800 Btu/lb.

Hot Gas Filter

Upon exiting the PYREG reactor, the syngas is filtered in the hot gas filter. The hot gas filter is a vessel with two chambers. In each chamber are hundreds of filter elements/cartridges made of a rigid body coated with a membrane designed to withstand the high temperature of the syngas (approximately 1,000 ^oF to 1,200 ^oF). Membrane filters are different from traditional fabric filters in that filterable particulate matter (PM) is collected on the membrane surface and there is no reliance on a filter cake to drive efficiency. Instead, the membrane acts as the primary filter cake which inhibits the migration of smaller particles into the filter material and improves filter cake release during backflow cleaning.

At a specific pressure drop across the chamber, the pyrolysis gases are routed through the second chamber while the first chamber is purged with nitrogen. The pressure vessel filter utilizes a pulse jet backflow cleaning system which removes particulate matter from the surface of the membrane filters with bursts of compressed nitrogen. The duration of the pulse of compressed nitrogen is within the range of 100 to 200 microseconds, and filter cartridges are cleaned individually which facilitates continuous operations. It is expected that the filter elements in the hot gas filter system may require replacement every 4-5 years. PYREG estimates that the pressure vessel membrane filter removes 99 percent of pre-combustion PM including filterable particulate matter less than 2.5 microns in diameter ($PM_{2.5}$).

FLOX Combustion Chamber

Once filtered, the syngas enters the combustion chamber which utilizes a 5.2 MMBtu/hr FLOX (flameless oxidation) burner. In FLOX burners, the fuel gases/syngas and combustion air are vigorously mixed prior to the onset of flame reactions. This leads to a homogenous temperature distribution within the chamber and reduced peak temperature zones, minimizing the formation of thermal NO_x. The combustion chamber also includes a separate 1.4 MMBtu/hr propane burner that will be utilized upon startup of the unit until the process can operate autothermally.

C. PYREG Units #1 - #4: BACT Findings

1. RACT/BACT/LAER Clearinghouse BACT Control Review

Potentially applicable emission control technologies for gaseous and biomass combustion units were identified by researching technical literature, control equipment vendor information, the U.S. EPA's RACT/BACT/LAER Clearinghouse (RBLC), state administered BACT databases, and air emission licenses recently issued by the Department. A search of the RBLC database for emission sources comparable to the PYREG carbonization units was conducted; however, there were no emission sources in the database that were comparable to these units. The majority of gasification and pyrolysis processes included in the database were either much larger in scale (greater than 100 MMBtu/hr) or were employed in coal gasification or biosolids (i.e., municipal sewage sludge) gasification which utilize feed stocks with a vastly different pollutant loading than the woodchips proposed for use by SBC.

There are several PYREG units in operation in Europe and one demonstration unit in operation at the Silicon Valley Clean Water Facility (SVCWF) in Redwood, California; however, the results of emissions testing on the SVCWF unit were not available. In addition, the PYREG unit in operation at the SVCWF utilizes sewage sludge as a feedstock, not biomass. Of the PYREG units in operation in Europe, SBC was able to obtain emissions testing results from three PYREG PX500 units located in Dorth, Germany and used these results to inform proposed BACT emission limits and the potential to emit (PTE) calculations of each unit.

2. BACT Findings for Syngas/Biogas Combustion Controls

a. Particulate Matter (PM, PM_{10})

Particulate matter (PM) is formed as a product of incomplete combustion and is categorized as either filterable or condensable. Filterable particulate matter emissions are generally considered to be the particles that are trapped by the glass fiber filter in the front half of a Reference Method 5 or Method 17 sampling train. Filterable particulate matter with an aerodynamic diameter smaller than 100 micrometers measured in accordance with these reference methods is a regulated pollutant known simply as PM. Condensable particulate matter is material that is emitted in the vapor state which later condenses to form homogeneous and/or heterogeneous aerosol particles. PM_{10} is a regulated form of particulate matter that is less than 10 micrometers in aerodynamic diameter and includes both filterable and condensable particulate matter. $PM_{2.5}$ also includes both filterable and condensable particulate matter with an aerodynamic diameter less than 2.5 micrometers.

PM emissions can be controlled by add-on technologies such as baghouses/fabric filters, membrane filters, electrostatic precipitators, wet scrubbers, and multicyclones. A description of each control technology and the feasibility determination are summarized in the subsequent sections.

(1) Fabric Filters (Baghouses)
Baghouses (i.e., fabric filters) consist of a number of fabric bags placed in parallel that collect PM on the surface of the bag as the exhaust stream passes through the fabric membrane. The collected particulate is periodically dislodged from the bags' surfaces to collection hoppers via short blasts of high-pressure air (pulsejet), physical agitation of the bags, or by reversing gas flow. Baghouse systems are capable of PM collection efficiencies greater than 99 percent. A fabric filter/baghouse is a technically feasible option for control of PM from the PYREG carbonization units.

(2) Membrane Filters
Membrane filters are different from traditional fabric filters in that filterable PM is collected on the membrane surface and there is no reliance on a filter cake to drive efficiency. Instead, the membrane acts as the primary filter cake which inhibits the migration of smaller particles into the filter material and improves filter cake release during backflow cleaning. The pressure vessel filter

utilizes a pulse jet backflow cleaning system which removes particulate matter from the surface of the membrane filters with bursts of compressed air. The duration of the pulse of compressed air is within the range of 100 to 200 microseconds and filter cartridges are cleaned individually which facilitates continuous operations. In addition, due to the high temperature of the hot syngas stream, the membrane filter elements are made from a coarse, porous body of ceramically bonded silicon carbide, which adds mechanical stability. PYREG estimates that the pressure vessel membrane filter removes 99 percent of PM including filterable particulate matter less than 2.5 microns in diameter ($PM_{2.5}$).

(3) Dry and Wet Electrostatic Precipitators (ESP)

An ESP removes filterable PM (PM-fil) from a gas stream through the use of electric fields. The incoming exhaust gas is ionized, which negatively charges the filterable PM and causes it to be attracted to and collected on positively charged plates. In a dry ESP, the plates are rapped at preset intervals to mechanically dislodge the PM, which is then collected for disposal. In a wet ESP, the collectors are either intermittently or continuously washed by a spray of liquid, usually water, with a drainage system instead of collection hoppers. Collection efficiency is affected by several factors including dust resistivity (for dry ESPs), gas temperature, chemical composition (of the dust and gas), and particle size distribution. PM-fil removal efficiencies of 99+ percent of total PM-fil and up to 98 percent is achievable for PM in the range of 0 to 5 microns. Dry and wet ESP technology are technically feasible options for control of PM from the PYREG carbonization units.

(4) Wet Scrubbers

Wet scrubbers remove PM from gas streams primarily through impaction. To a lesser extent, other mechanisms such as interception and diffusion help to remove PM as well. A scrubbing liquid, typically water, is sprayed countercurrent to the exhaust gas stream. Contact between the larger scrubbing liquid droplets and the suspended particulate removes the PM from the gas stream. Entrained liquid droplets pass through a mist eliminator (coalescing filter) which causes the droplets to become heavier and fall out. Wet scrubbers have typical removal efficiencies of 90 to 99 percent for emissions of PM_{10} and significantly lower removal efficiencies for $PM_{2.5}$ (as low as 50 percent for spray tower scrubbers). High-efficiency scrubbers such as venturi scrubbers can be used to achieve removal efficiencies for $PM_{2.5}$ of greater than 99 percent due to the high velocities and pressure drops at which they operate. A wet scrubber is a technically feasible option for control of PM from the PYREG carbonization units.

(5) Mechanical Separators (Cyclones)

Mechanical separators include cyclonic and inertial separators. In a cyclone, centrifugal force separates larger PM from the gas stream. The exhaust gas enters a cylindrical chamber on a tangential path and is forced along the outside wall of the chamber at a high velocity causing the PM to impact collectors on the outer wall of the unit and fall into a hopper for collection. Multi-cyclones are smaller diameter cyclone units operating in parallel or in series and designed to achieve high efficiency PM collection using the same operational principles as the single cyclone. Mechanical separators have a typical removal efficiency of 40 to 90 percent for PM_{10} and 0 to 40 percent for $PM_{2.5}$. Mechanical separators are a technically feasible option for control of PM from the PYREG carbonization units.

Selection of BACT for Particulate Matter (PM, PM_{10})

SBC proposes to use a hot gas filter equipped with pressure membrane filters to reduce emissions of PM and PM_{10} in the syngas stream to the combustion chamber to protect the combustion chamber and downstream equipment from particle erosion.

With the exception of multicyclones, the emission limit and control technology review did not identify any similar sized natural gas or biomass fired combustion units that employ add-on control technology to reduce emissions of PM. SBC proposes the use of a pulse jet pressure membrane filter vessel to reduce PM emissions in the syngas stream to the combustion chamber in order to meet a PM and PM_{10} emission limit of 0.12 lb/MMBtu, consistent with PM emission limits from other biomass combustion units utilizing PM controls (multicyclone). These emission limits were demonstrated to be achievable based on emissions testing of similar PYREG units combusting woodchips as fuel.

Fuel Burning Equipment Particulate Emission Standard, 06-096 C.M.R. ch. 103, applies to all fuel burning equipment that has a rated heat input capacity of 3 MMBtu per hour or greater which includes the four PYREG carbonization units. In accordance with this rule, the PYREG units are subject to a PM limit of 0.12 lb/MMBtu for gas-fired sources less than 50 MMBtu/hr.

The Department finds that BACT for emissions of PM and PM_{10} is the use of a hot gas filter equipped with pressure membrane filters and emission limits of 0.62 lb/hr for PM/PM_{10} (based on 0.12 lb/MMBtu).

b. Sulfur Dioxide Emissions

Sulfur dioxide (SO_2) is formed from sulfur inherent in the fuel used during combustion. The quantity of SO_2 released is entirely dependent upon the sulfur content of the fuel and is independent of the combustion unit size or design. The gaseous fuel that will be used by the PYREG carbonization units is derived from woodchips which have an inherently low sulfur content.

SBC proposes the use of biomass derived syngas as BACT. Based on U.S. EPA AP-42 Table 1.4-1, SBC proposes meeting a BACT emission limit of 0.01 lb/hr which was demonstrated to be achievable based on emissions testing of similar PYREG units combusting woodchips as fuel.

The Department finds that BACT for SO_2 emissions is the use of biomass derived syngas and an emission limit of 0.01 lb/hr.

c. Nitrogen Oxides (NO_x)

Nitrogen oxides (NO_x) are a product of combustion. NO_x is generated in one of three mechanisms: fuel NO_x, thermal NO_x, and prompt NO_x. Fuel NO_x is produced by oxidation of nitrogen in the fuel source. Combustion of fuels with high nitrogen content produce greater amounts of NO_x than those with lower nitrogen content such as gaseous fuels. The results of a study published in the May 2013 edition of *Fuel* concluded that "*When compared to natural gas, syngas from (both) woody feedstock generates higher NO_x emissions even when the heat rates are comparable, indicating that fuel NO_x formation is highly important in biomass-derived syngas combustion.*[1]" Thermal NO_x forms in the high temperature area of the combustor. Thermal NO_x increases exponentially with increases in flame temperature and linearly with increases in residence time. Flame temperature is dependent upon the ratio of fuel burned in a flame to the amount of fuel that consumes all the available oxygen, also known as the equivalence ratio. By maintaining a low fuel ratio (lean combustion), the flame temperature will be lower, thus reducing the potential for thermal NO_x formation. In most modern burner designs, the high temperature combustion gases are cooled to an acceptable temperature with dilution air. The sooner this cooling occurs, the lower the thermal NO_x formation. Prompt NO_x forms from the oxidation of hydrocarbon radicals near the combustion flame and produces an insignificant amount of NO_x.

Based on the emission limit and controls review, there are several potential control technologies for NO_x emissions from gaseous and wood fuel combustion including add-on controls such as selective catalytic reduction (SCR) and selective non-catalytic reduction (SNCR); combustion control techniques such as staged combustion, low excess air firing, and flue gas recirculation; and combustion of clean fuels. A description of each control technology and the feasibility determination are summarized in the subsequent sections.

(1) Selective Catalytic Reduction

The Selective Catalytic Reduction (SCR) process employs the reaction of NO_x with ammonia in the presence of a catalyst to produce nitrogen and water. The

[1] Cuong Van Huynh, Song-Charng Kong, "Combustion and NOx Emissions of Biomass-derived Syngas Under Various Gasification Conditions Utilizing Oxygen-enriched Air and Steam," *Fuel* Volume 107, May 2013, Pages 455-464.

reduction is considered "selective" because the catalyst selectively targets NO_x reduction in the presence of ammonia within a temperature range of approximately 480 ºF to 800 ºF. One mole of ammonia is required to reduce one mole of NO, and two moles are required to reduce one mole of NO_2 as shown in the following reactions:

$$4NO + 4NH_3 + O_2 \rightarrow 4N_2 + 6H_2O$$
$$2NO_2 + 4NH_3 + O_2 \rightarrow 3N_2 + 6H_2O$$

An SCR system requires a reactor vessel, a catalyst, and an ammonia or urea storage and injection system. As a toxic substance, the storage of anhydrous ammonia above certain quantities requires the development of a Risk Management Plan (RMP) and imposes a risk of release of ammonia. Many facilities, however, choose to use aqueous ammonia (19.5%) or urea-based systems to minimize the risk of release to the environment. Aqueous ammonia systems are typically more expensive to operate on an ongoing basis than anhydrous ammonia systems due to the cost of water being transported along with the ammonia and due to the energy required to vaporize the water. Urea systems require higher capital costs due to the additional infrastructure required to convert dry-delivered urea to liquid-urea and for the reactor needed to convert the liquid urea to ammonia.

While an SCR system is a technically feasible option to control NO_x emissions from the PYREG carbonization units, it is not an economically feasible option given the relatively low design heat input capacity of each unit. The U.S.EPA Air Pollution Control Technology Fact Sheet (EPA-452/F-03-032) for SCR states that SCR is cost effective for large coal-fired industrial boilers with design heat inputs greater than 100 MMBtu/hr and for gas-fired industrial boilers greater than 50 MMBtu/hr. The lower cost effectiveness threshold for gas boilers is due to the relatively smaller volume of catalyst needed to control NO_x emissions from combustion of natural gas, which has less fuel-bound nitrogen than coal. As previously described, biomass has greater fuel-bound nitrogen than natural gas. Each PYREG carbonization unit has a design heat input of 5.2 MMBtu/hr which is well below these cost effectiveness thresholds. Even if the exhaust gases from each unit were combined into a single flue, the combined heat input capacity is still well below 50 to 100 MMBtu/hr. In addition, the need to maintain reagent on-site presents a risk to the environment. Due to these economic and environmental considerations, SCR was not selected as BACT for the PYREG carbonization units.

(2) Selective Non- Catalytic Reduction

Selective Noncatalytic Reduction (SNCR) is a method of post-combustion control that selectively reduces NO_x into nitrogen and water vapor by reacting the exhaust gas with a reagent such as ammonia or urea. Under carefully controlled conditions, control efficiencies of up to 70 percent have been realized in practice; however, typical control efficiencies range from 30 to 50 percent. The use of SNCR is highly temperature dependent since a catalyst is not used to lower the activation temperature of the NO_x reduction reaction which is favored over other chemical reactions at temperatures ranging from 1,600 to 21,00 ^oF. In the SNCR process, the combustion unit acts as the reactor chamber, therefore, sufficient space and residence time is required in the combustion chamber to efficiently complete the reaction. The FLOX burner combustion chambers are relatively small in volume and would not allow for the space and residence time required for SNCR. For this reason, the use of SNCR is technically infeasible for the PYREG carbonization units.

(3) Water/Steam Injection

Water/steam injection is the process of injecting water or steam into the combustion chamber to cool the combustion process and lower the peak flame temperature, thus reducing thermal NO_x formation. This is a highly effective control technique, reducing NO_x emissions by up to 50 percent; however, it is not widely applied because of the potential for large thermal penalties, safety concerns, and burner control problems. Other combustion control techniques (such as FGR) are as effective as water/steam injection without the thermal losses.

(4) Flue Gas Recirculation (FGR)

FGR is a combustion design technique used to reduce the peak flame temperature of combustion, in turn reducing thermal NO_x formation. A portion of the flue gas is extracted and remitted into the combustion area along with fresh combustion air. The recycled flue gas includes combustion products which act as inert heat sinks during combustion of the fuel/air mixture. This reduces NO_x emissions by two mechanisms, primarily, the recirculated gas acts as a diluent to reduce combustion temperatures, lowering peak flame temperatures, thus suppressing thermal NO_x formation. In addition, the recirculated flue gas lowers the average oxygen concentration in the combustion zone, which lowers the oxygen available to react with nitrogen to form NO_x. FGR a highly effective control option for reducing NO_x emissions, and reduction efficiencies of 50 to 70 percent are typical. FGR is a technically feasible control option for NO_x emissions from the PYREG carbonization units.

(5) Combustion Control Techniques and Burner Design

Ultra-low NO_x burners (ULNBs) are a NO_x control technology that typically involve various combinations of the NO_x control techniques discussed above to reduce thermal and prompt NO_x formation without contributing to thermal efficiency losses. The technology employed is highly specific to each manufacturer and application; however, rapid mixing which involves rapidly mixing gaseous fuel with air near the burner exit is commonly used. Rapid mixing virtually eliminates prompt NO_x formation and promotes complete fuel combustion.

Low NO_x burners (LNBs) are specially designed pieces of combustion equipment that reduce NO_x formation through careful control of the fuel-air mixture during combustion. The emission control strategy behind LNBs generally reflects a combination of NO_x reduction techniques such as staged air, staged fuel, and FGR. Some LNBs create combustion conditions that produce a low flame temperature by either dividing one large flame into several smaller flames or enlarging the radiative heat absorbing area of the flame. Other designs achieve a low flame temperature by decreasing the temperature of preheated combustion air, injecting either steam or water into the combustion zone, or supplying the burner with recirculated flue gas.

The PYREG carbonization units will use a flameless oxidation (FLOX) burner. In FLOX burners, fuel, air, and recirculated flue gases are intensely mixed in the combustion chamber at temperatures exceeding 1,600 ^oF before the onset of flame reactions. This leads to a homogenous temperature distribution within the chamber and reduced peak temperatures which significantly reduces thermal NO_x formation which readily occurs at temperatures greater than 2,200 ^oF. FLOX technology is especially suited for applications requiring the combustion of low calorific gases, such as the syngas produced by the PYREG carbonization units.

Selection of BACT

Considering the energy, environmental, and economic impacts of the control technologies identified, SBC proposed the use of FLOX burners utilizing FGR as BACT for the PYREG carbonization units. Based on emission testing completed on similar PYREG units using woodchips as fuel and based on U.S.EPA AP-42 Table 1.6-2, SBC proposes a NO_x emission limit of 0.22 lb/MMBtu as BACT.

The Department finds that BACT for NO_x emissions for the PYREG carbonization units is the use of FLOX burners utilizing FGR and a NO_x emission limit of 1.14 lb/hr (based on 0.22 lb/MMBtu).

d. Carbon Monoxide (CO) and Volatile Organic Compounds (VOC)

Carbon monoxide (CO) is a colorless, odorless, relatively inert gas formed as an intermediate product of combustion. CO emissions result when there is insufficient residence time or if there is insufficient oxygen available near the hydrocarbon molecule during combustion to complete the final step in hydrocarbon oxidation. In addition, combustion modifications taken to reduce NO_x emissions may result in increased CO emissions.

Small amounts of volatile organic compounds (VOC) are emitted from combustion. As with CO emissions, the rate at which organic compounds are emitted depends, to some extent, on the combustion efficiency of the unit. Emissions of VOC are primarily characterized by the criteria pollutant class of unburned vapor phase hydrocarbons. Unburned hydrocarbon emissions can include essentially all vapor phase organic compounds emitted from a combustion source.

CO and VOC emissions can be controlled through combustion control techniques or by add-on technologies such as oxidation catalysts, as discussed below.

(1) Oxidation Catalysts

Catalytic oxidation is a post-combustion control technology that has been used extensively with gas turbines and internal combustion engines. Noble metal-based catalysts are typically used and operate by decreasing the temperature at which oxidation of CO will occur. The catalyst lowers the activation energy necessary for CO to react with available oxygen in the exhaust to produce CO_2. Despite the decreased oxidation temperature, process exhaust gas must typically be preheated prior to contact with the catalyst bed. An oxidation catalyst is located within the heat recovery section of the system or in a downstream location where the exhaust gases are reheated to meet the proper temperature environment. The operating temperature window of an oxidation catalyst is between approximately 600-800 ^{o}F.

Based on emission testing completed on similar PYREG units using woodchips as fuel, each PYREG carbonization unit is expected to emit less than 1.9 TPY of CO and 0.12 TPY of VOC, assuming that each unit operates every hour of the year. The EPA Air Pollution Control Fact Sheet for Catalytic Incineration (EPA 452/F-03-018) provides a range of annualized control costs from $8 to $50 per scfm of exhaust gas treated. Considering the exhaust gas flow rate of each unit of approximately 839 scfm, the cost of this control technology could range from $6,700 to $41,959 per year which equates to $3,580 to $22,370 per ton of CO controlled. The annualized control costs for an oxidation catalyst is likely not economically justifiable for CO and would be prohibitively expensive for control of 0.12 TPY of VOC.

(2) Good Combustion Practices

Good combustion practices refer to maintaining the appropriate air to fuel mixtures, air/fuel contact, and combustion residence times needed to achieve proper combustion in accordance with the manufacturer’s combustion design. The PYREG carbonization units will utilize a FLOX burner that requires a high internal recirculation of hot flue gases and the syngas, ensuring complete mixing and oxidation of combustibles.

Selection of BACT

Considering the economic impacts of the add-on control technologies identified, SBC proposes the use of good combustion practices as BACT for the PYREG carbonization units. Based on emissions testing completed on similar PYREG units using woodchips as fuel and based on U.S.EPA AP-42 Table 1.4-1, SBC proposes a CO emission limit of 0.08 lb/MMBtu and a VOC limit of 0.005 lb/MMBtu.

The Department finds that BACT for CO and VOC emissions from Boiler #1 is the use of good combustion practices and emission limits of 0.42 lb/hr (based on 0.08 lb/MMBtu) for CO and 0.03 lb/hr (0.005 lb/MMBtu) for VOC.

e. Visible Emissions

Visible Emission Regulations, 06-096 C.M.R. ch. 101, establishes visible emissions standards for emissions from several categories of air contaminant sources. The PYREG carbonization units combust biomass-derived syngas in the FLOX combustion chamber; however, this is not a fuel for which this rule prescribes specific visible emission regulations. Thus, the Department has determined BACT to be the following: visible emissions from each PYREG unit when firing syngas shall not exceed 20% opacity on a six-minute block average basis.
[06-096 C.M.R. ch. 115, BACT]

During startup, which is anticipated to take approximately 12 hours, the PYREG units will fire propane for fuel. During this time, these units are subject to the visible emission regulations for fuel burning equipment firing natural gas or propane. Section 06-096 C.M.R. ch. 101, § 3(A)(3) requires that visible emissions from any unit firing natural gas or propane shall not exceed 10 percent opacity on a six-minute block average basis.

f. Emission Limits

The BACT emission limits for PYREG units were based on the following:

Syngas

PM/PM_{10}	–	0.12 lb/MMBtu, 06-096 C.M.R. ch. 115, BACT
SO_2	–	0.01 lb/hr, 06-096 C.M.R. ch. 115, BACT
NO_x	–	0.22 lb/MMBtu based on manufacturer’s specifications, 06-096 C.M.R. ch. 115, BACT
CO	–	0.08 lb/MMBtu based on manufacturer’s specifications, 06-096 C.M.R. ch. 115, BACT
VOC	–	0.005 lb/MMBtu based on manufacturer’s specifications, 06-096 C.M.R. ch. 115, BACT
Visible Emissions	–	06-096 C.M.R. ch. 115, BACT

Propane

PM/PM_{10}	–	0.05 lb/MMBtu, 06-096 C.M.R. ch. 115, BACT
SO_2	–	0.6 lb/MMscf based on AP-42 Table 1.4-2 dated 7/98
NO_x	–	100 lb/MMscf based on AP-42 Table 1.4-1 dated 7/98
CO	–	84 lb/MMscf based on AP-42 Table 1.4-1 dated 7/98
VOC	–	5.5 lb/MMscf based on AP-42 Table 1.4-2 dated 7/98
Visible Emissions	–	06-096 C.M.R. ch. 101

The BACT emission limits for the PYREG units are the following.

Emissions when firing syngas shall not exceed the following:

Emission Unit	Pollutant	lb/MMBtu	Origin and Authority
PYREG Unit #1	PM	0.12	06-096 C.M.R. ch. 115, BACT
PYREG Unit #2	PM	0.12	06-096 C.M.R. ch. 115, BACT
PYREG Unit #3	PM	0.12	06-096 C.M.R. ch. 115, BACT
PYREG Unit #4	PM	0.12	06-096 C.M.R. ch. 115, BACT

Emissions when firing syngas shall not exceed the following:
[06-096 C.M.R. ch. 115, BACT]

Emission Unit	PM (lb/hr)	PM_{10} (lb/hr)	SO_2 (lb/hr)	NO_x (lb/hr)	CO (lb/hr)	VOC (lb/hr)
PYREG Unit #1	0.62	0.62	0.01	1.14	0.42	0.03
PYREG Unit #2	0.62	0.62	0.01	1.14	0.42	0.03
PYREG Unit #3	0.62	0.62	0.01	1.14	0.42	0.03
PYREG Unit #4	0.62	0.62	0.01	1.14	0.42	0.03

Emissions when firing propane shall not exceed the following:
[06-096 C.M.R. ch. 115, BACT]

Emission Unit	PM (lb/hr)	PM_{10} (lb/hr)	SO_2 (lb/hr)	NO_x (lb/hr)	CO (lb/hr)	VOC (lb/hr)
PYREG Unit #1	0.07	0.07	0.01	0.2	0.11	0.02
PYREG Unit #2	0.07	0.07	0.01	0.2	0.11	0.02
PYREG Unit #3	0.07	0.07	0.01	0.2	0.11	0.02
PYREG Unit #4	0.07	0.07	0.01	0.2	0.11	0.02

3. Visible Emissions

Visible emissions from the each PYREG unit when firing propane shall not exceed 10% opacity on a six-minute block average basis.

Visible emissions from each PYREG unit when firing syngas shall not exceed 20% opacity on a six-minute block average basis

4. Periodic Monitoring and Recordkeeping

Periodic monitoring for the PYREG units shall include recordkeeping to document the amount of biomass and propane used both on a monthly and calendar year total basis.

The following parameters shall be recorded.

Parameter	Units of Measure	Monitoring tool/method	Frequency of Monitor	Frequency of Recordkeeping
Pressure drop across hot gas filter	Pressure difference	Differential pressure gauge	continuously	Once per shift
FLOX combustion temperature	^{o}F	Thermometer	continuously	Continuously, with Maximum and Minimum values recorded daily
Biomass Moisture content	%	Lab test	monthly	Monthly

5. New Source Performance Standards (NSPS)

The federal regulation Subpart Dc, *Standards of Performance for Industrial-Commercial-Institutional Steam Generating Units*, 40 C.F.R. Part 60, applies to new, modified, and reconstructed steam generating units with a maximum design heat input capacity greater than 10 MMBtu/hr but less than or equal to 100 MMBtu/hr. Subpart Dc defines a steam generating unit as follows:

> *a device that combusts any fuel and produces steam or heats water or heats any heat transfer medium. This term includes any duct burner that combusts fuel and is part of a combined cycle system. This term does not include process heaters as defined in this subpart.*

The PYREG carbonization units are not subject to Subpart Dc because they are not steam generating units and because the design heat input capacity of each unit is 5.2 MMBtu/hr, less than the10 MMBtu/hr applicability threshold.

6. National Emission Standards for Hazardous Air Pollutants (NESHAP): 40 C.F.R. Part 63, Subpart JJJJJJ

   The federal regulation *National Emission Standards for Hazardous Air Pollutants for Area Sources: Industrial, Commercial, and Institutional Boilers*, 40 C.F.R. Part 63, Subpart JJJJJJ, applies to all new, reconstructed, and existing boilers located at an area source of HAP. The proposed SBC facility has been classified as an area source of HAP because the facility has a potential to emit less than 10 TPY of a single HAP and less than 25 TPY of all HAP combined. Subpart JJJJJJ defines "boiler" as follows:

   > *an enclosed device using controlled flame combustion in which water is heated to recover thermal energy in the form of steam of hot water. Controlled flame combustion refers to a steady-state, or near steady-state, process wherein fuel and/or oxidizer feed rates are controlled… Waste heat boilers, process heaters, and autoclaves are excluded from the definition of Boiler.*

   The PYREG carbonization units do not meet the definition of boiler because the hot water generated by the system is not created within an enclosed device using flame combustion. In addition, gas-fired boilers which are defined as boilers designed to burn gaseous fuels, are also specifically exempted from Subpart JJJJJJ. The term "gaseous fuels" includes but is not limited to natural gas, process gas, landfill gas, coal derived gas, refinery gas, hydrogen, and biogas which is the fuel the carbonization units will combust.

D. Performance Testing [06-096 C.M.R. ch. 115, BACT]

1. Within 180 days of the first PYREG unit firing syngas, SBC shall conduct stack testing to demonstrate compliance with the associated lb/hr emission limits for PM, PM_{10}, NO_x, and VOC and lb/MMBtu emission limits for PM and PM_{10} during normal operating conditions.

   If the any of the tested pollutant emissions are greater than 75% of the emission limit, SBC shall test both units within two years of the initial testing date.

2. For any performance testing required by this license, SBC shall submit to the Department for approval a performance test protocol, as outlined in the Department's Performance Testing Guidance, at least 30 days prior to the scheduled date of the performance test. [06-096 C.M.R. ch. 115, BPT]

   The Department's Performance Testing Guidance is available online at:
   https://www.maine.gov/dep/air/emissions/testing.html

3. SBC shall submit a stack test protocol, submit stack test results, and use methods approved by the Department as outlined in the Standard Conditions of this license. Stack testing of one of the operating PYREG units shall be representative of the

emissions from the other units at the facility. Testing on a PYREG unit stack shall be performed in accordance with the compliance methods listed below and shall be conducted on syngas only:

Pollutant	lb/hr	Compliance Method
PM	0.62	EPA Method 5 (Performance Test) 40 C.F.R. Part 60, App. A, Method 5
PM_{10}	0.62 (filterable + condensable)	40 C.F.R. Part 60, App. A, Method 5 or EPA Test Method 201 or 201A and Method 202
NO_x	0.20	40 C.F.R. Part 60, App. A, Method 7
VOC	0.02	40 C.F.R. Part 60, App. A, Method 25 or 25A

E. *Emission Statements*, 06-096 C.M.R. ch. 137

SBC is not subject to emissions inventory requirements contained in *Emission Statements*, 06-096 C.M.R. ch. 137. SBC is not licensed to emit criteria air pollutants in amounts at or exceeding the minimum reporting thresholds as outlined in the following table.

Chapter 137 Reporting Thresholds

	PM_{10}	$PM_{2.5}$	NO_x	CO	SO_2	VOC
Ch. 137 Reporting Threshold, tpy	15	15	25	75	40	25
SBC Licensed Emissions, tpy	10.9	10.9	20.0	7.5	0.2	0.5

F. Fugitive Emissions

Visible emissions from a fugitive emission source (including stockpiles and roadways) shall not exceed 20% opacity on a five-minute block average basis.

G. General Process Emissions

Visible emissions from any general process source shall not exceed 20% opacity on a six-minute block average basis.

H. Annual Emissions

The table below provides an estimate of facility-wide annual emissions for the purposes of calculating the facility's annual air license fee. Only licensed equipment is included, i.e., emissions from insignificant activities are excluded. Similarly, unquantifiable fugitive particulate matter emissions are not included. Maximum potential emissions were calculated based on operating the four PYREG carbonization units 8,760 hr/yr. Propane emissions have not been included in the table since the normal hourly emissions from combusting syngas are higher than that of propane.

This table provides the basis for fee calculation only and should not be construed to represent a comprehensive list of license restrictions or permissions. That information is provided in the Order section of this license.

Total Licensed Annual Emissions for the Facility
Tons/year
(used to calculate the annual license fee)

	PM	PM_{10}	SO_2	NO_x	CO	VOC
PYREG Units #1 - #4	10.9	10.9	0.2	20.0	7.5	0.5
Total TPY	**10.9**	**10.9**	**0.2**	**20.0**	**7.5**	**0.5**

Pollutant	Tons/year
Single HAP	9.9
Total HAP	24.9

III. AMBIENT AIR QUALITY ANALYSIS

The level of ambient air quality impact modeling required for a minor source is determined by the Department on a case-by case basis. In accordance with 06-096 C.M.R. ch. 115, an ambient air quality impact analysis is not required for a minor source if the total licensed annual emissions of any pollutant released do not exceed the following levels and there are no extenuating circumstances:

Pollutant	Tons/Year
PM_{10}	25
SO_2	50
NO_x	50
CO	250

The total licensed annual emissions for the facility are below the emission levels contained in the table above and there are no extenuating circumstances; therefore, an ambient air quality impact analysis is not required as part of this license.

ORDER

Based on the above Findings and subject to conditions listed below, the Department concludes that the emissions from this source:

- will receive Best Practical Treatment,
- will not violate applicable emission standards, and
- will not violate applicable ambient air quality standards in conjunction with emissions from other sources.

The Department hereby grants Air Emission License A-1158-71-A-N subject to the following conditions.

Severability. The invalidity or unenforceability of any provision of this License or part thereof shall not affect the remainder of the provision or any other provisions. This License shall be construed and enforced in all respects as if such invalid or unenforceable provision or part thereof had been omitted.

STANDARD CONDITIONS

(1) Employees and authorized representatives of the Department shall be allowed access to the licensee's premises during business hours, or any time during which any emissions units are in operation, and at such other times as the Department deems necessary for the purpose of performing tests, collecting samples, conducting inspections, or examining and copying records relating to emissions (38 M.R.S. § 347-C).

(2) The licensee shall acquire a new or amended air emission license prior to commencing construction of a modification, unless specifically provided for in Chapter 115.
[06-096 C.M.R. ch. 115]

(3) Approval to construct shall become invalid if the source has not commenced construction within eighteen (18) months after receipt of such approval or if construction is discontinued for a period of eighteen (18) months or more. The Department may extend this time period upon a satisfactory showing that an extension is justified, but may condition such extension upon a review of either the control technology analysis or the ambient air quality standards analysis, or both. [06-096 C.M.R. ch. 115]

(4) The licensee shall establish and maintain a continuing program of best management practices for suppression of fugitive particulate matter during any period of construction, reconstruction, or operation which may result in fugitive dust, and shall submit a description of the program to the Department upon request. [06-096 C.M.R. ch. 115]

(5) The licensee shall pay the annual air emission license fee to the Department, calculated pursuant to Title 38 M.R.S. § 353-A. [06-096 C.M.R. ch. 115]

(6) The license does not convey any property rights of any sort, or any exclusive privilege. [06-096 C.M.R. ch. 115]

(7) The licensee shall maintain and operate all emission units and air pollution systems required by the air emission license in a manner consistent with good air pollution control practice for minimizing emissions. [06-096 C.M.R. ch. 115]

(8) The licensee shall maintain sufficient records to accurately document compliance with emission standards and license conditions and shall maintain such records for a minimum of six (6) years. The records shall be submitted to the Department upon written request. [06-096 C.M.R. ch. 115]

(9) The licensee shall comply with all terms and conditions of the air emission license. The filing of an appeal by the licensee, the notification of planned changes or anticipated noncompliance by the licensee, or the filing of an application by the licensee for a renewal of a license or amendment shall not stay any condition of the license.
[06-096 C.M.R. ch. 115]

(10) The licensee may not use as a defense in an enforcement action that the disruption, cessation, or reduction of licensed operations would have been necessary in order to maintain compliance with the conditions of the air emission license.
[06-096 C.M.R. ch. 115]

(11) In accordance with the Department's air emission compliance test protocol and 40 C.F.R. Part 60 or other method approved or required by the Department, the licensee shall:

A. Perform stack testing to demonstrate compliance with the applicable emission standards under circumstances representative of the facility's normal process and operating conditions:
   1. Within sixty (60) calendar days of receipt of a notification to test from the Department or EPA, if visible emissions, equipment operating parameters, staff inspection, air monitoring or other cause indicate to the Department that equipment may be operating out of compliance with emission standards or license conditions; or
   2. Pursuant to any other requirement of this license to perform stack testing.

B. Install or make provisions to install test ports that meet the criteria of 40 C.F.R. Part 60, Appendix A, and test platforms, if necessary, and other accommodations necessary to allow emission testing; and

C. Submit a written report to the Department within thirty (30) days from date of test completion.

[06-096 C.M.R. ch. 115]

(12) If the results of a stack test performed under circumstances representative of the facility's normal process and operating conditions indicate emissions in excess of the applicable standards, then:

A. Within thirty (30) days following receipt of the written test report by the Department, or another alternative timeframe approved by the Department, the licensee shall re-test the non-complying emission source under circumstances representative of the facility's normal process and operating conditions and in accordance with the Department's air emission compliance test protocol and 40 C.F.R. Part 60 or other method approved or required by the Department; and

B. The days of violation shall be presumed to include the date of stack test and each and every day of operation thereafter until compliance is demonstrated under normal and representative process and operating conditions, except to the extent that the facility can prove to the satisfaction of the Department that there were intervening days during which no violation occurred or that the violation was not continuing in nature; and

C. The licensee may, upon the approval of the Department following the successful demonstration of compliance at alternative load conditions, operate under such alternative load conditions on an interim basis prior to a demonstration of compliance under normal and representative process and operating conditions.

[06-096 C.M.R. ch. 115]

(13) Notwithstanding any other provisions in the State Implementation Plan approved by the EPA or Section 114(a) of the CAA, any credible evidence may be used for the purpose of establishing whether a person has violated or is in violation of any statute, regulation, or license requirement. [06-096 C.M.R. ch. 115]

(14) The licensee shall maintain records of malfunctions, failures, downtime, and any other similar change in operation of air pollution control systems or the emissions unit itself that would affect emissions and that is not consistent with the terms and conditions of the air emission license. The licensee shall notify the Department within two (2) days or the next state working day, whichever is later, of such occasions where such changes result in an increase of emissions. The licensee shall report all excess emissions in the units of the applicable emission limitation. [06-096 C.M.R. ch. 115]

(15) Upon written request from the Department, the licensee shall establish and maintain such records, make such reports, install, use and maintain such monitoring equipment, sample such emissions (in accordance with such methods, at such locations, at such intervals, and in such a manner as the Department shall prescribe), and provide other information as the Department may reasonably require to determine the licensee's compliance status.
[06-096 C.M.R. ch. 115]

(16) The licensee shall notify the Department within 48 hours and submit a report to the Department on a quarterly basis if a malfunction or breakdown in any component causes a violation of any emission standard (38 M.R.S. § 605). [06-096 C.M.R. ch. 115]

SPECIFIC CONDITIONS

(17) **PYREG Units #1 - #4**

A. Fuel

1. SBC is licensed to combust syngas derived from biomass in the FLOX combustion chamber. Propane shall be used solely as a startup fuel.
2. SBC shall use FLOX burners utilizing FGR for control of NO_x in the PYREG carbonization units whenever the units are operating.

B. Stack Height

Each PYREG unit shall exhaust through its own stack having a height of at least 60 feet above ground level.

C. Emissions while firing syngas shall not exceed the following:

Emission Unit	Pollutant	lb/MMBtu	Origin and Authority
PYREG Unit #1	PM	0.12	06-096 C.M.R. ch. 115, BACT
PYREG Unit #2	PM	0.12	06-096 C.M.R. ch. 115, BACT
PYREG Unit #3	PM	0.12	06-096 C.M.R. ch. 115, BACT
PYREG Unit #4	PM	0.12	06-096 C.M.R. ch. 115, BACT

D. Emissions when firing syngas shall not exceed the following:
[06-096 C.M.R. ch. 115, BACT]

Emission Unit	PM (lb/hr)	PM_{10} (lb/hr)	SO_2 (lb/hr)	NO_x (lb/hr)	CO (lb/hr)	VOC (lb/hr)
PYREG Unit #1	0.62	0.62	0.01	1.14	0.42	0.03
PYREG Unit #2	0.62	0.62	0.01	1.14	0.42	0.03
PYREG Unit #3	0.62	0.62	0.01	1.14	0.42	0.03
PYREG Unit #4	0.62	0.62	0.01	1.14	0.42	0.03

E. Emissions when firing propane shall not exceed the following:
[06-096 C.M.R. ch. 115, BACT]:

Emission Unit	PM (lb/hr)	PM_{10} (lb/hr)	SO_2 (lb/hr)	NO_x (lb/hr)	CO (lb/hr)	VOC (lb/hr)
PYREG Unit #1	0.07	0.07	0.01	0.2	0.11	0.02
PYREG Unit #2	0.07	0.07	0.01	0.2	0.11	0.02
PYREG Unit #3	0.07	0.07	0.01	0.2	0.11	0.02
PYREG Unit #4	0.07	0.07	0.01	0.2	0.11	0.02

F. Visible Emissions

1. Visible emissions from the each PYREG unit firing propane shall not exceed 10% opacity on a six-minute block average basis. [06-096 C.M.R. ch. 101, § 3(A)(3)]

2. Visible emissions from each PYREG unit when firing syngas shall not exceed 20% opacity on a six-minute block average basis.
[06-096 C.M.R. ch. 115, BACT]

G. Performance Testing [06-096 C.M.R. ch. 115, BACT]

1. Within 180 days of the first PYREG unit firing syngas, SBC shall conduct stack testing to demonstrate compliance with the associated lb/hr emission limits for PM, PM_{10}, NO_x, and VOC and lb/MMBtu emission limits for PM and PM_{10} firing

2. If any of the tested pollutant emissions are greater than 75% of the emission limit, SBC shall test the first two units installed within two years of the initial testing date.

3. Department's Performance Testing Guidance, at least 30 days prior to the scheduled date of the performance test. [06-096 C.M.R. ch. 115, BPT]

   The Department's Performance Testing Guidance is available online at:
   https://www.maine.gov/dep/air/emissions/testing.html

4. SBC shall submit a stack test protocol, submit stack test results, and use methods approved by the Department as outlined in the Standard Conditions of this license. Stack testing of one of the operating PYREG stacks shall be representative of the emissions from the other units at the facility. Testing on a PYREG unit stack shall be performed in accordance with the compliance methods listed in the following table and shall be conducted on syngas only:

Pollutant	lb/hr	Compliance Method
PM	0.62	40 C.F.R. Part 60, App. A, Method 5
PM_{10}	0.62 (filterable + condensable)	40 C.F.R. Part 60, App. A, Method 5 or EPA Test Method 201 or 201A and Method 202
NO_x	0.20	40 C.F.R. Part 60, App. A, Method 7
VOC	0.02	40 C.F.R. Part 60, App. A, Method 25 or 25A

5. Periodic Monitoring and Recordkeeping

Periodic monitoring for the PYREG units shall include recordkeeping to document the amount of biomass and propane used both on a monthly and calendar year total basis. SBC shall record the amount of biomass received based on information provided by the supplier or shall weigh, measure, and calculate the tons of biomass conveyed into the system. [06-096 C.M.R. ch. 115, BACT]

The following operational values shall be monitored and recorded.

The following parameters shall be recorded.

Parameter	Units of Measure	Monitoring tool/method	Frequency of Monitor	Frequency of Recordkeeping
Pressure drop across hot gas filter	Pressure difference	Differential pressure gauge	continuously	Once per shift
FLOX combustion temperature	^{o}F	Thermometer	continuously	Continuously, with Maximum and Minimum values recorded daily
Biomass Moisture content	%	Lab test	monthly	Monthly

[06-096 C.M.R. ch. 115, BACT]

(18) **Fugitive Emissions**

Visible emissions from a fugitive emission source (including stockpiles and roadways) shall not exceed 20% opacity on a five-minute block average basis.
[06-096 C.M.R. ch. 115, BPT]

(19) **General Process Sources**

Visible emissions from any general process source shall not exceed 20% opacity on a six-minute block average basis. [06-096 C.M.R. ch. 115, BPT]

DONE AND DATED IN AUGUSTA, MAINE THIS 12th DAY OF November, 2021.

DEPARTMENT OF ENVIRONMENTAL PROTECTION

BY:____for_____
MELANIE LOYZIM, COMMISSIONER

FILED
NOV 12, 2021
State of Maine
Board of Environmental Protection

The term of this license shall be ten (10) years from the signature date above.

[Note: If a renewal application, determined as complete by the Department, is submitted prior to expiration of this license, then pursuant to Title 5 M.R.S. § 10002, all terms and conditions of the license shall remain in effect until the Department takes final action on the license renewal application.]

PLEASE NOTE ATTACHED SHEET FOR GUIDANCE ON APPEAL PROCEDURES

Date of initial receipt of application: August 12, 2021
Date of application acceptance: August 18, 2021

Date filed with the Board of Environmental Protection:

This Order prepared by Lisa P. Higgins, Bureau of Air Quality.