TECHNICAL EVALUATION

&

PRELIMINARY DETERMINATION

APPLICANT

U.S. EcoGen Polk, LLC
1000 North U.S. Highway 1, No. 807
Jupiter, Florida 33841

U.S. EcoGen Polk Biomass Generating Facility
ARMS Facility ID No. 1050444

PROJECT

Project No. 1050444-001-AC
63 Megawatt Woody Biomass Power Plant

COUNTY

Polk County, Florida

PERMITTING AUTHORITY

Florida Department of Environmental Protection
Division of Air Resource Management
Office of Permitting and Compliance
2600 Blair Stone Road, MS#5505
Tallahassee, Florida 32399-2400

June 2012

1. APPLICATION INFORMATION

1.1. Applicant Name and Address

U.S. EcoGen Polk, LLC (US EcoGen)
1000 North U.S. Highway 1, No. 807
Jupiter, Florida 33841

Authorized Representative: Mr. William F. Quinn, P.E., President

1.2. Key Dates

- April 16, 2012: Received air construction permit application from US EcoGen.
- June 2012: Department distributed Draft Permit package and posted documents.

1.3. Facility Location

The proposed US EcoGen Biomass Generating Facility will be located in Polk County on a 1,163-acre parcel in the City of Fort Meade off of U.S. Highway 17. The location of Polk County is shown in Figure 1. The location of the plant in relationship to U.S. Highway 17 is shown in Figure 2 with a close up in Figure 3. The Progress Energy Hines Facility cooling water ponds are visible to the northwest.

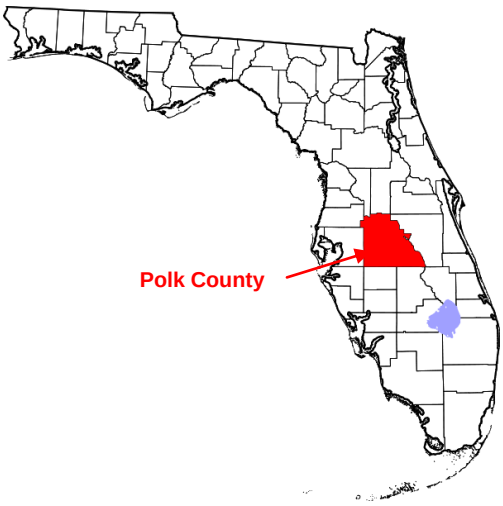

Figure 1. Polk County, Florida

Figure 2. US EcoGen Site in Relation to U.S. Highway 17

Figure 3. Close Up Aerial View of Site

2. PROPOSED PROJECT

2.1. Project Description

The applicant proposes to construct a nominal 63 megawatts (MW) woody biomass electric power plant. The power plant will be comprised of four process areas consisting of:

- Clean woody biomass receiving, handling, storage and processing;
- Power Island, including a bubbling fluidized bed (BFB) boiler and steam turbine electrical generator, an aqueous ammonia storage tank, a sand storage silo, an air cooled condenser and an auxiliary cooling tower;
- Ash (fly and bottom) handling, storage and shipment including a fly ash storage silo; and
- Emergency support equipment consisting of an emergency generator and fire water pump.

Table 1 is a list of the Emissions Unit (EU) that comprises this project.

Table 1 – List of Emissions Unit for the US EcoGen Polk County Biomass Generating Facility

EU No.	Emission Unit Description
001	Fuel Receiving, Handling, Storage and Processing
002	Power Island
003	Ash Handling, Storage and Shipment
004/005	Emergency Equipment

A preliminary site layout of the US EcoGen plant with the major components labeled is given in Figure 4.

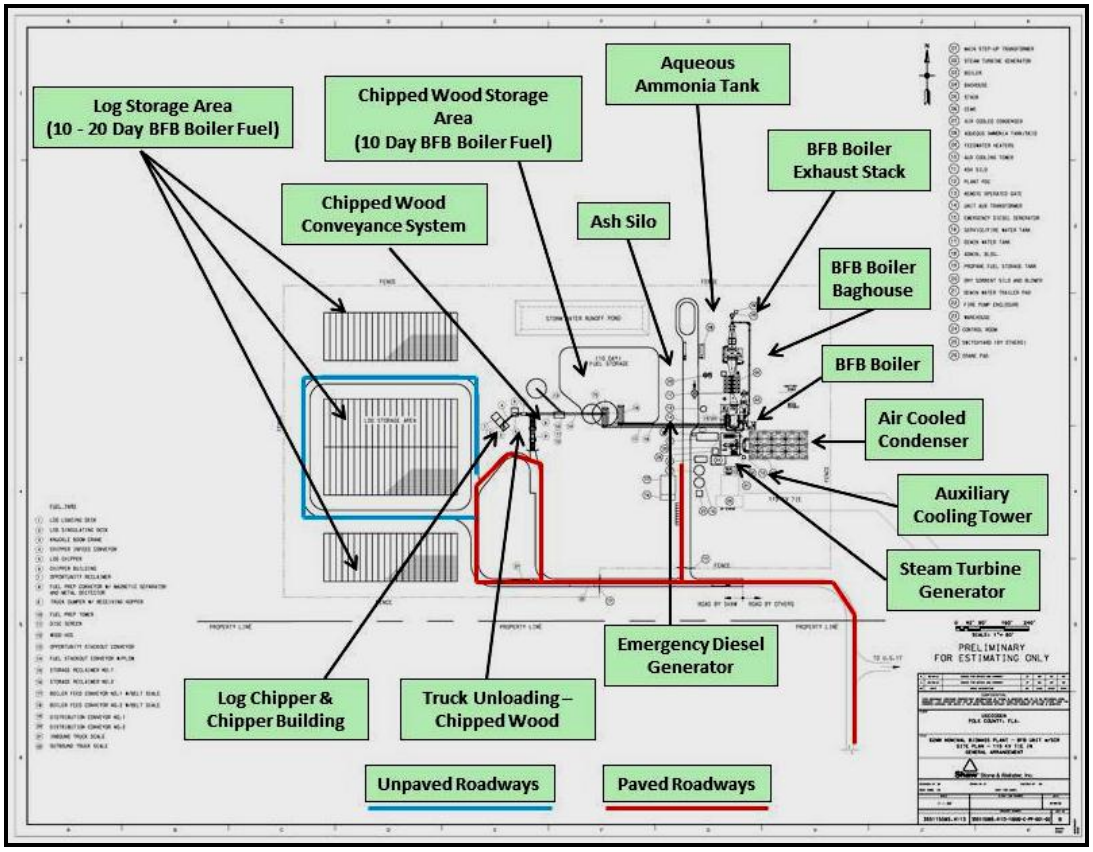

Figure 4. US EcoGen Biomass Generating Facility Site Layout

3. PROCESS DESCRIPTION

Figure 5 is a general process flow diagram of the proposed US EcoGen plant. Clean woody biomass and air are introduced into the BFB boiler where the biomass is combusted in a bed of sand as described in **subsection 3.3.1** below. The exhaust gas heats water to produce high pressure, high temperature steam. The exhaust gases are then treated in a series of air pollution control devices and emitted via a nominal 180 foot tall stack to the atmosphere.

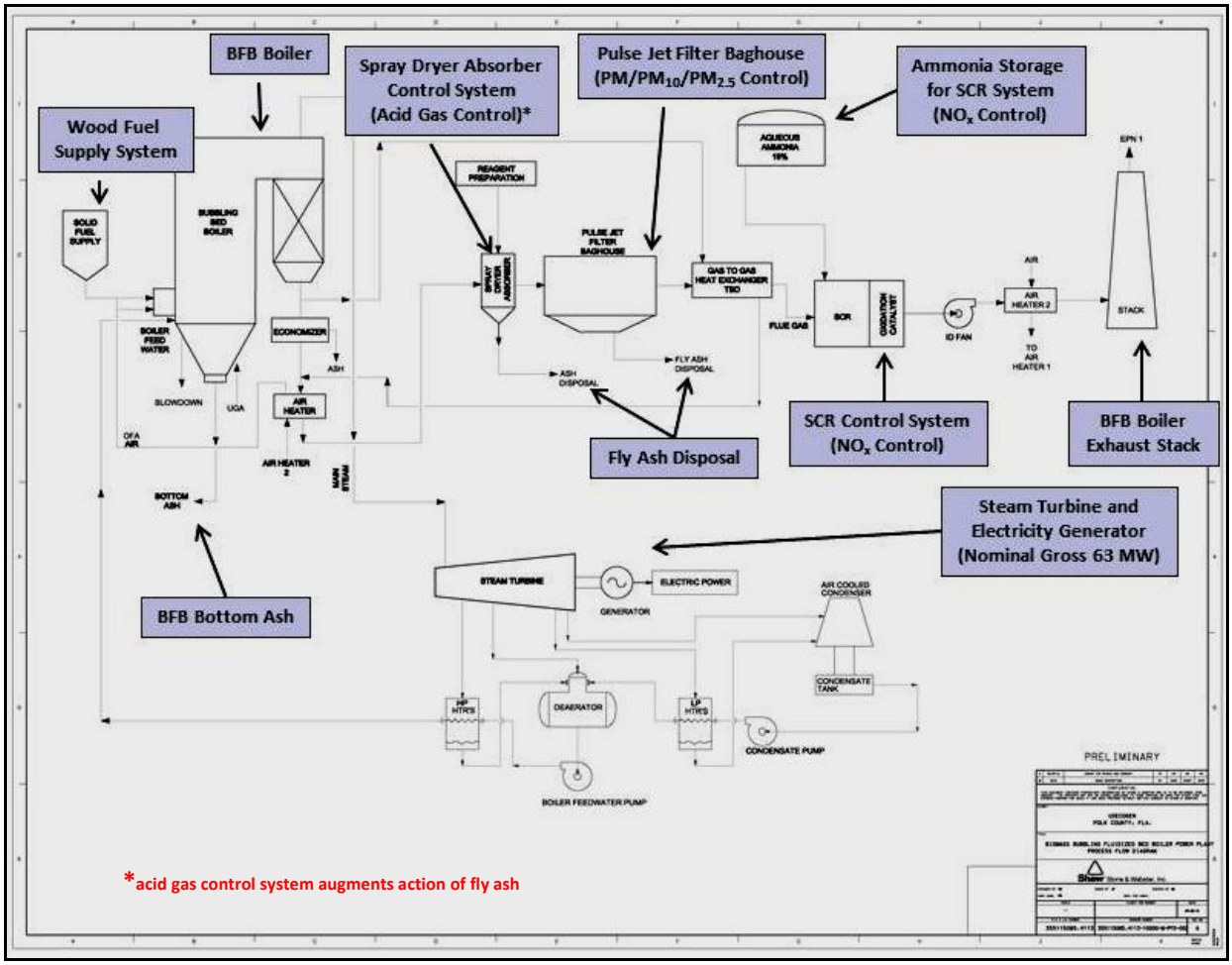

Figure 5. Process Flow Diagram of US EcoGen Polk Biomass Generating Facility

The high pressure, high temperature steam is expanded in a steam turbine-electric generator to produce electricity. The spent steam is condensed and the water repeats the described cycle. Bottom ash from the BFB boiler and fly ash from the fabric filter baghouse particulate matter control device will be collected, conveyed, stored and shipped offsite by truck.

3.1. Fuel Slate and Sources

The US EcoGen plant will eventually be a "closed loop" eucalyptus plantation-based system with regard to biomass. A "closed loop" system means that the BFB boiler at the plant will utilize biomass grown and harvested in close proximity to the plant as fuel. Eucalyptus trees will be grown and harvested in nearby eucalyptus tree plantation(s) for use as the primary BFB boiler fuel. Until sufficient eucalyptus trees are available, "bridging" biomass will be used to fuel the BFB boiler.

The "bridging" biomass will consist of clean, untreated woody biomass and will include: clean untreated lumber; tree stumps; tree limbs; slash; wood residue, bark; sawdust; sander dust; wood chips and pellets; scraps; slabs; millings; shavings; and processed pellets made from wood or other forest residues. Most of the "bridging" woody biomass will be processed at a remote fuel preparation area (or areas) where it will be sorted, screened and chipped to size.

Table 2 below further identifies the types of woody biomass that will be combusted in the BFB boiler.

Table 2. Summary of Woody Biomass Fuel Descriptions

Fuel Group	Description
Eucalyptus Trees (Primary Fuel)	Whole logs chipped off site or shipped to the site and then chipped to provide wood chips as fuel to the BFB boiler
Bridging Biomass	
Forest Products Residue & Commercial Tree trimmings	Tops, limbs and whole tree (soft or hardwoods) that result from harvesting and/or thinning as well as the residue therefrom
	Forest understory including smaller trees and saplings
	Tree parts and/or branches that have been cut down for land development or line clearing purposes or that have been gathered after storms.
Wood Production Residuals	Butts, sticks, pole ends and tree surgeon material
	Saw dust and kerf waste from cutting/milling whole green trees
	Fines from planing kiln-dried lumber
Clean wood waste	Clean construction wood waste that was a primary mill product and has not been treated in any way. Acceptable materials include untreated pallets, dimensional lumber, clean wood trim, and clean milled lumber
Whole Tree Chips	Wood chips from whole trees on an opportunity basis and eventually wood from whole eucalyptus trees grown in a dedicated plantation

Clean woody biomass excludes secondary residues, such as plywood, particle board, medium density fiberboard, oriented strand board, laminated beams, finger jointed trim, sheet goods and any chemical treated wood residue, products or byproducts such as butts and shives from the wood pulp industry. These secondary residues and other materials not falling in the categories described above cannot be used as fuel without prior approval of the Department. See Appendix BMP of the permit for further information on the allowable and prohibited type of biomass fuel for the BFB boiler.

Natural gas will also be used in the BFB boiler for startup, shutdown and flame (bed) stabilization.

3.2. Fuel Receiving, Handling, Storage and Processing (EU 001)

Figure 6 below shows representative pictures of some of the main processes and equipment involved in Fuel Receiving, Handling, Storage and Processing Emission Unit (EU 001). Further discussion of this EU is given below by task. The applicant proposes to control emissions from this EU which consists principally of particulate matter (PM) by utilizing a Best Management Practices (BMP) plan.

3.2.1. Chipped Wood Receiving, Handling, Storage and Processing

As shown in Figures 6 and 7, woody biomass in the form of pre-processed chips will be brought to the site in trucks. The trucks will then proceed to the scale station for weighing and from there to the truck dumping stations where the contents will be emptied into above ground receiving hoppers. Receiving hoppers that can be accessed by material handling equipment will also be installed as part of the material handling operations.

Figure 6. Representative Pictures of Fuel Receiving, Handling, Storage and Processing EU

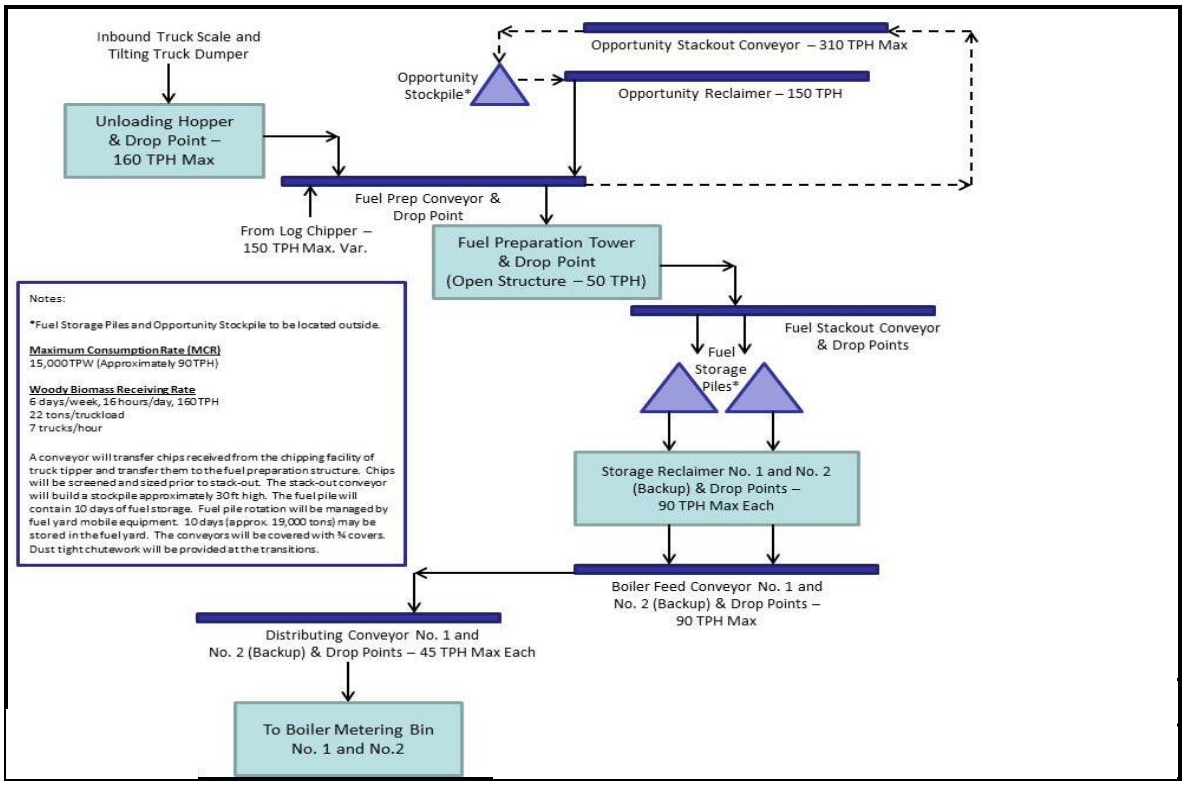

Figure 7. Chipped Woody Biomass Handling System (Fuel Yard) Process Flow Diagram

The chipped wood emptied into the receiving hoppers will be sent through a covered conveyor system to the primary wood storage area. Certain portions of the conveyor system will be open to allow for material inspections and removal of unwanted materials. Front end loaders or similar means will be used to groom the chipped wood pile and to move chipped wood to the reclaim areas. The initial estimate of the handling capacity of the open bulk chipped wood storage area is approximately 19,000 tons.

Top covered conveyor systems will also be utilized to transfer materials to and from the storage areas and to the boiler building for combustion in the BFB boiler. Small portions of the conveyor systems will not be covered to allow for inspection and removal of non-acceptable woody biomass by plant personnel. Fuel bins will be utilized to store the woody biomass prior to combustion and will be equipped with screw feeders to manage wood chip discharge from these bins prior to combustion in the BFB boiler. Transfer points between conveyor systems will utilize an equipment design that minimizes exposure of the woody biomass to wind.

3.2.2. Log Wood Receiving, Handling, Storage and Processing

Refer to Figures 6 and 8. Logs will be brought to the plant via trucks. Trucks will be weighed and then will proceed to the log storage area. Once trucks enter the log storage area, the roadway will become unpaved. A majority of the plant roadway will be paved in order to handle chipped/log trucks entering the plant, as well as trucks providing materials to support the Power Island such as aqueous ammonia delivery and the off shipment of the BFB boiler fly and bottom ash.

Logs will be removed from the trucks by equipment designed to pick up the logs from the truck and place them on the log storage piles. This equipment will also be used to take logs from the log pile and place them on trucks that will transport the logs to the log loading deck. As shown in Figure 8, logs will be placed on the deck and conveyed to an electrically driven log chipper that will process the logs into chips. The chipper will be located in an enclosed structure. Wood chips will leave the enclosure via a conveyor system that will be connected to the BFB boiler fuel feed bins.

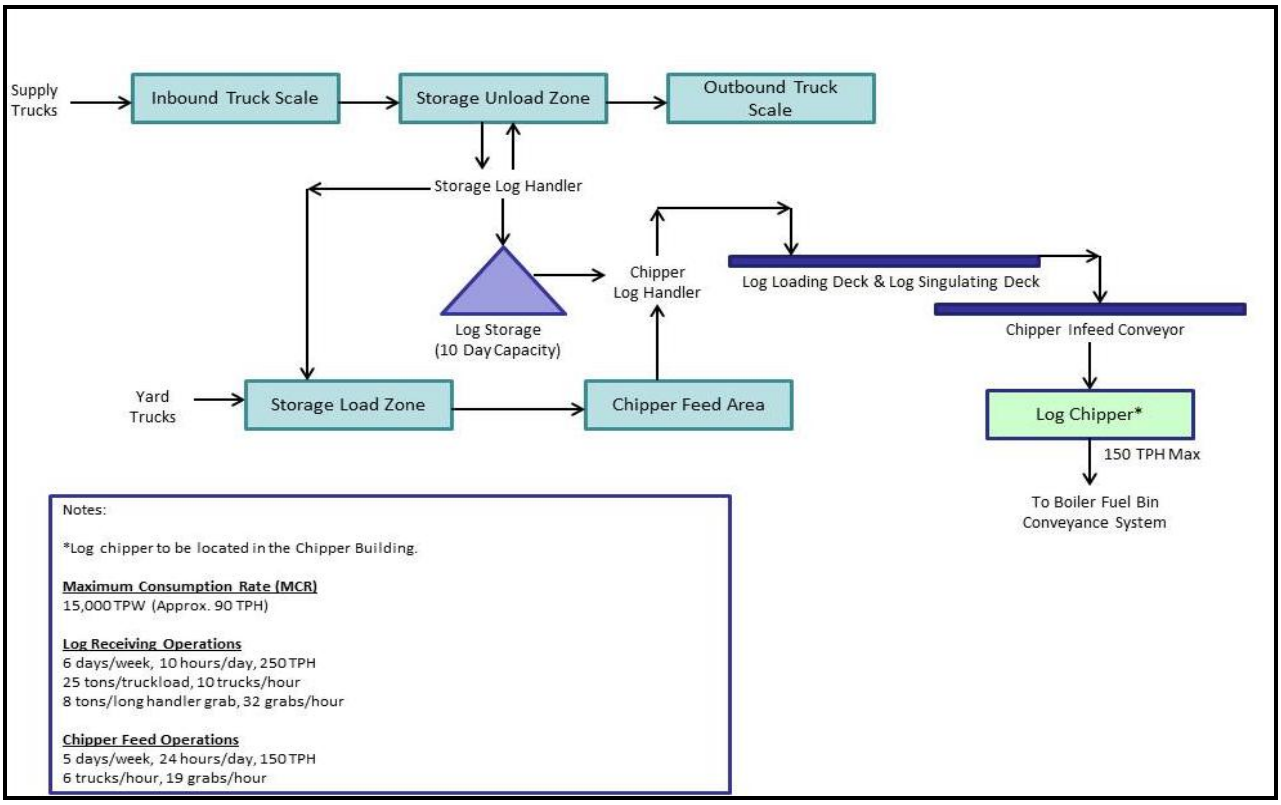

Figure 8. Log Handling System (Fuel Yard) Process Flow Diagram

3.3. Power Island (EU 002)

Figure 5 above presents the layout of the plant indicating the main equipment and control technologies for the Power Islands (EU 002). Natural gas will be provided via pipeline and woody biomass will be provided by wood suppliers via incoming trucks and stored onsite. Figure 9 is a process flow diagram of the U.S. EcoGen Polk Power Island, including identification of the regulated air pollutants potentially emitted from the power island.

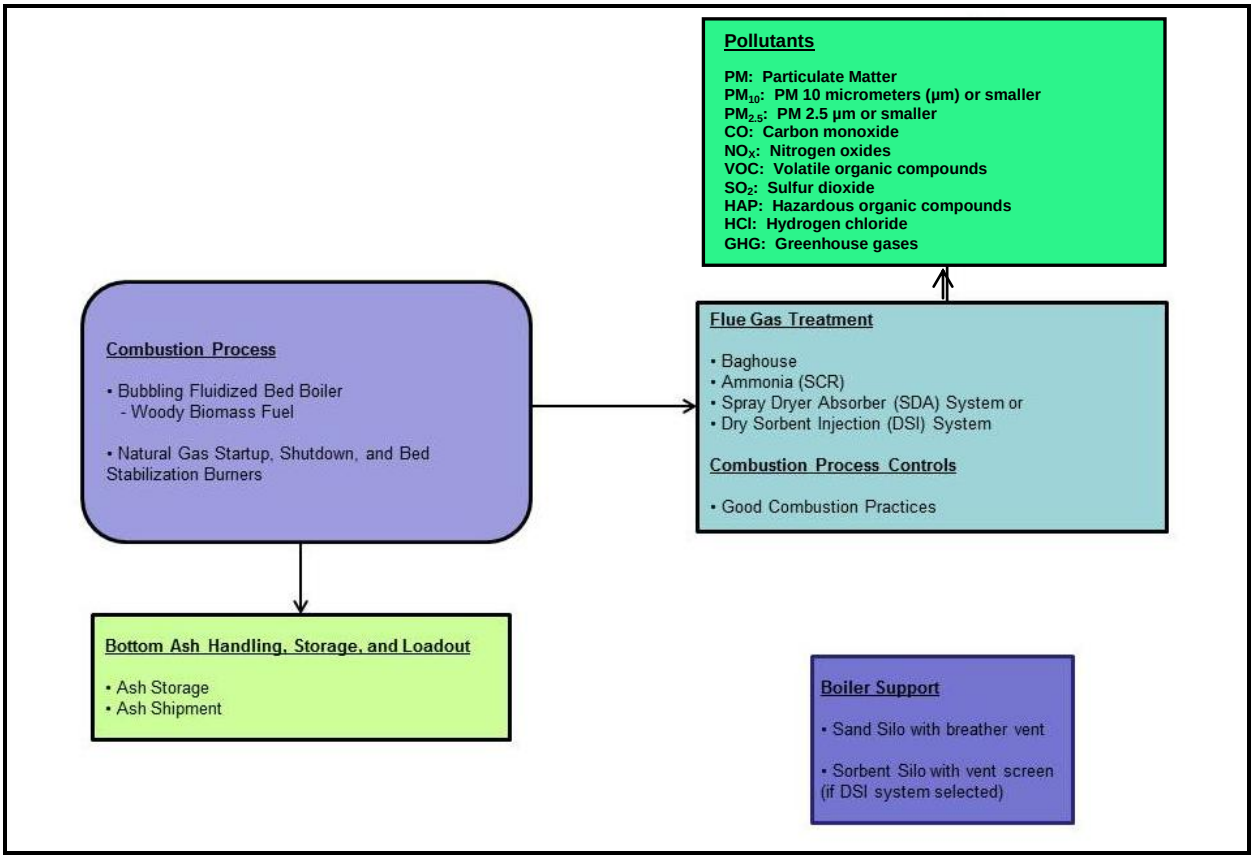

Figure 9. Power Island Process Flow Diagram

3.3.1. BFB Boiler

The BFB boiler at the US EcoGen plant will use woody biomass as the primary fuel during normal operation. The maximum continuous rating (MCR) of the boiler will be 565,000 pounds/hour of steam. The heat input of the boiler at the MCR while combusting woody biomass at 50 percent (%) moisture is approximately 740 MMBtu/hour.

The BFB boiler will use natural gas for boiler startup, shutdown and boiler bed stabilization. The maximum design heat input capacity from natural gas is 160 million Btu per hour (MMBtu/hr).

Further details are provided in **Section 5.1** below.

3.3.2. Aqueous Ammonia Storage Tank

Aqueous NH_3 at a 19% concentration level or less will be used as the reactant to control NO_X emissions. It will be stored onsite in a nominal 10,000 gallon pressurized horizontal tank. No air emissions will be associated with the ammonia storage tank in the Power Island.

3.3.3. Air Cooled Condenser and Auxiliary Cooling Towers

Cooling of spent steam in the steam turbine power system will be provided by an air cooled condenser unit. Because no water is required to cool the steam no PM emissions will result from cooling tower drift. The condensed steam will be recycled through the steam generation system in a closed loop operation minimizing the requirement for water. The air cooled condenser does not have the potential to emit regulated air pollutants.

The auxiliary cooling tower will provide cooling for various components, including turbine lube oil, BFB lube oil, and generator coolers. It will most likely be a galvanized induced draft cooling tower and will utilize city water as its water source. The auxiliary cooling tower has the potential to emit a small amount of PM in the form of mist, which will be minimized by the incorporation of a drift eliminator.

3.3.4. Sand Storage Silo

A sand storage silo will be installed to store the makeup sand for use in the bed of the BFB boiler. To control PM, the applicant proposes to use a silo with a breather vent or vent filter. PM emission from the silo will be minimal and will only occur during sand loading operations.

3.3.5. Sorbent Storage Silo

A sorbent storage silo will be installed to store the sorbent use in the spray dryer absorber (SDA) system or multilevel/multiple injection location dry sorbent injection (DSI) system. . To control PM, the applicant proposes to use a silo with a breather vent or vent filter. PM emission from the silo will be minimal and will only occur during sand loading operations.

3.4. Ash Handling, Storage and Shipment (EU 003)

Figure 10 is a schematic of the ash handling, storage and shipment steps.

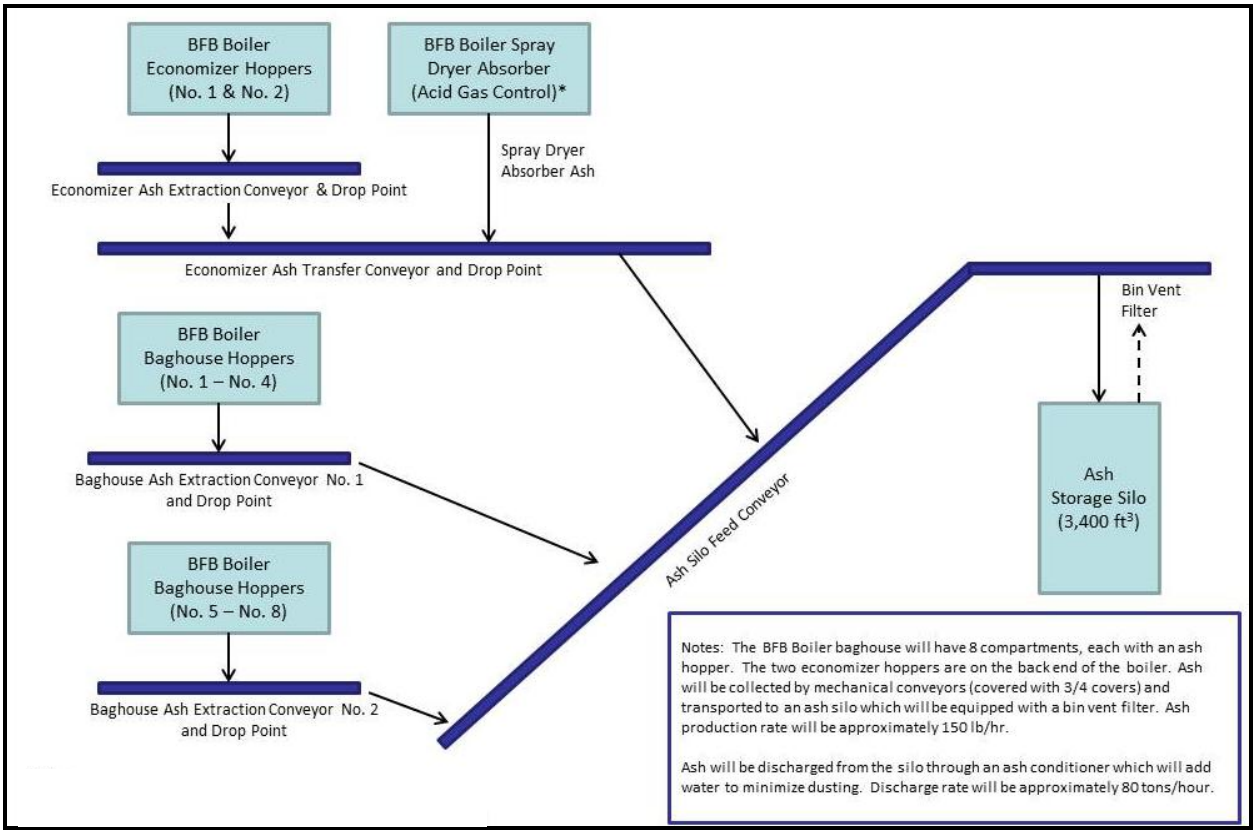

Figure 10. Ash Handling, Storage and Shipment Process Flow Schematic Design

The combustion of biomass in the proposed BFB boiler will result in the formation of bottom ash and fly ash. The amount of ash is a reflection of the non-combustibles in the fuel. Bottom ash will be in the form of large solid particles and will be removed from the bottom of the boiler and stored in a metal container for future removal offsite. The fly ash consists of the PM captured by the BFB boiler baghouse. An enclosed conveyor or similar system will be used to transport the fly ash from the baghouse to the fly ash storage silo.

The storage silo will be equipped with a vent filter for minimizing any PM from the storage silo during fly ash loading operations. The design PM outlet concentration of the vent filter is 0.01 grains per dry standard cubic feet (gr/dscf). Fly ash from the storage silo will be sent to a truck loading operation via a conveyor system for removal offsite. The conveyor system will be enclosed, and the chute used to dispense fly ash into the trucks will be designed to minimize PM emissions. Appropriate techniques will also be utilized during truck loading operations to minimize PM emissions.

3.5. Emergency Equipment (EU 004 and 005)

The proposed plant will require an emergency generator and emergency fire water pump. These pieces of emergency equipment will be fueled with ultra low sulfur distillate fuel oil and operate only a limited number of hours (100 hours per year or less) per year for testing and maintenance purposes under normal conditions. The applicant proposes to control pollutant emissions with good combustion practices (GCP) and the use of clean fossil fuel. A summary of the emergency equipment is provided below:

3.5.1. Emergency Generator

- Equipment Rating: Nominal 670 horsepower (Hp) and 493 kilowatt (kW);
- Type of Fuel: Ultra low sulfur distillate fuel oil; and
- Fuel Storage: Generator engine will be supported by a nominal 600 gallon fuel oil storage tank. Storage tank will be equipped with an emergency pressure relief vent cap.

3.5.2. Emergency Fire Water Pump

- Equipment Rating: Nominal 200 Hp and 147 kW;
- Type of Fuel: Ultra low sulfur distillate fuel oil; and
- Fuel Storage: Pump engine will be supported by a nominal 200 gallon fuel oil storage tank.

4. AIR POLLUTION REGULATIONS AND APPLICABILITY DETERMINATIONS

4.1. Department Regulations

Projects at stationary sources with the potential to emit air pollution are subject to the applicable environmental laws specified in Section 403 of the Florida Statutes (F.S.). The statutes authorize the Department of Environmental Protection (Department) to establish regulations regarding air quality as part of the Florida Administrative Code (F.A.C.), which includes the following applicable chapters:

Table 3. Potential Applicable Rules from the Florida Administrative Code

Chapter	Description
62-4	Permits
62-17	Power Plant Siting (not applicable as project is smaller than 75 MW)
62-204	Air Pollution Control – General Provisions
62-210	Stationary Sources of Air Pollution – General Requirements
62-212	Stationary Sources – Preconstruction Review
62-213	Operation Permits for Major Sources (Title V) of Air Pollution
62-214	Requirements for Sources Subject to the Federal (Title IV) Acid Rain Program
62-296	Stationary Sources – Emission Standards
62-297	Stationary Sources – Emissions Monitoring

4.2. Federal Regulations

The U.S. Environmental Protection Agency (EPA) establishes air quality regulations in Title 40, Code of Federal Regulations, Part 60 (40 CFR 60) that identifies New Source Performance Standards (NSPS) for a variety of industrial activities. 40 CFR 61 specifies National Emission Standards for Hazardous Air Pollutants (NESHAP). 40 CFR 63 specifies NESHAP provisions based on the Maximum Achievable Control Technology (MACT) for given source categories.

Federal regulations adopted by reference are given in Rule 62-204.800, F.A.C. State regulations approved by EPA are given in 40 CFR 52, Subpart K – Florida; also known as the State Implementation Plan (SIP) for Florida.

4.3. General PSD Major Stationary Source Applicability

The Department regulates major stationary sources in accordance with Florida's PSD program pursuant to Rule 62-212.400, F.A.C. PSD preconstruction review is required in areas that are currently in attainment with the state and federal ambient air quality standards (AAQS) or areas designated as "unclassifiable" for these regulated pollutants.

Commonly addressed PSD pollutants in the power industry include: CO, NO_X, PM, PM smaller than 10 micrometers (µm) (PM_{10}), PM smaller than 2.5 µm ($PM_{2.5}$), SO_2, VOC, SAM, lead (Pb), fluorides (F), and mercury (Hg).

Additional PSD pollutants that are more common to certain other industries include: hydrogen sulfide (H_2S), TRS including H_2S, reduced sulfur compounds (RSC) including H_2S, municipal waste combustor (MWC) organics measured as total tetra- through octa-chlorinated dibenzo-p-dioxins and dibenzofurans (dioxin/furan), MWC metals measured as PM; MWC acid gases measured as SO_2 and HCl, and municipal solid waste (MSW) landfill emissions as non-methane organic compounds (NMOC).

As defined in Rule 62-210.200(Definitions), F.A.C., a stationary source is a "major stationary source" (major PSD source) if it emits or has the potential to emit (PTE):

- 250 tons per year (tons/year) or more of any PSD pollutant; <u>or</u>
- 100 tons/year or more of any PSD pollutant <u>and</u> the facility belongs to one of the 28 listed PSD major facility categories.

The list given in the citation includes the category of "**<u>fossil</u>** fuel-fired steam electric plants of more than 250 MMBtu/hour heat input". However the US EcoGen project will not use more than 250 MMBtu of fossil fuel as it will rely almost entirely on biomass. Biomass-fueled steam electric plants are not included among the 28 listed PSD major facility categories. Therefore, to be considered a major stationary source the project would have to emit or have the potential to emit 250 tons/year or more of at least one PSD pollutants.

According to 40 CFR 52.21, six greenhouse gases (GHG), are also be subject to regulation at new stationary sources that will emit or have the potential to emit 100,000 tons/year expressed as the carbon dioxide equivalent emissions (CO_2e). This requirement has not been incorporated into Department rules but is a separate requirement of the US EPA. Federal PSD applicability to the CO_2 contribution to GHG emissions from bioenergy and biogenic stationary sources was recently deferred by EPA until the second half of 2014. Refer to: Link to Final CO2 PSD Deferral .

4.4. Specific PSD Major Stationary Source Applicability for the Project

The project will be located in Polk County, which is in an area that is currently in attainment with the state and federal AAQS or otherwise designated as unclassifiable.

The project will result in emissions of $PM/PM_{10}/PM_{2.5}$, NO_X, SO_2, sulfuric acid mist (SAM sometimes expressed as H_2SO_4), CO, VOC, fluoride (F), hazardous air pollutants (HAP including certain metals, acid gases and organic species) and GHG. Table 4 summarizes the applicant's estimates of the potential-to-

emit in tons/year of key regulated air pollutants from the proposed woody biomass power plant.

Table 4. Estimated Potential to Emit of Key Regulated Air Pollutants (tons/year)

Pollutant by Emissions Unit										
PM	**PM_{10}**	**$PM_{2.5}$**	**NO_X**	**SO_2**	**H_2SO_4**	**CO**	**VOC**	**F**	**HAP**	**CO_2e [2]**
Fuel Receiving, Handling, Storage and Processing (EU 001)										
1.71	0.81	0.12	--	--	--	--	--	--	--	--
Power Island (EU 002) Including Sand Silo and Auxiliary Cooling Tower										
155.3 [1]			246.3	226.9	4.5	246.3	64.8	0.2		684,365 81,996 [3]
Ash Handling, Storage and Shipment Including Fly Ash Storage Silo (EU 003)										
0.78	0.76	0.75	--	--	--	--	--	--	--	--
Emergency Equipment (EU 004)										
0.04 [3]			0.8	0.001	0.0001	0.6	0.8	--		73
Totals of all Emissions Units										
157.8	156.9	156.2	247.1	227.0	4.5	246.9	65.6	0.2		684,438
Fugitive Emissions (No EU) [4]										
36	6	1	--	--	--	--	--	--	--	--
Total Project Emissions Including Fugitives										
193.8	162.9	157.2	247.1	227.0	4.5	246.9	65.6	0.2	--	684,438

1. For the BFB boiler, the applicant is making the conservative (worst case) assumption that all particulate emissions are $PM_{2.5}$. By contrast, most particles generated from the biomass/ash processing and fugitive sources are greater than 10 μm in diameter.
2. As CO_2e; GHG are regulated by the US EPA but not the Department.
3. The CO_2 contribution to GHG from biomass combustion has been deferred from PSD applicability by EPA until the second half of 2014. Only the 81,996 tons CO_2/year attributed to natural gas combustion counts towards the 100,000 tons/year threshold of the 684,365 tons/year emitted by the BFB boiler. All emissions from the emergency equipment which utilize diesel fuel oil count toward the PSD threshold.
4. Fugitive emissions from this facility do not apply towards PSD major stationary source threshold.

No PSD pollutant will be emitted at a rate equal to or greater than the respective State or Federal major stationary source PSD threshold. Thus, the project is not subject to PSD review or best available control technology (BACT) determinations pursuant to Rule 62-212.400, F.A.C.

4.5. Major Source of Air Pollution (Title V Source) Determination

As defined in Rule 62-210.200(Definitions), F.A.C., a Title V source is an emissions unit or group of emissions units that directly emits, or has a PTE of, 100 tons/year or more of any regulated air pollutant. The Major (Title V) Source of Air Pollution definition also includes, any emissions unit or group of emissions units that (except for radionuclides) emits or has the PTE of, in the aggregate, 10 tons/year or more of any one HAP, 25 tons/year or more of any combination of HAP, or any lesser quantity of a HAP as established through EPA rulemaking. HAP are defined/listed in Rule 62-210.200(Definitions), F.A.C.

The emissions estimates given in Table 4 are sufficient to conclude that the US EcoGen plant will be a Title V source based on emissions of regulated air pollutants regardless of HAP emissions.

4.6. Major Source of Hazardous Air Pollutants Determination

Estimates by the applicant of individual key HAP emissions are provided in Table 5. Only individual HAP emissions greater than 0.10 tons/year are listed with all others grouped into the "other HAP" category.

Table 5. Estimated Emissions of Key HAP (tons/year)

Pollutant [1]	HCl	HF	Mn	Cl_2	C_6H_{14}	C_2H_4O	C_6H_5Cl	C_8H_{10}
Emissions	9.9	0.16	0.65	0.99	1.2	0.15	0.11	0.10
Pollutant [2]	**Pb**	**C_6H_6O**	**C_3H_6O**	**C_8H_8**	**Other HAP**		**Total**	
Emissions	0.60	0.17	0.20	6.2	0.67		**21.1**	

1. HF is hydrogen fluoride; Mn is manganese; Cl_2 is chlorine; C_6H_{14} is hexane; C_2H_4O is acetaldehyde; C_6H_5Cl is chlorobenzene; and C_8H_{10} is ethylbenzene.
2. C_6H_6O is phenol; C_3H_6O is propionaldehyde; and C_8H_8 is styrene.

The Department regulates major sources of HAP in accordance with applicable portions of 40 CFR 63 adopted in Rule 62-204.800(11), F.A.C. As shown in Table 5, the applicant has estimated that the proposed US EcoGen plant will not have the potential to emit a single HAP at a rate equal to or greater than 10 tons/year or aggregated HAP at a rate equal to or greater than 25 tons/year. Therefore, the US EcoGen plant is an area source of HAP and not a major source of HAP.

4.7. New Source Performance Standards (NSPS) Applicability

The following provisions incorporated into Rule 62-204.800(8), F.A.C. adopted from federal regulations and incorporated into this rule apply to this project:

- BFB boiler and emergency equipment: 40 CFR 60, Subpart A – General Provisions;
- BFB boiler: NSPS Subpart Db – Industrial, Commercial, Institutional Steam Generating Units;
- Emergency equipment: NSPS Subpart IIII – Stationary Compression Ignition Internal Combustion Engines (ICE).

4.8. National Emissions Standards for Hazardous Air Pollutants (NESHAP) Applicability

The following provision incorporated into Rule 62-204.800(11), F.A.C. adopted from federal regulations and incorporated into this rule applies to this project:

- BFB boiler and emergency equipment: NESHAP Subpart A – General Provisions;
- BFB boiler: NESHAP Subpart JJJJJJ – Area Sources: Industrial, Commercial, and Institutional Boilers.
- Emergency equipment: NESHAP Subpart ZZZZ – Stationary Reciprocating Internal Combustion Engines (RICE).

4.9. Summary of Key Regulations and their Applicability to the Project

Following is a summary of the applicability of key regulations to the US EcoGen project:

- The proposed project is a major stationary source in accordance with Department Rule 62-212.400, F.A.C. – PSD;
- The proposed project is a Title V major source of air pollution in accordance with Chapter 62-213, F.A.C;
- The proposed project is not major source of HAP;
- The proposed project includes units subject to the NSPS of 40 CFR 60;
- The proposed project includes units subject to the NESHAP of 40 CFR 63;
- The proposed project includes a unit subject to the acid rain provisions of the Clean Air Act (CAA);

- The proposed project is subject to the Clean Air Interstate Rule (CAIR) in accordance with the Final Department Rules issued pursuant to CAIR as implemented by the Department in Rule 62-296.470, F.A.C.; and
- The project is not subject to certification under the Florida Power Plant Siting Act, 403.501-518, F.S. and Chapter 62-17, F.A.C.

4.10. Other Key Regulations Applicable to the Project

The following regulations also apply to the project:

- *Rule 62-210.700, F.A.C., Excess Emissions*;
- *Rule 62-296.320, F.A.C., General Pollutant Emission Limitation Standards* - specifically, prohibition of objectionable odors, a visible emissions standard of 20% opacity and prohibition of unconfined particulate emissions without reasonable precautions to prevent such emissions;
- *Rule 62-296.410, F.A.C., Carbonaceous Fuel Burning Equipment* - specifically, a PM standard of 0.2 pounds per mmBtu heat input (lb/mmBtu) and;
- *Rule 62-296.406, F.A.C., Fossil Fuel Steam Generators with Less than 250 mmBtu Heat Input* – specifically a visible emissions standard of 20% opacity and a requirement to conduct a BACT determination for PM and SO_2 (to the extent that fossil fuel is burned).

5. EMISSION LIMITS AND POLLUTANT CONTROLS

5.1. Emissions Pollutant Controls, Power Island (EU 002)

5.1.1. Bubbling Fluidized Bed Boiler Process Description

Figure 11 presents a schematic of a of a typical BFB boiler while Figure 12 shows a close-up of the BFB boiler combustion zone.

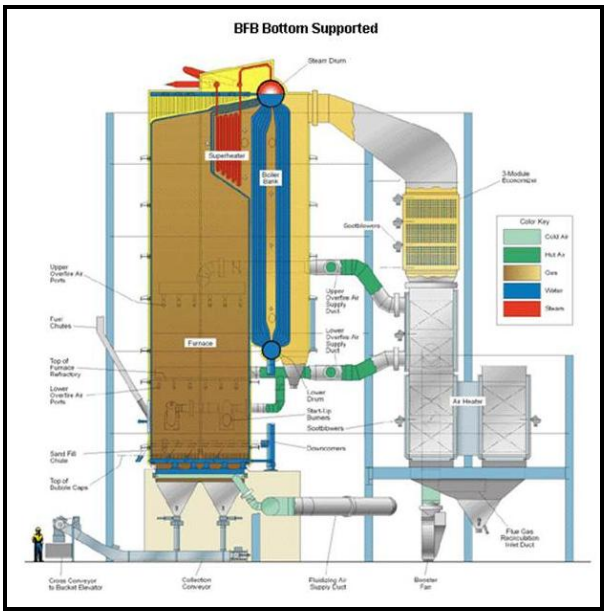

Figure 11. Typical BFB Boiler

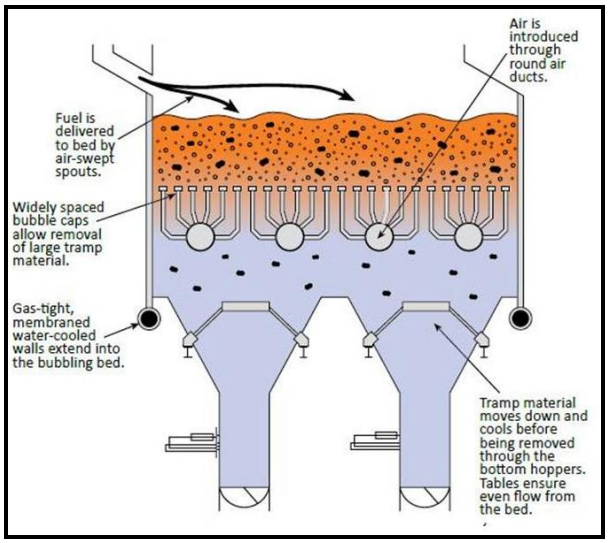

Figure 12. BFB Boiler Combustion Zone

The bed of a BFB boiler is located in the lower part of the furnace and is charged with sand. High pressure air is introduced through air ducts under the bed as shown in Figure 12 thus fluidizing the sand. The sand is initially heated with auxiliary fuel in this case natural gas. The auxiliary fuel is then shut off and biomass is introduced into the BFB boiler through fuel chutes on one or more of its walls.

The bed is operated under sub-stoichiometric (low oxygen) conditions. This has the effect of gasifying the fuel. The gasified fuel is promptly combusted with overfire air (OFA) introduced above the bed as shown in Figure 11. The BFB boiler temperature is maintained at approximately 1500°F. Bed temperature is controlled by adding or reducing air to the bed, adjusting fuel and employing flue gas recirculation. This particular design promotes attrition of the wood chips and minimizes the amount of unburned biomass carried away in the exhaust gas.

BFB boilers are capable of more efficiently combusting woody biomass than conventional types of boilers. The fluid-like mixture of sand and biomass is suspended in the BFB boiler's combustion chamber by a turbulent upward air flow. The turbulent mixing provides for greater chemical reaction efficiency in the BFB boiler.

The key characteristics of the BFB biomass-fueled boiler for the US EcoGen project are given in Table 6.

Table 6. Characteristics of the BFB Biomass-fueled Boiler

Parameter	Description
Boiler Type	BFB design
Primary Fuel	Clean woody biomass at maximum design rate of 107 tons per hour (tons/hour)
Supplemental Fuel	Natural gas
Ash Removal	From baghouse to ash storage silo via conveyors
Maximum Continuous Rating (MCR)	MCR is 565,000 pounds/hour of steam (peak is 110% of MCR)
Heat Input	Approximately 740 MMBtu/hour at MCR Maximum design rate from natural gas is 160 MMBtu/hr
Thermal Efficiency	To be established
Stack Parameters	11 feet diameter (maximum); 180 feet tall (minimum)
Flue Gas	295 °F at a nominal flow rate of 306,200 actual cubic feet per minute (ACFM); moisture content to be established
PM Control including HAP metals	Fabric filter baghouse greater than 99% control efficiency
NO_X Control including organic HAP	Selective catalytic reduction (SCR) based on NH_3 injection
SO_2 Control including acid gas HAP	A Spray Dryer Absorber (SDA) or multilevel and multipoint Dry Sorbent Injection (DSI) system prior to the fabric filter baghouse based on injection of a highly reactive alkaline absorbent such as lime to augment action of fly ash; use of natural gas as a supplemental fuel
VOC, CO Control including Organic HAP	GCP for VOC, organic HAP and CO; SCR for VOC and organic HAP

5.1.2. Pollution Controls for the Bubbling Fluidized Bed Boiler

Following are some observations provided by Babcock &Wilcox (a possible supplier of the BFB boiler) when comparing the emission characteristics of a typical stoker boiler with a BFB boiler.

"[In a stoker boiler] the combustion zone temperature is typically neither measured nor controlled and can range from 2200 to over 3000 °F. The BFB bed temperature is both measured and controlled to an optimum temperature of approximately 1500 °F.

"Due to the improved combustion process previously described for a BFB, the uncontrolled (upstream of any post combustion air quality control systems) NO_X, CO and VOC emissions for a BFB are typically 10 to 25% less for a given biomass fuel than for a stoker. The BFB emissions are also less susceptible to

variations in fuel properties that are inherent with any biomass plant. Under normal steady state operating conditions, both the BFB and stoker can be operated reliably within permitted emission limits.

"However, normal day-to-day operations in a typical plant are anything but steady state. Fuel variability is a fact of life, even when a conscious effort is made in the fuel yard to keep the fuel homogeneous. The large mass of bed material in the BFB creates a "flywheel effect," which is better suited to minimize spikes in emissions due to any changes in fuel characteristics. Conversely, the relatively low fuel inventory on a grate will typically be much more susceptible to an upset and potential emissions spikes, under changing fuel conditions."

Until recently, add-on controls were uncommon for biomass boilers (except for PM). The BFB design makes it possible to start with relatively low emissions prior to further control by add-on control equipment for pollutants other than PM.

The applicant proposes to control pollutant emissions from the BFB boiler as follows:

- NO_X, CO and organic HAP formation will be minimized by GCP in the BFB boiler;
- A portion of the acid gases (such as SO_2 and HCl) will be partially absorbed onto fly ash;
- A portion of the SO_2 and HCl will be neutralized and converted to particulate salts in a lime spray dryer absorber (SDA) system or a multilevel and multipoint dry sorbent injection (DSI) and multiclone system utilizing the sodium bicarbonate ($NaHCO_3$);
- PM, PM_{10}, $PM_{2.5}$ and metal HAP together with the acid gas products will be captured in a fabric filter (baghouse);
- NO_X that are formed will be controlled by an aqueous NH_3 based selective catalytic reduction (SCR) system; and
- Organic HAP and VOC that are formed will be largely destroyed by the SCR system.

5.1.3. Requirement of NSPS Subpart Db

Table 7 is a summary of the key applicable requirements from NSPS Subpart Db applicable to the biomass-fueled BFB boiler. The complete list of requirements is available at: Link to Subpart Db

Table 7. NSPS Subpart Db – Emission Standards Applicable to Biomass-Fueled Boiler

SO_2 [1] (lbs/mmBtu)	**PM** [2] (lb/mmBtu)	**Opacity** [3] (%)	**NO_X** [4] (lb/mmBtu)
0.32	0.030	20%	0.30

1. This is not a limit. If uncontrolled SO_2 emissions (such as for inherently low sulfur wood) are less than 0.32 lb/MMBtu then no specific limit applies per NSPS Subpart Db (40 CFR 60.42b(k)1 and 2). Controlled annual SO_2 mass emission limit equates to approximately 0.070 lb/mmBtu. Sources that achieve this limit are excluded from other SO_2 reductions under NSPS Db.
2. Filterable PM only.
3. Visible emissions (VE) shall meet 20 percent opacity (6-minute average), except for one 6-minute period per hour of not more than 27 percent.
4. Applies to facilities that combust wood with natural gas having a very low sulfur content. 30-day basis.

5.1.4. Requirements of NESHAP Subpart JJJJJJ

Table 8 is a summary of the key applicable requirements from NESHAP Subpart JJJJJJ applicable to the biomass-fueled BFB boiler at an area source of HAP. The complete list of requirements is available at: Link to Subpart JJJJJJ

Table 8. NESHAP Subpart JJJJJJ – Emission Standards Applicable to Biomass-Fueled Boiler

Emission Standards [1,2,3]	Management Practices During Start-ups and Shutdowns	Biennial Tune-ups	Energy Assessment
PM = 0.03 lb/MMBtu	Yes	Yes	No

1. For fabric filter control of PM, maintain visible emissions to less than or equal to 10% opacity (daily block average) **or** install and operate a bag leak detection system according to §63.11224 and operate the fabric filter such that the bag leak detection system alarm does not sound more than 5% of the operating time during each 6-month period;
2. For boilers that operate dry control systems, the boilers must maintain opacity to less than or equal to 10% opacity (daily block average); **and**
3. For boilers that demonstrate compliance with a performance stack test, maintain the operating load of each unit such that it does not exceed 110% of the average operating load recorded during the most recent performance stack test.

5.1.5. Summary of Emission Standards for the Biomass-fueled BFB Boiler

Table 9 is a summary of the emission limits applicable to the woody biomass-fueled boiler.

Table 9. Emission Limits Applicable to the Biomass-fueled Boiler

Pollutant	Limit	Basis
PM/PM_{10}	0.03 lb(f)/MMBtu [1], stack test	NSPS Subpart Db and NESHAP JJJJJJ, Applicant Request, avoids PSD
NO_X	0.30 lb/MMBtu, 30-day CEMS	NSPS Subpart Db
	246 tons/year [2], 12-month CEMS	Applicant Request, avoids PSD
SO_2	227 tons/year [3], 12-month CEMS	Applicant Request, avoids PSD
CO	246 tons/year [4], 12-month CEMS	Applicant Request, avoids PSD
HCl [5]	2.26 lb/hour and 9.9 tons/year Initial and annual stack tests [5]	Applicant Request, avoids HAP Major Source
VE [6] (opacity)	10% average, daily block COMS	NESHAP JJJJJJ, Reasonable Assurance [6]
	20% (27%), one 6-minute block/hour	NSPS Subpart Db

1. Filterable fraction denoted by lb(f) and measured by EPA Method 5 stack test.
2. Annual NO_X mass emission limit equates to 0.076 lb/MMBtu.
3. Uncontrolled SO_2 emissions are less than 0.32 lb/MMBtu and no specific limit applies per NSPS Subpart Db (40 CFR 60.42b(k)1 and 2). Controlled annual SO_2 mass emission limit equates to approximately 0.070 lb/mmBtu.
4. No NSPS or NESHAP based CO limits apply. Annual CO mass emission limit equates to 0.076 lb/MMBtu.
5. For HCl, Performance curves in conjunction with annual stacking testing to determine suitable sorbent inject rates shall be used to show compliance with the 9.9 tons/year emission limit.
6. VE by continuous opacity monitoring system (COMS). VE standard of 10% opacity per NESHAP Subpart JJJJJJ. VE must meet 20 percent opacity (6-minute average), except for one 6-minute period per hour of not more than 27 percent to meet NSPS Subpart Db requirements. Meeting the Subpart Db requirements ensure meeting the VE requirements of Rules 62-296.320 and 62-296.406, F.A.C. The permittee must meet the work practice standard requirements of the NESHAP JJJJJJ during periods of startup, shutdown and malfunction. A work practice standards plan to minimize emissions during these periods shall be submitted to the Compliance Authority for approval no later than 180 days prior to boiler startup. Opacity of 10% provides reasonable assurance of continuous compliance with PM/PM_{10} and is a reasonable expectation given catalyst-based NO_X, CO, VOC controls.

The values provided in the foregoing table meet: the applicable requirements of 40 CFR 60, Subpart Db; the applicable requirements of 40 CFR 60, Subpart JJJJJJ; the Department's General Visibility rule at Section 62-296.320(4)(b)1., F.A.C.; the Department's Carbonaceous Fuel Burning Rule at Section 62-296.410, F.A.C.; and avoidance of PSD applicability in accordance with Rules 62-210 and 62-212, F.A.C.

5.1.6. Restrictions on BFB Boiler Natural Gas Usage

NSPS Subpart Da does not apply because the gas burner will not be capable of combusting 250 MMBtu/hour or more of natural gas. The EPA greenhouse gas (GHG) rule does not apply because annual emissions will be less than 100,000 tons/year as CO_2 equivalent (CO_2e). The applicant has proposed the following restrictions on the natural gas burner and on the use of natural gas to provide reasonable assurance that these requirements will not be triggered (with a margin of safety).

- The burner equipment to fire natural gas in the BFB boiler shall be physically constrained such that it cannot burn more than 160 MMBtu/hour of heat input from natural gas; and
- The maximum amount of natural gas burned in the BFB boiler during any 12-month consecutive period shall be restricted to 1,374 million standard cubic feet (~ 82,000 tons/year of CO_2).

BFB Boiler Startup, Shutdown and Malfunctions

BFB boiler startups, shutdown and malfunctions are conditions subject to the previously described excess emissions provisions at Rule 62-210.700, F.A.C and the requirements of NESHAP Subpart JJJJJJ. The applicable CEMS-based SO_2, NO_X, and CO emissions limits are largely 30-day or 12-month rolling limits that do not provide for data exclusion per the applicable NSPS Subpart or the nature of emission caps for the purposes of avoiding PSD. The applicant must therefore insure that excess emissions do not occur for these mentioned pollutants for the applicable averaging periods. Excess PM/PM_{10} emissions are also not allowed.

The excess emission rule can apply to VE/opacity. However, the NESHAP Subpart JJJJJJ requirement of 10% opacity (daily block average) precludes excess opacity during periods of startup, shutdown or malfunction.

5.1.7. Auxiliary Cooling Tower

As previously mentioned, an auxiliary cooling tower will be used to provide cooling for various components, including turbine lube oil, BFB lube oil and generator coolers. The auxiliary cooling tower has the potential to emit a small amount of PM in the form of mist. To minimize PM, the auxiliary cooling tower will incorporate a drift eliminator. The drift eliminator can eliminate drift to approximately 0.05% of circulating water.

The auxiliary cooling tower will have a design circulation water flow rate of 60,000 gallons per hour (gal/hr) with an anticipated total dissolves solids (TDS) content 500 milligrams per liter (mg/l). The estimated PM emissions from the auxiliary cooling tower are 5.0 lb/hour and 2.2 tons/year.

5.1.8. Sand Storage Silo

A storage silo for sand is required to provide makeup sand for the BFB boiler bed. The storage silo will utilize either a breather vent or vent filter to control PM emission during sand loading operations. The estimated flow rate from the vent during loading operations is 2,000 dry standard cubic feet per minute (dscf/minute) at a loading rate of 0.01 gr/dscf. This equates to estimated PM emissions of 0.17 lb/hour and 0.75 tons/year.

5.2. Emission and Pollutant Controls, Fuel Receiving, Handling, Storage and Processing (EU 001)

Table 10 is a listing of the estimated emission from EU 001 including fugitive emissions.

Fugitive emissions are not counted in determining whether this particular project is subject to PSD. However, the Department requires adherence to Rule 62-296.320(4)(c), F.A.C., which specifies the types of reasonable precautions required to control unconfined emissions of PM.

The applicant submitted a BMP plan that describes fugitive dust minimization, storage pile management, fire prevention/spontaneous combustion minimization and quality assurance procures for the clean woody biomass fuel. The BMP plan broken down by category is provided in Tables 11, 12, 13 and 14 below.

Table 10. Estimated Potential to Emit (PTE) Criteria Air Pollutants (tons/year)

Source Operation	PM	PM_{10}	$PM_{2.5}$
Woody Biomass Handling and Processing	1.71	0.81	0.12
In-plant Paved Roads	21.7	4.2	0.6
Wood chipper emissions	8.76	0.44	0.22
Woody Biomass Pile Processing	1.0	0.05	0.01
Woody Biomass Pile Wind Erosion	0.7	0.4	0.1
EU Total Including Fugitive Sources	33.87	5.9	1.05

Table 11. BMP: Minimization of Fugitive Dust

- Conveyor systems and associated drop points shall be enclosed or partially enclosed.
- Drop points to chipped woody biomass storage area shall be designed to minimize the overall exposed (or exposed to atmosphere) drop height.
- Fly ash storage silo shall be equipped with vent filter or equivalent device.
- Procedures shall be established for defining excessive fugitive dust from woody biomass truck unloading operations.
- All major roadways at the plant shall be paved. Unpaved roadways should be maintained to minimize dust potential.

Table 12. BMP: Storage Pile Management

- Woody biomass storage areas (chipped/logs) shall be managed to avoid excessive wind erosion.
- A woody biomass fugitive dust management plan shall be developed and maintained onsite. Plan shall identify warning signs for conditions that could result in excessive dust formation. Plant personnel shall be trained on what warning signs to look for.

Table 13. BMP: Fire Prevention/Spontaneous Combustion Minimization

- Contact local fire marshal to develop fire management plan. Plan shall be maintained on site.
- Incoming unprocessed materials shall be stored in areas with a clearance between each storage area (includes chipped and log storage areas).
- The stacker reclaimer being used shall maximize the removal of older material in order to minimize the stacking of newer material on top of the older material.

Table 14. BMP: Quality Assurance of Clean Woody Biomass

- The feedstock for the bubbling fluidized bed (BFB) boiler will consist of clean woody biomass (i.e., eucalyptus trees) that will be processed in designated fuel preparation area (or areas) where it will be sorted, screened, and sized as necessary, placed in the storage areas or sent directly to the BFB boiler.
- The permittee will contract for woody biomass that specifically meets the definition of woody biomass as identified in the permit. The woody biomass will consist of clean untreated wood or untreated wood products including clean untreated lumber, tree stumps (whole or chipped), tree limbs (whole or chipped) and slash.
- The woody biomass feedstock will be delivered to the Polk County Plant in vehicles designed to prevent release.
- For each shipment of woody biomass, the permittee shall record the date, quantity and a description

of the material received.

- The permittee shall inspect each shipment of woody biomass upon receipt for any material not specifically identified in this plan. If the permittee identifies any such material, the material shall be rejected and/or marshaled in specified areas until proper disposal can be arranged. Rejected materials shall be moved off site in a logistically reasonable time period.
- The following items are not considered woody biomass and are expressly prohibited:
  - those materials that are prohibited by state or federal law;
  - plastics;
  - woody biomass that has been chemically treated or processed;
  - yard trash;
  - municipal solid waste;
  - paper;
  - treated wood such as CCA or creosote;
  - painted wood; and
  - wood wastes from landfills.

5.3. Emissions and Pollutant Controls, Ash Handling, Storage and Shipment (EU 003)

This EU deals with the fly and bottom ash generated by combusting the biomass fuel in the BFB boiler. Air emissions consist of PM. The portion of this EU dealing with fly ash is composed of covered conveyors and a fly ash storage silo. The conveyors transport the fly ash from the BFB boiler's fabric filter baghouse to a storage silo. The storage silo will be equipped with a vent filter to minimize any PM during fly ash silo loading operations. The design PM outlet concentration of the vent filter is 0.01 gr/dscf. Fly ash from the storage silo will be sent to a truck loading operation for removal offsite. Estimated emission from fly ash silo loading operations and truck load out are less than 1.0 tons/year.

Bottom ash will be in the form of large solid particles and will be removed from the BFB boiler and stored in a metal container for future removal off-site. No PM emissions are anticipated from this process

5.4. Emissions and Pollutant Controls, Emergency Equipment (EU 004 and EU 005)

5.4.1. Emergency Generator

A nominal 493 kW emergency generator will be used. The generator will be limited to 100 operational hours or less per year for maintenance and testing purposes. The generator will be supported by a nominal 600 gallon diesel fuel storage tank. The storage tank is equipped with an emergency pressure relief vent cap. Table 15 provides the emission limits pursuant to 40 CFR 60, Subpart IIII per §89.112, Tier 3. Compliance with this standard also satisfies the requirements of 40 CFR 63, Subpart ZZZZ.

Table 15. NSPS Subpart IIII – Standards Applicable to the Emergency Generator

Capacity Category (Tier 3)	**CO** (g/kW-hr)[1]	**PM** (g/kW-hr)	**SO_2**[2] **(% S)**	**NMHC**[3]**+NO_X** (g/kW-hr)
(450≤ kW and ≤ 560 kW)	3.5	0.2	0.0015	4.0

1. g/kW-hr means grams per kilowatt-hour.
2. SO_2 emission standard will be met by using ultra low sulfur distillate fuel oil in the emergency generator with fuel sulfur (S) content of 0.0015% by weight.
3. NMHC means Non-Methane Hydrocarbons.

5.4.2. Emergency Fire Pump Engine

A nominal 200 Hp emergency fire pump engine will be used. The pump will be limited to 100 operational hours or less per year for maintenance and testing purposes. The pump will be supported by a nominal 200 gallon diesel fuel storage tank. The storage tank is equipped with an emergency pressure

relief vent cap. Table 16 is a summary of the emission limits pursuant to 40 CFR 60, Subpart IIII for the category that covers the fire pump engine.

Table 16. NSPS Subpart IIII – Emission Standards Applicable to the Emergency Water Pump

Emergency Pumps (2009 and later)	**CO** (g/hp-hr)[1]	**PM** (g/hp-hr)	**SO_2**[2] **(% S)**	**NMHC+NO_X** (g/hp-hr)
(≥ 300 hp and < 600 hp)	2.6	0.15	0.0015	3.0

1. g/hp-hr means grams per horsepower-hour.
2. SO_2 emission standard will be met by using ultra low sulfur distillate fuel oil in the emergency pumps with a fuel sulfur content of 0.0015% by weight.

6. AMBIENT AIR QUALITY

6.1. Introduction

The proposed project will not increase emissions of criteria pollutants at levels in excess of PSD significant emission rates (SER). Although the proposed project is not PSD applicable, the applicant provided an air quality analysis to ensure that the conversion will not cause or contribute to a violation of a National Ambient Air Quality Standard (NAAQS).

6.2. Major Stationary Sources near Polk County

The current largest stationary sources around the proposed project site in Southern Polk County are listed below. The information is from annual operating reports submitted to the Department from 2010. The future estimates for US EcoGen are included for comparison.

Table 17. Largest Sources of NO_X near the proposed project site (2010)

Owner	Site Name	County	tons/year
Tampa Electric (TECO)	Big Bend Station	Hillsborough	4,835
Florida Power and Light (FPL)	Manatee Power Plant	Manatee	2,161
Lakeland Electric	CD McIntosh Plant	Polk	1,544
Hillsborough County	Hillsborough Resource Recovery	Hillsborough	865
Progress Energy	Hines Energy Complex	Polk	711
TECO	Bayside Power Station	Hillsborough	604
TECO	Polk Power Station	Polk	472
Seminole Electric	Midulla Generating Station	Hardee	397
City of Tampa	McKay Bay Refuse-to-Energy	Hillsborough	330
Wheelabrator Ridge Energy	Ridge Generating Station	Polk	247
US EcoGen Polk, LLC	**US EcoGen Polk (proposed)**	**Polk**	**247**
Mosaic Fertilizer	New Wales Facility	Polk	211
Mosaic Fertilizer	Riverview Facility	Hillsborough	146
Mosaic Fertilizer	Bartow Facility	Polk	130
Cutrale Citrus Juices USA	Cutrale Citrus Juices USA	Polk	118
CF Industries	Plant City Phosphate Complex	Hillsborough	95

Table 18. Largest Sources of SO_2 near the proposed project site (2010)

Owner	Site Name	County	tons/year
TECO	Big Bend Station	Hillsborough	9,617
Mosaic Fertilizer	New Wales Facility	Polk	7,900
FPL	Manatee Power Plant	Manatee	7,492
Mosaic Fertilizer	Bartow Facility	Polk	4,088
Lakeland Electric	CD McIntosh Plant	Polk	4,240
Mosaic Fertilizer	Riverview Facility	Hillsborough	3,144
CF Industries	Plant City Phosphate Complex	Polk	2,525
Tampa Electric Company	Polk Power Station	Polk	1,386
Mosaic Fertilizer	South Pierce Facility	Polk	547
Envirofocus Technologies	Envirofocus Lead Battery Recycling	Hillsborough	306
US EcoGen Polk, LLC	**US EcoGen Polk (proposed)**	**Polk**	**227**
Wheelabrator Ridge Energy	Ridge Generating Station	Polk	170

Table 19. Largest Sources of PM_{10} near the proposed project site (2010)

Owner	Site Name	County	tons/year
TECO	Big Bend Station	Hillsborough	857
FPL	Manatee Power Plant	Manatee	629
TECO	Bayside Power Station	Hillsborough	206
Lakeland Electric	CD McIntosh Plant	Polk	195
US EcoGen Polk, LLC	**US EcoGen Polk (proposed)**	**Polk**	**194**
Mosaic Fertilizer	New Wales Facility	Polk	113
Progress Energy	Hines Energy Complex	Polk	85
Conagra Foods	Conagra	Hillsborough	81

Table 20. Largest Sources of CO in near the proposed project site (2010)

Owner	Site Name	County	tons/year
TECO	Big Bend Station	Hillsborough	9,168
Cutrale Citrus Juices USA	Cutrale Citrus Juices USA	Polk	984
FPL	Manatee Power Plant	Manatee	891
Lakeland Electric	CD McIntosh Plant	Polk	642
Wheelabrator Ridge Energy	Ridge Generating Station	Polk	502
Progress Energy	Hines Energy Complex	Polk	446
Citrosuco North America	Citrosuco North America	Polk	398
Envirofocus Technologies	Envirofocus Lead Battery Recycling	Hillsborough	350
TECO	Bayside Power Station	Hillsborough	317
Citrus World	Citrus World	Polk	248
US EcoGen Polk, LLC	**US EcoGen Polk (proposed)**	**Polk**	**247**
Bartow Citrus Products	Bartow Citrus Products	Polk	197
Auburndale Power Partners	Auburndale Power Partners	Polk	174
Tampa Electric Company	Polk Power Station	Polk	139

Table 21. Largest Sources of VOC near the proposed project site (2010)

Owner	Site Name	County	Tons/year
Citrus World	Citrus World	Polk	561
Cutrale Citrus Juices USA	Cutrale Citrus Juices USA	Polk	561
Citrosuco North America	Citrosuco North America	Polk	430
Tropicana Manufacturing	Tropicana Bradenton	Manatee	250
TECO	Bayside Power Station	Hillsborough	176
Bartow Citrus Products	Bartow Citrus Products	Polk	163
Genpak	Genpak	Hillsborough	153
Manatee County Utilities	Manatee County Landfill	Manatee	149
Central Florida Pipeline	Tampa Terminal	Hillsborough	121
Dart Container Corp	Dart Container Corp	Hillsborough	121
Progress Energy	Hines Energy Complex	Polk	118
Carpenter Company	Carpenter Insulation Division	Polk	115
Keymark Corp. of Florida	Lakeland Plant	Polk	111
FPL	Manatee Power Plant	Manatee	97
Carlisle Construction Materials	Insulfoam	Polk	95
TECO	Big Bend Station	Hillsborough	90
US EcoGen Polk, LLC	**US EcoGen Polk (proposed)**	**Polk**	**66**

The main industrial pollutants in Polk, Hillsborough and Manatee Counties are from electric power generation, fertilizer manufacturing and citrus processing.

6.3. SO_2 and NO_X Emission Trends from Power Plants in Florida

The Department graphed the SO_2 and NO_X emission trends during the period 1998-2011 from power plants in Florida that report their emissions to the EPA Clean Air Markets database. The results are summarized in Figure 13.

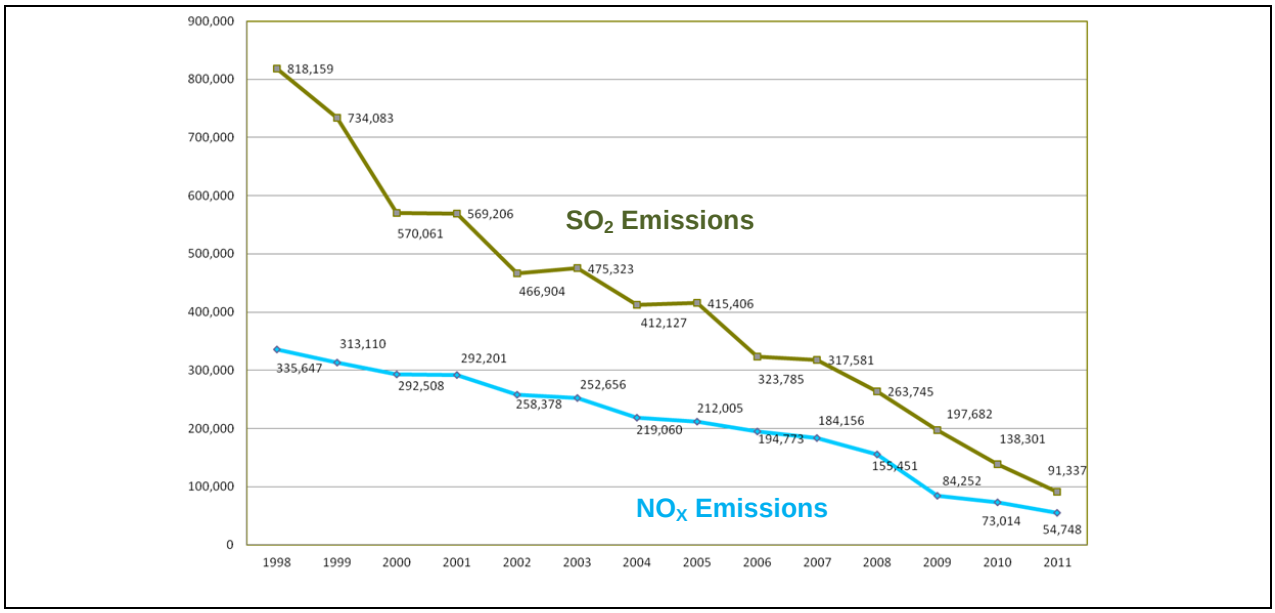

Figure 13. SO_2 and NO_X reductions in tons/year at Florida Power Plants (1998-2011)

SO_2 emissions from power plants in Florida have declined by more than 725,000 tons/year and 89% referenced to 1998. NO_X emissions from power plants in Florida were reduced by more than 280,000 tons/year and 84% referenced to 1998. The main reasons include installation of air pollution control equipment on conventional coal-fueled power plants and construction of natural gas-fueled combined cycle units to add or replace system capacity.

6.4. Air Quality and Monitoring in the Polk County

The Department operates several monitors across the county measuring PM_{10}, $PM_{2.5}$, CO, ozone, NO_2 and SO_2. The 2011 monitoring network closest to the project site is shown below in Figure 14. The 2009-2011 ambient air summaries for the stations near the project site are given in Table 22.

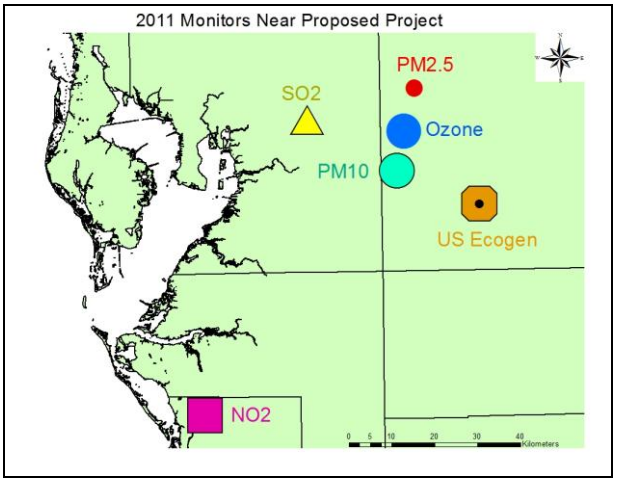

Figure14. Ambient Air Quality Monitors Nearest to US EcoGen

Table 22. Ambient Air Quality Measurements Nearest to the Project Site (2009-2011)

Pollutant	Location (Site Number)	Averaging Period	Ambient Concentration			
			Compliance Period	Value	Standard	Units [a]
PM_{10}	Mulberry (105-0010)	24-hour [b]	2011	33	150	$\mu g/m^3$
		Annual [e]	2011	16	50	$\mu g/m^3$
$PM_{2.5}$	Lakeland, Polk (105-6006)	24-hour [d]	2009-2011	15	35	$\mu g/m^3$
		Annual [e]	2009-2011	7.5	15.0	$\mu g/m^3$
SO_2	Dover (057-3002)	1-hour [i]	2011	25	75	ppb
		3-hour [b]	2011	0.01	0.5	ppm
		24-hour [b]	2011	0.003	0.14	ppm
		Annual [f]	2011	0.001	0.03	ppm
NO_2	Sarasota (115-1006)	Annual [c]	2011	3	53	ppb
		1-hour [h]	2009-2011	17	100	ppb
CO	Dover (057-3002)	1-hour [f]	2011	0.9	35	ppm
		8-hour [g]	2011	0.5	9	ppm
Ozone	Medulla (105-6005)	8-hour [g]	2011	0.068	0.075	ppm

a. Units are in: micrograms per cubic meter ($\mu g/m^3$); parts per billion (ppb); or parts per million (ppm).
b. Not to be exceeded on more than an average of one day per year over a three-year period.
c. Arithmetic mean.
d. Three year average of the 98th percentile of maximum daily 24-hour concentrations with exceptional events excluded (as approved by EPA).
e. Three year average of the arithmetic annual means.
f. Not to be exceeded more than once per year.
g. Three year average of the annual 4th highest daily 8-hour maximum.
h. Three-year average of the annual 98th percentile maximum daily 1-hour value
i. Three-year average of the annual 99th percentile maximum daily 1-hour value

6.5. Existing Ambient Air Quality Near Project Site – $PM_{2.5}$ and Ozone

Ozone is a key indicator of the overall state of regional air quality. It is not emitted directly from combustion processes. Rather it is formed from VOC and NO_X emitted primarily from regional industrial and transportation sources. VOC is also emitted from authorized agricultural fires, natural drought-related fires and natural emissions from vegetation. These two precursors participate in photochemical reactions that occur on an area-wide basis and are highly dependent on meteorological factors.

$PM_{2.5}$ (also known as PM_{fine}) is another key indicator of the overall state of regional air quality. Some $PM_{2.5}$ is directly emitted as a product of combustion from transportation and industrial sources as well as fires. Much of it consists of particulate nitrates and sulfates formed through chemical reactions between gaseous precursors such as SO_2 and NO_X from combustion sources and NH_3 naturally present in the air or added by other industrial sources.

Ozone limits and measurements in Table 22 are summarized on three year blocks, rolled annually. The reported ozone value was calculated by taking the maximum 8-hour readings recorded each day during the three years. The fourth highest of the recorded maxima were identified for each year and then the average of those three values was reported as the compliance value given in Table 22 and Figure 15.

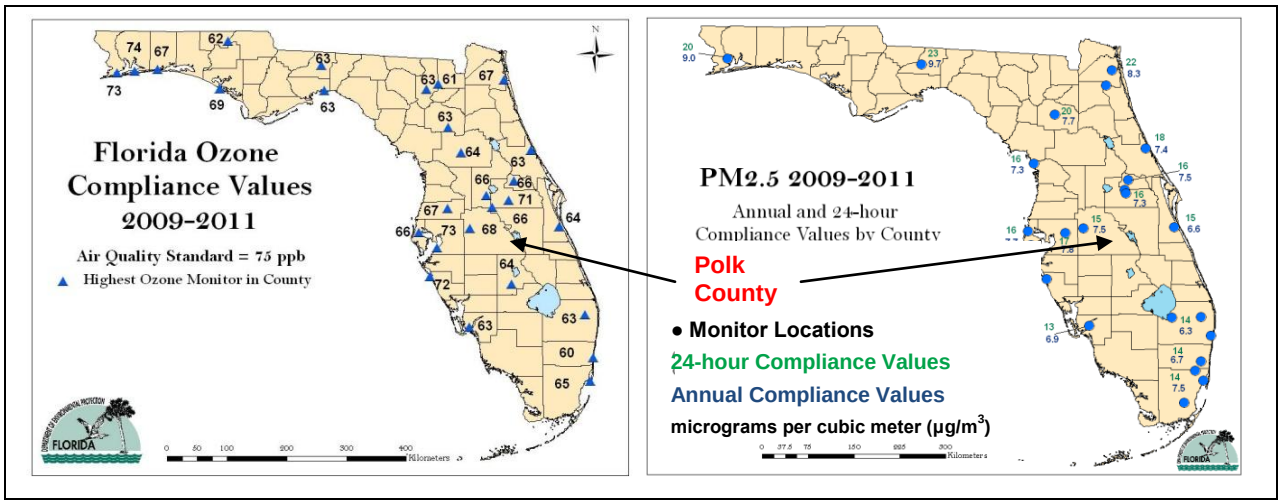

Figure 15 – Florida Ozone Compliance Values **Figure 16 – Florida $PM_{2.5}$ Compliance Values**

$PM_{2.5}$ limits and measurements are summarized on three-year blocks, rolled annually. The reported 2011 24-hour compliance value for $PM_{2.5}$ is 15 $\mu g/m^3$ as indicated above in Figure 16 and Table 22 for the Lakeland (Polk County) site. These values were calculated by taking the average 24-hour readings recorded each day during the three years (2009-2011). The value for each year that exceeds 98% of all daily measurements within each given year was identified and then the average of those three numbers was reported as the 24-hour compliance value and compared with the standard of 35 $\mu g/m^3$.

The simple average of all $PM_{2.5}$ measurements within each three years (2009-2011) was also calculated and then the mean of the three averages (7.5 μg/m^3) was reported as the annual compliance value and compared with the standard of 15 μg/m^3. Based on the data, Polk County is in attainment with the ozone and the $PM_{2.5}$ ambient air quality standards.

6.6. Air Quality Impact Analysis

The applicant provided an air quality analysis which included air quality modeling to show compliance with the NAAQS.

6.6.1. Receptor Grid

A combination of fence line, near-field and far-field receptors were chosen for predicting maximum concentrations in the vicinity of the project. The fence line receptors consisted of 50 discrete Cartesian receptors around the facility fence line. The remaining receptor grid consisted of densely spaced Cartesian receptors at 100 meters apart starting at the property line and extending to 1 kilometer from the facility. Cartesian receptors with a spacing of 200 meters were used from 1 to 2 kilometers, 500 meter spacing from 2 to 5 kilometers, and 1,000 meter spacing from 5 to 20 km from the plant site.

6.6.2. Models and Meteorological Data Used in the Air Quality Analysis

PSD Class I & II Areas: The AERMOD modeling system was used to evaluate the pollutant emissions from the proposed project. AERMOD was approved by the EPA in November 2005. The AERMOD modeling system incorporates air dispersion based on planetary boundary layer turbulence structure and scaling concepts, including the treatment of both surface and elevated sources, and both simple and complex terrain. AERMOD contains two input data processors, AERMET and AERMAP. AERMAP is the terrain processor and AERMET is the meteorological data processor.

Specific model features, recommended by the EPA, are referred to as the regulatory options. The applicant used the EPA recommended regulatory options. Direction-specific downwash parameters were used for all sources for which downwash was considered. Building downwash effects were included in the modeling analysis.

The AERMET meteorological data used for this analysis consisted of a concurrent 5-year period of hourly surface weather observations and twice-daily upper air soundings from Orlando by the National Weather Service. The 5-year period of meteorological data was from 2006 through 2010. The project site is close in proximity to both locations, and surrounding land use is also very similar to the project site. Because of this, the data is representative of the project site.

6.6.3. Results of Ambient Air Quality Analysis

The total impact on ambient air quality is obtained by adding a "background" concentration to the maximum modeled concentration. This "background" concentration takes into account all sources of a particular pollutant that are not explicitly modeled. The maximum modeled concentrations listed below are the 6th-highest values produced by AERMOD. For NO_X modeling, the applicant used the Tier 1 screening analysis and conservatively assumed that 100% of the modeled NO_X emissions convert to NO_2. For PM_{10} and $PM_{2.5}$ modeling, the emission inventories from the plant included both filterable and condensable portions.

The results of the AAQS analysis are summarized in Table 23. As shown in the table, emissions from the proposed facility (and all other development in the area) are not expected to cause or contribute to a violation of an AAQS.

6.6.4. Conclusion regarding Air Quality

Emissions from the proposed US EcoGen Polk Biomass generating Facility will not trigger PSD. The results of the air quality impact assessment demonstrate that the proposed plant will not cause or contribute to a violation of an ambient air quality standard.

Table 23. Projected Ambient Air Quality Concentrations after US EcoGen Polk

Pollutant	Averaging Time	Major Sources Impact ($\mu g/m^3$)	Background 2009- 2011 ($\mu g/m^3$)	Total Impact ($\mu g/m^3$)	AAQS ($\mu g/m^3$)	Total Impact Greater Than AAQS?
PM_{10}	24-hour	89	33	122	150	NO
	Annual	17	16	33	50	NO
$PM_{2.5}$	24-hour	6	15	21	35	NO
	Annual	2	8	10	15	NO
SO_2	1-hour	12	66	78	195	NO
	3-hour	12	37	49	1,300	NO
	24-hour	4	8	12	260	NO
	Annual	1	3	4	60	NO
NO_2	Annual	1	5	6	100	NO
	1-hour	31	32	63	188	NO
CO	1-hour	426	1,035	1,461	40,000	NO
	8-hour	199	575	774	10,000	NO

7. PRELIMINARY DETERMINATION

The Department makes a preliminary determination that the proposed US EcoGen, Polk Project will comply with all applicable state and federal air pollution regulations as conditioned by the Draft Permit. This determination is based on a technical review of the complete application, reasonable assurances provided by the applicant, the draft emissions standards determinations, review of the air quality impact analysis, and the conditions specified in the draft permit.

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