Bioenergy Project Permitting in Florida

Paper # 503

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ABSTRACT

The Florida Department of Environmental Protection (Department) has been heavily involved in the permitting of bioenergy projects during the last several years. These projects involve power generation (24 to 100 megawatts) utilizing biomass as the primary fuel source and included: the burning of woody biomass in boilers of various types to generate electrical power; gasification of woody biomass with the resulting synthetic gas (syngas) fired in combustion turbine electrical generators (CTG) to generate electrical power; plasma arc gasification of municipal solid waste (MSW) with the resulting syngas burned in a thermal oxidizer (TO) to generate electrical power; and a sweet sorghum-to-ethanol cogeneration power plant which burns the sweet sorghum bagasse by-product of ethanol production in a boiler to generate electrical power. These projects were both major emission sources requiring Prevention of Significant Deterioration (PSD) review along with a corresponding Best Available Control Technology (BACT) determination and minor sources requiring a less stringent review. Many lessons were learned while permitting these projects. Specifically, detailed knowledge was gained with respect to: New Source Performance Standard (NSPS) applicability; State Rule and Statute applicability; hazardous air pollutant (HAP) emissions such as dioxin and furans (D/F), hydrogen chloride (HCl) and hydrogen fluoride (HF) and their corresponding control; the feasibility of different types of pollution control equipment such as selective catalytic reduction (SCR) systems for nitrogen oxide (NO_X) and HAP control and oxidization catalysts for carbon monoxide (CO) and HAP control; continuous emissions monitoring systems (CEMS) especially with regard to HAPs such as mercury (Hg), HCl and HF; best management practices with regard to biomass handling, processing and storage; air modeling issues; and public concerns and outreach. This paper briefly describes the knowledge gained during these bioenergy project permitting efforts, along with possible pitfalls and concerns that should be addressed while permitting such projects and the critical questions that should be asked of the applicant before and after an application is received.

INTRODUCTION

In the last four years (as of March 25, 2011), the Department has received 11 applications for air construction permits for projects utilizing biomass, including WTE, as the principal fuel source for power generation. Three of these applications were withdrawn with seven receiving final air construction permits and the remaining project application currently under review by the Department. These projects range in net power generation from 2 megawatts (MW) to 100 MW and in two cases also produce ethanol. Generally these projects generate 50 to 60 MW of power. While permitting these projects, the Department has learned many important lessons with regards to application requirements for completeness, the applicability of State and Federal Rules and Statues, PSD and BACT requirements, viable pollution control equipment, critical HAP and their control, pollutant monitoring requirements and the public views on such projects, including

Environmental Justice issues. The purpose of this paper is to briefly discuss these lessons learned to help both applicants and state and federal agencies in permitting such projects in a comprehensive and timely manner while informing and educating the public about such projects.

BIOMASS RESOURCES AND PROJECT S IN FLORIDA

As shown in Figure 1 below, biomass resources are plentiful in Florida, especially in the panhandle, big bend, northeast, north-central, south-central and southeast regions of the state.

Figure 1. Biomass Resources in Florida.

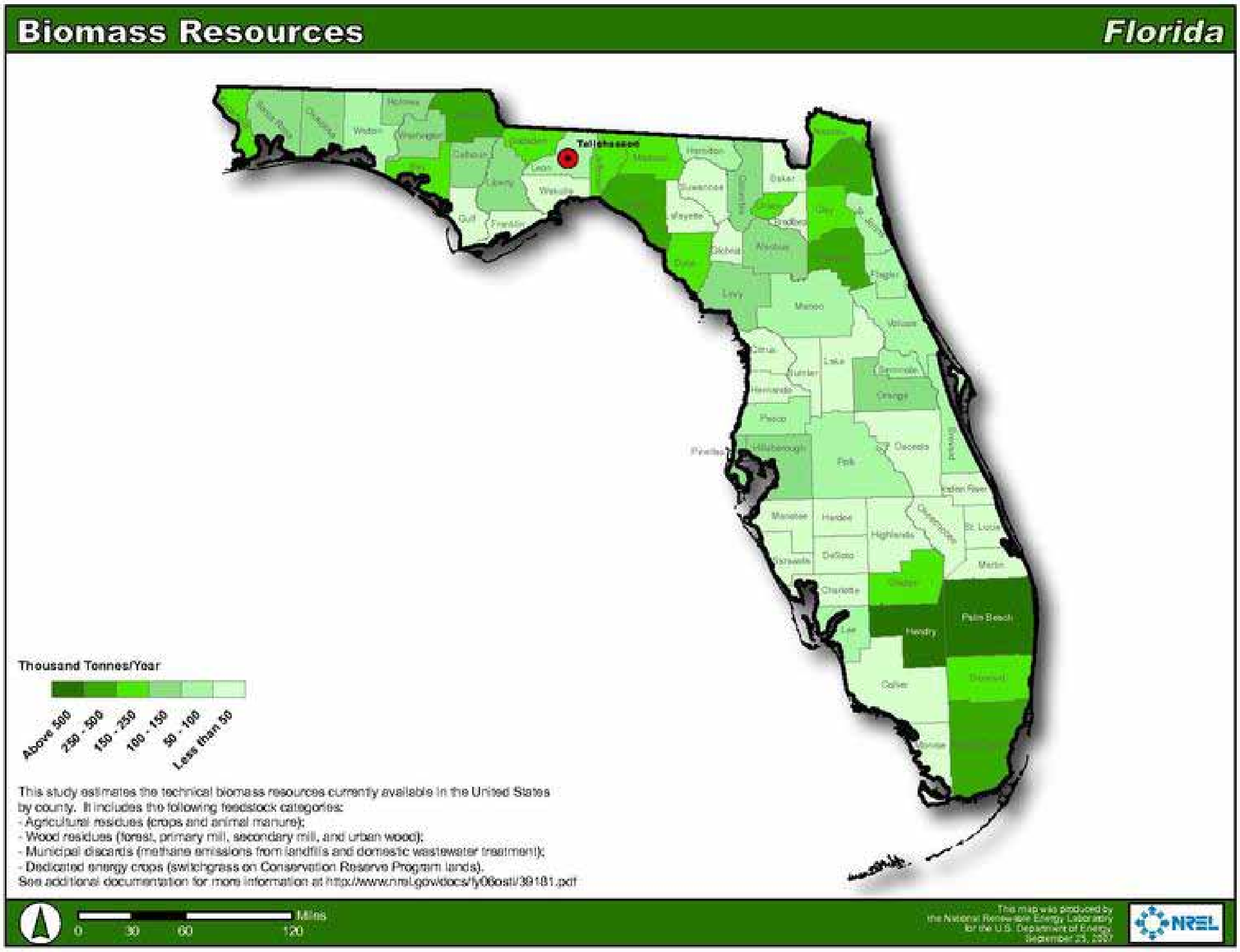


Figure 2 below shows the locations of proposed bioenergy and biofuel projects in Florida. The nine bioenergy projects addressed by this paper are included on this figure. In addition, several ethanol projects (Sunshine and Highlands) that do not produce power for export, and consequently are not addressed in this paper, are also shown on the figure. As seen from Figure 2, the bioenergy projects tend to be located in areas of the state that are rich in biomass resources. This is due in large part to the high moisture content and relatively low energy density of biomass fuels, which makes long transportation distances economically infeasible. Research has indicated that enough biomass must be available within a 100 mile radius of a project for it to be economically viable[1]. In turn, this fuel supply radius restriction tends to limit the maximum power output of bioenergy projects to an upper limit of approximately 100 MW[2].

Figure 2. Locations of Bioenergy Projects in Florida.

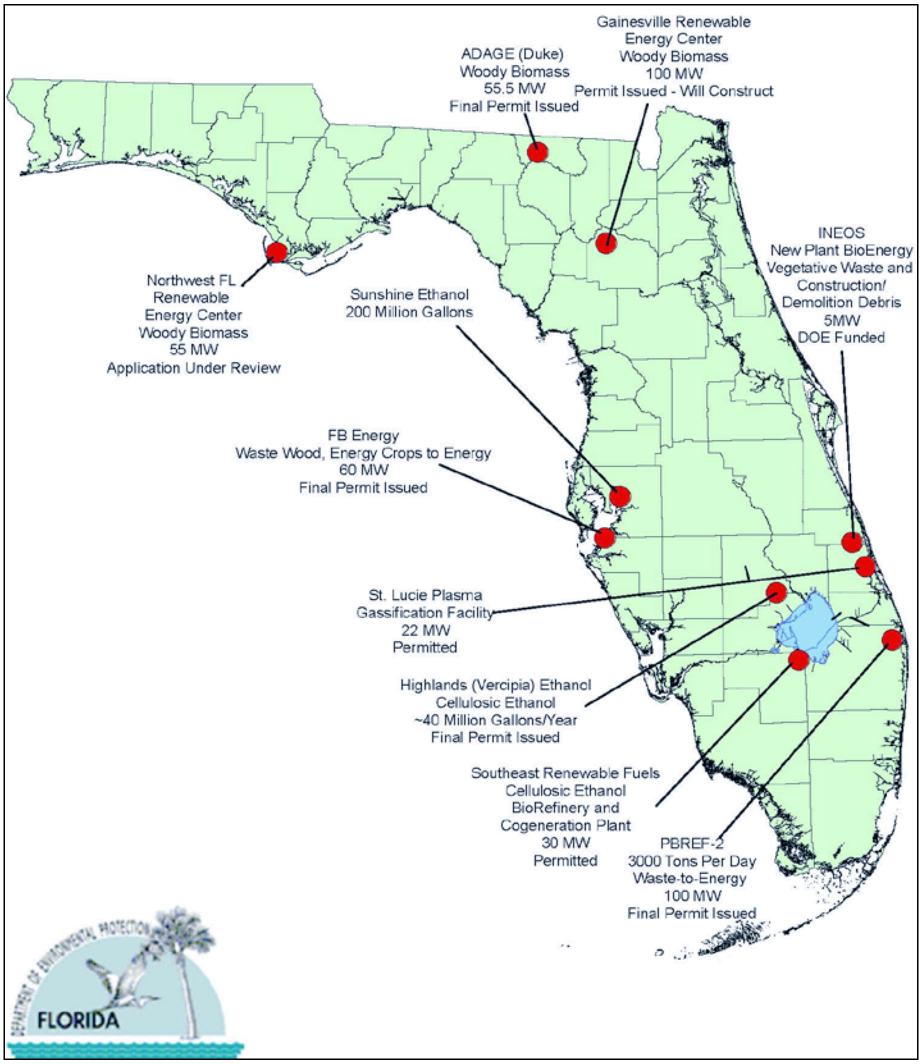


Table 1 below provides a summary of the major characteristics of the nine bioenergy projects permitted by the Department that are addressed in this paper. As seen from the table, the projects vary significantly in power output/biomass feed rate, type of combustion and pollution control technologies. Three of these projects (GREC, SRF and PBREC-II) were major sources of air pollution triggering PSD review along with a corresponding BACT determination while the remaining six were minor sources that did not trigger PSD. Triggering PSD also requires the permit applicant to conduct extensive air pollution modeling to show compliance with National Ambient Air Quality s (NAAQS) and that pollutant increment consumption in Class I and II areas does not exceed Federal Standards. Major and minor sources of air pollution along with the Federal PSD program and air pollution modeling requirements will be discussed in a separate subsection of this paper. Suffice it to say that if a project triggers PSD, the cost and complexity of the air permit application increases significantly, with a corresponding increase in the application processing time by the Department.

Table 1. Summary of Biomass Projects in Florida.

Project Name [1]	Location (County)	Power (MW, net)	Biomass (TPH) [2]	Combust Type [3]	Generation [4]	Pollution Controls [5]	Pollutant Monitoring [6]
ADAGE	Hamilton	55.5	47	BFB	STG	GCP, DSI, SCR, FF	NO_X, SO_2, CO, VE, HCl
GREC	Alachua	100	159	BFB	STG	GCP, DSI, SCR, FF	NO_X, SO_2, CO, VE, HCl, HF
FBE	Manatee	60	68	SG	STG	GCP, DSI, SCR, ESP, OC	NO_X, SO_2, CO, HCl, HF
INEOS [7]	Indian River	2	15 (MSW)	GS	STG	GCP, SGC	NO_X, SO_2, CO, VE
SRF [7]	Hendry	25-30	71	SG	STG	GCP, DSI, SNCR/SCR, ESP, OC(?)	NO_X, SO_2, CO, HCl
PBREC-II	Palm Beach	100	96 (MSW)	SG	STG	GCP, SDA, SCR, FF, CI	NO_X, SO_2, CO, VE, HCl, HF
Geo Plasma	St. Lucie	18	26 (MSW)	PG	TO STG	GCP, DSI, SCR, ESP, CI, OC	NO_X, SO_2, CO, VE, Hg
NWFREC [8]	Gulf	55.4	54	GS	CTG STG	GCP, SGC, SCR, FF, OC. SGC	NO_X, SO_2, CO, VE

1. ADAGE - ADAGE Hamilton; GREC – Gainesville Renewable Energy Center; FBE – Florida Biomass Energy; INEOS – New Plant BioEnergy; SRF – Southeast Renewable Fuels; PBREC-II – Palm Beach Renewable Energy Center No. 2; Geo Plasma – St. Lucie Plasma Gasification Waste-to Energy Facility; and NWFREC – Northwest Florida Renewable Energy Center.
2. Maximum hourly biomass feed rate to boiler. Prorated yearly rate in tons per year is less.
3. BFB – Bubbling Fluidized Bed Boiler; SG = Stoker/Grate Boiler; GS = Gasification to Syngas; PG = Plasma Arc Gasification to Syngas.
4. Method to Generate Electrical Power: STG = Steam Turbine Electrical Generator; TO = Thermal Oxidizer; CTG = Combustion Turbine Electrical Generator.
5. GCP = Good Combustion Practices; DSI = Dry Sorbent Injection; SCR = Selective Catalytic Reduction; SNCR = Selective Non-Catalytic Reduction; FF = Fabric Filter; ESP = Electro-Static Precipitator; CI = Activated Carbon Injection; OC = Oxidation Catalysis; SDA = Spray Dryer Absorber; SGC = Syngas Cleanup.
6. Continuous Emission Monitor (CEMS) for Nitrogen Oxides (NO_X), sulfur Dioxide (SO_2), carbon monoxide (CO), hydrogen chloride (HCl) and hydrogen fluoride (HF) and Continuous Opacity Monitor for visible emissions (VE).
7. Makes ethanol as a byproduct.
8. Application received in February 1, 2011. Draft permit not issued as of March 25, 2011.

TYPICAL PERMIT APPLICATION DEFICIENCIES

The Department according to Rule 62-4.070(3), Florida Administrative Code (F.A.C.) cannot issue a permit unless there is reasonable assurance that the Departments rules will be met. An incomplete air permit application does not provide reasonable assurance. Based on the permit applications received by the Department for bioenergy projects, several critical areas were identified where the applications typically were deficient and thus deemed incomplete. An incomplete application requires the Department to issues a formal request for additional information (RAI) asking the applicant to provide the missing or incomplete information or to provided clarification on technical matters. This can significantly increase the time required to process the application and issue a draft permit package. Given below are the typical areas where the bioenergy permit applications received by the Department were deemed deficient.

- Defining the Biomass Fuel Slate: Most applications tended to provide a general description of the biomass intend for fuel use. For example, clean woody biomass or wood chips. This did not allow the Department to accurately describe the allowable fuel slate in the permit. It was left to the Department to try to define the fuel slate, both allowable and prohibited. This could result in problems down the road for the applicant when biomass fuels of opportunity became available or when vendor fuel contracts were under negotiation. At typical example of well defined fuel slate for a bioenergy plant is given in Table 2 below.

Table 2. Well Defined Biomass Fuel Slate.

Fuel Type	**Description**
In-forest residue and slash	Tops, limbs, whole tree material and other residues from soft and hardwoods that result from traditional silvicultural harvests.
Mill residue	Saw dust, bark, shavings and kerf waste from cutting/milling whole green trees; fines from planning kiln-dried lumber; wood waste material generated by primary wood products industries such as round-offs, end cuts, sticks, pole ends; and reject lumber as well as residue material from the construction of wood trusses and pallets.
Pre-commercial tree trimmings and understory clearings	Tops, limbs, whole tree material and other residues that result from the cutting or removal of certain, smaller trees from a stand to regulate the number, quality, and distribution of the remaining commercial trees; and forest understory which includes smaller trees, bushes, and saplings.
Storm, fire and disease debris	Tops, limbs, whole tree material and other residues that are damaged due to storms, fires or infectious diseases.
Urban wood waste	Tree parts and/or branches generated by landscaping contractors and power line/roadway clearance contractors that have been cut down for land development or right-of-way clearing purposes.
Recycled industrial wood	Wood derived from used pallets packing crates; and dunnage disposed by commercial or industrial users.
Supplementary fuel material	Herbaceous plant matter; clean agricultural residues (i.e., rice hulls, straw, etc.; no animal wastes or manure); and whole tree chips and pulpwood chips.

- Best Management Practices: Some major concerns with the bioenergy projects pertain to fugitive dust, odors and spontaneous combustion of biomass storage piles and overall management biomass storage piles. To address these concerns, the Department requires a Best Management Practices (BMP) plan. The Department could develop such a plan for each project, but instead required the applicant to submit such a plan if one was not include in the original permit application. The applicant is in a better position to develop a BMP plan due to their greater knowledge of the facility's design, operation and biomass fuel slate. An application was not deemed complete unless it included a draft BMP plan that addressed at a minimum: (1) minimization of fugitive dust; (2) storage pile management; (3) fire prevention & spontaneous combustion minimization; and (4) quality assurance of woody biomass fuel.

- Biomass Handling and Processing: The systems for receiving, processing, handling, storing and reclaiming biomass fuel needed to be clearly defined. Applications tended to provide only general information on the biomass handling and processing emission unit (EU), which in turn made developing enforceable permit conditions for the EU difficult. An RAI could be required to obtain the necessary detailed information which would delay permit processing. Schematic drawings of a biomass handling and processing system, as shown in Figures 3 and 4 below, were determined to be a good way to provide the necessary information.

Figure 3. Biomass Handling & Storage

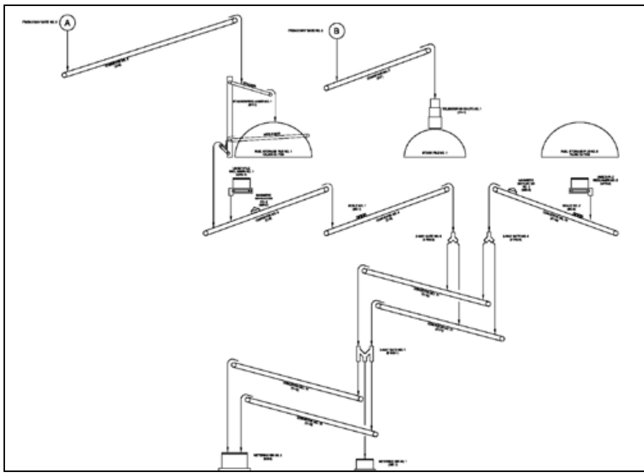
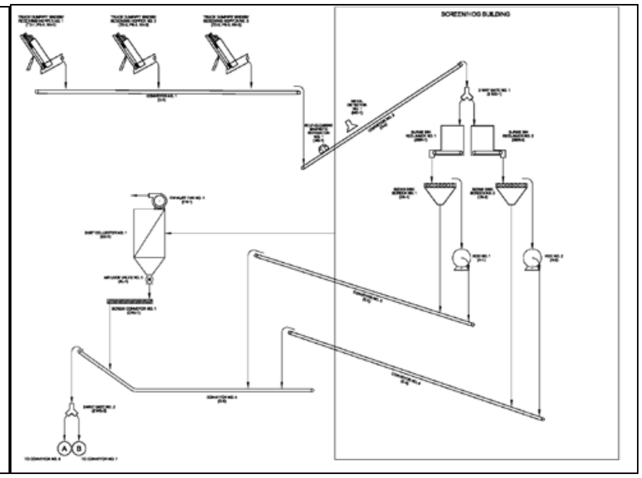


Figure 4. Biomass Delivery



STATE AND FEDERAL RULE APPLICABILITY

Bioenergy projects are subject to the applicable environmental laws specified in Chapter 403 of the Florida Statutes (F.S.) and to the rules in the F.A.C given in Table 2 below.

Table 2. Applicable Rules from the F.A.C.

F.A.C. Rule	Description
62-4	Permits
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 of Air Pollution
62-214	Requirements for Sources Subject to the Federal Acid Rain Program
62-296	Stationary Sources – Emission Standards
62-297	Stationary Sources – Emissions Monitoring

Following is a brief summary of the key regulations that apply to most bioenergy projects. Links are provided to the cited rule at the Department's web site.

Chapter 62-4, F.A.C. www.dep.state.fl.us/air/rules/fac/62-4.pdf

Rule 62-4.070(1), F.A.C., Standards for Issuing or Denying Permits; Issuance; Denial.

This rule applies to all permitting decisions:

Chapter 62-204, F.A.C. www.dep.state.fl.us/air/rules/fac/62-204.pdf

Rule 62-204.220(1), F.A.C., Ambient Air Quality Protection.

This rule applies to all air permitting decisions.

Rule 62-204.240, F.A.C., Ambient Air Quality Standards.

This rule applies to all air permitting decisions.

Rule 62-204.800(8), F.A.C., 40 CFR 60, NSPS.

The following provisions incorporated into Rule 62-204.800(8), F.A.C. adopted from 40 CFR 60 and incorporated into this rule typically apply to bioenergy projects which include boilers and emergency equipment (generators and fire pump engines):

- 40 CFR 60, Subpart A – General Provisions;
- 40 CFR 60, Subpart Da – Standards of Performance for Electric Utility Steam Generating Units for Which Construction Is Commenced After September 18, 1978 (and After February 28, 2005);
- 40 CFR 60, Subpart Db – Industrial, Commercial, Institutional Steam Generating Units; and
- 40 CFR 60, Subpart IIII – Stationary Compression Ignition Internal Combustion Engines (ICE).

Rule 62-204.800(11), F.A.C., 40 CFR 63, NESHAP.

The following provision incorporated into Rule 62-204.800(11), F.A.C. adopted from 40 CFR 63 and incorporated into this rule applies to most bioenergy projects which include boilers and emergency equipment (generators and fire pump engines):

- 40 CFR 63, Subpart ZZZZ – Stationary Reciprocating Internal Combustion Engines (RICE). This subpart requires all affected area source units to meet the applicable emission standards of 40 CFR 60, Subpart IIII.

The following (otherwise applicable) provision was vacated and remanded in 2007 by the U.S. Court of Appeals, D.C. District:

- 40 CFR 63, Subpart DDDDD – NESHAP for Major Sources: Industrial, Commercial, and Institutional Boilers and Process Heaters.

On June 4, 2010 EPA published notice in the Federal Register and is presently accepting comments on a proposed rule to be issued by EPA as Subpart DDDDD (major source) and JJJJJJ (area source). These subparts, which were recently finalized, may potentially apply to bioenegy project boilers depending on their respect level of HAP emissions.

Chapter 62-210, F.A.C. www.dep.state.fl.us/air/rules/fac/62-210.pdf

62-210.200, F.A.C., Definitions.

Rule 62-210.300, F.A.C., Permits Required.

- Unless exempted, the owner or operator of any facility or emissions unit which emits or can reasonably be expected to emit any air pollutant shall obtain appropriate authorization (i.e. a permit) from the Department prior to undertaking any activity at the facility or emissions unit for which such authorization is required.

Rule 62-210.350, F.A.C. Public Notice and Comment.

- A notice of proposed agency action on permit application, where the proposed agency action is to issue the permit, shall be published by any applicant.

Rule 62-210.700, F.A.C., Excess Emissions.

This rule applies to all air permitting decisions.

Chapter 62-212, F.A.C. www.dep.state.fl.us/air/rules/fac/62-212.pdf

Rule 62-212.300, F.A.C., General Preconstruction Review Requirements.

- This rule generally applies to the construction or modification of air pollutant emitting facilities in those parts of the state in which the state ambient air quality standards are being met.

Rule 62-212.400, F.A.C., PSD.

- The rule applies if a project is a major stationary (PSD) source.

Chapter 62-213, F.A.C. www.dep.state.fl.us/air/rules/fac/62-213.pdf

- If a project is a Title V source, the applicant will be required to apply for and obtain a Title V operation permit in the future.

Chapter 62-214, F.A.C. www.dep.state.fl.us/air/rules/fac/62-214.pdf

- If proposed project is a Title V source, will serve an electric generator capable of generating 25 MW or more of electricity and will sell the resultant electricity. It will be required to apply for and obtain a Title IV Acid Rain Part within its Title V operation permit.

Chapter 62-296, F.A.C. www.dep.state.fl.us/air/rules/fac/62-296.pdf

Rule 62-296.320, F.A.C., General Pollutant Emission Limitation Standards.

The below requirements are usually critical concerns for bio energy projects.

- This rule prohibits the discharge of air pollutants which cause or contribute to an objectionable odor;
- This rule specifies a visible emissions standard of 20 percent (%) opacity; and
- The rule prohibits emissions of unconfined PM provisions without taking reasonable precautions to prevent such emissions.

Rules 62-296.401, F.A.C., Incinerators and Rule 62-296.416, F.A.C., Waste-to-Energy Facilities.

- Incinerators and waste to energy facilities combust waste. The fuel slate typically authorized for bioenergy projects does not constitute a waste or municipal solid waste according to the Department's rules.

Rule 62-296.410, F.A.C., Carbonaceous Fuel Burning Equipment.

This rule typically applies to bioenergy projects, but Federal NSPS standards are usually more restrictive.

- Woody biomass is carbonaceous fuel when directly combusted and this rule requires that the carbonaceous component of fuel combustion comply with a PM standard of 0.2 lb/mmBtu. Visible emissions are limited to 30% opacity except that 40% opacity is permissible for not more than 2 minutes in any hour.

Rule 62-296.405, F.A.C., Fossil Fuel Steam Generators with More than 250 mmBtu Heat Input

- This rule applies only to the extent that fossil fuel is burned in the bioenergy project boiler.

Rule 62-296.470, F.A.C., Implementation of Federal Clean Air Interstate Rule (CAIR).

MAJOR AND MINOR SOURCES AND PSD 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.

As defined in Rule 62-210.200, (Definitions), F.A.C., a facility is considered a "major stationary source" if it emits or has the potential to emit 5 tons per year of lead, 250 tons per year (TPY) or more of any PSD pollutant, or 100 tons per year or more of any PSD pollutant and the facility belongs to one of the 28 listed PSD major facility categories. PSD pollutants include: CO; NO_X; SO_2; PM; PM_{10}; VOC; lead (Pb); Fluorides (F); SAM; hydrogen sulfide (H_2S); total reduced sulfur (TRS), including H_2S; reduced sulfur compounds, including H_2S; municipal waste combustor (MWC) organics measured as total tetra- through octa-chlorinated dibenzo-p-dioxins and dibenzofurans (D/F); MWC metals measured as PM; MWC acid gases measured as SO_2 and hydrogen chloride (HCl); municipal solid waste (MSW) landfill emissions measured as non-methane organic compounds (NMOC); and mercury (Hg).

Typically, bioenergy projects are not considered one of the 28 listed PSD source categories and do not trigger PSD unless they emit more than 250 TPY of a PSD-regulated pollutant. However, large bioenergy projects can exceed the 250 TPY limit thereby triggering PSD and requiring a BACT determination along with the corresponding extensive air pollution modeling requirements. If PSD is trigger for any one pollutant 100 TPY (major source) or 250 TPY (minor source) then for the rest of the regulated pollutants, PSD applicability is based on emissions thresholds known as the significant emission rate (SER) as defined in Rule 62-210.200, (Definitions) F.A.C. Emissions increases of PSD pollutants from a bioenergy project exceeding these SER are considered "significant" and BACT must be employed to minimize emissions of each PSD pollutant. Although a bioenergy project may be "major" for only one PSD pollutant, a project must include BACT controls for any PSD pollutant that exceeds the corresponding SER given in Table 4.

Table 4. List of SER by PSD-Pollutant [1]

Pollutant	SER (TPY)	Pollutant	SER (TPY)
CO	100	NO_X	40
PM/PM_{10} [2]	25/15	Ozone (VOC) [3]	40
Ozone (NO_X) [3]	40	SAM	7
SO_2	40	F	3
Pb	0.6	TRS	10
H_2S	10	Hg [4]	0.1

1. Excluding those defined exclusively for MWC and MSW landfills.
2. $PM_{2.5}$ is also a PSD pollutant, but SER have not yet been defined. It is regulated by its precursors and surrogates (e.g. SO_2, NO_X and PM/PM_{10}).
3. Ozone is regulated by its precursors (VOC and NO_X).
4. Hg is not a PSD pollutant but has a defined SER.

A proposed project that increases criteria pollutants to levels above PSD thresholds must conduct air pollution modeling for these pollutants. The criteria pollutants (NO_X, CO, SO_2, PM/PM_{10} and VOC) that trigger air pollution modeling requirements are subject to NAAQS and state ambient air quality standards (AAQS) analysis, PSD increments analysis, a significant impact analysis (SIA) and a de minimis monitoring levels modeling analysis. A NAAQS and AAQS modeling analysis is done to shown these standards will not be violated as a result of the project. The PSD increment represents the amount that new sources in an area may increase ambient ground level concentrations of a pollutant from a baseline concentration. An increment analysis is required to show that the project results in an increase that is less than the allowable increment. A SIA is performed to determine if a project can cause an increase in ground level concentration for a pollutant that is greater than the significant impact levels (SIL) for the pollutant. Typically an applicant uses the project's emissions at worst load conditions as inputs to the air model used in the SIA. De minimis monitoring levels modeling involves a preconstruction monitoring analysis for those pollutants with listed de minimis impact levels. These are levels, that if exceeded, would require pre-construction ambient monitoring. As was done for the SIA analysis, an applicant typically uses the project's emissions at worst load conditions as inputs to the air model.

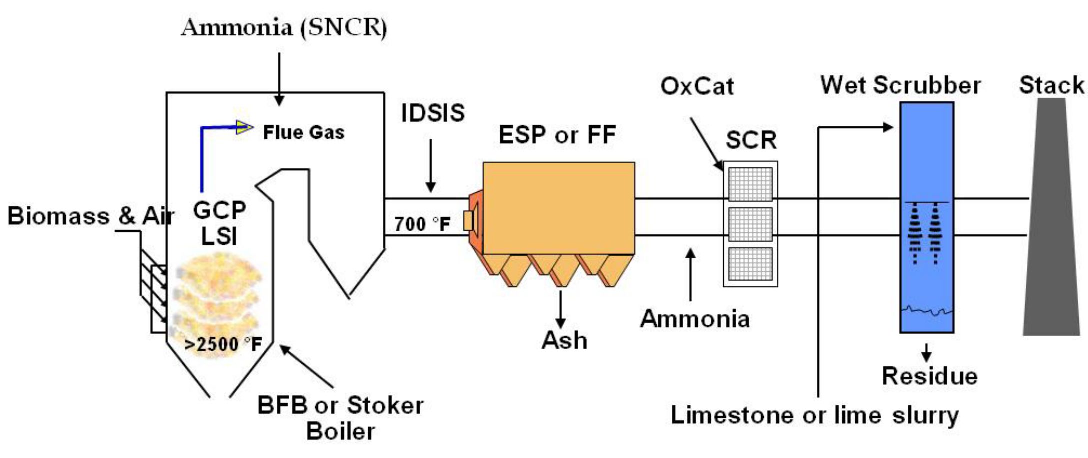
If a bioenergy project is a minor source, the Department may not air pollution modeling depending on the location and size of the project. However, even if not required by the Department, permit applicants may find that some air pollution modeling should be conducted to address public concerns. For instance, an applicant may conduct air pollution modeling to shown that NAAQS and AAQS will not be violated as a result of the project.

POLLUTION CONTROL EQUIPMENT

Figure 5 shows a schematic of pollution control equipment typically proposed for bioenergy projects in Florida. In the case of Figure 5, a boiler is used for steam generation but other configurations such as CTG would utilize similar equipment to control emissions. A brief breakdown of the control equipment by pollutant is given below:

- NO_X: Good combustion practices (GCP), BFB boiler, Non-Selective Catalytic Reduction (SNCR), Selective Catalytic Reduction (SCR);
- SO_2: Limestone Injection (LSI) in BFB boiler, In-Duct Sorbent Injection System (IDSIS) of trona or lime also call DSI, Wet Scrubber;
- CO: GCP; oxidation catalyst (Ox-Cat);
- VOC: GCP; Ox-Cat; and
- $PM/PM_{10}/PM_{2.5}$: Electrostatic Precipitator (ESP); Fabric Filter (FF) Baghouse.

Figure 5. Schematic of Typical Pollution Control Equipment at a Bioenergy Facility.



The PSD-pollutant of interest for most bioenergy projects is NO_X. NO_X is typically controlled by good combustion practices (GCP) in the boiler and in several recently permitted projects the use of a BFB boiler. Until recently, add-on controls for NO_X were uncommon for biomass boilers. Initial add-on NO_X controls consisted of SNCR whereby NH_3 or urea is injected at a point in the process characterized by a suitable temperature window between about 1,500 and

1,900 °F depending on residence time, turbulence, oxygen content, and a number of other factors specific to the given gas stream. The reaction products are nitrogen (N_2) and water vapor (H_2O). A control efficiency of 50% to 60% can be typically achieved with a SNCR system.

One drawback with SNCR is that some of the NH_3 can be converted to NO_X and excessive NH_3 injection is occasionally required to effect good reduction. Excess NH_3 (called slip) can combine with chloride and sulfate species in the exhaust and cause visible emissions. Additionally, good CO control is necessary when employing SNCR due to interference with the reaction.

In the case of SCR technology, the NH_3 is injected in the presence of catalyst and at a lower temperature than encountered in the furnace. The reactions are more complete and efficient and NH_3 slip is minimized. Control efficiencies on the order of 90% can be achieved with a SCR system.

Most bioenergy applicants prefer SNCR due to its simplicity and low cost. Also applicants are concern that catalyst poisoning of an SCR will occur due to the high potassium content of the biomass fuel. Poisoning can occur if an SCR is placed before the PM control device (FF or ESP) where high dust loadings on the catalyst occur.

Recently, a number of SCR systems have been specified or actually installed on biomass boilers. The catalyst is located in the clean, medium temperature zone after all other control equipment and before the air preheaters. In contrast to common perceptions, no reheat of the exhaust gas is required in order to use such a SCR system at a biomass installation. However, the particulate control equipment must be designed for a relatively high temperature environment.

The Department considers SCR to be a viable and the preferred NO_X control strategy at biomass energy facilities.

HAP EMISSIONS AND CONTROL

A major source of HAP has the potential to emit (PTE) 10 TPY of any single HAP or 25 TPY of all HAP. If the PTE of any single HAP is equal to or greater than 10 TPY or if the PTE of all aggregated HAP is equal to or greater than 25 TPY then the source would be a major source of HAP. If a National Emissions Standard for Hazardous Air Pollutants (NESHAP) is enforce for that major source, for instance a large industrial/commercial/institutional boiler, then the source must meet the emissions standards in the NESHAP. If no NESHAP is available, then a case-by-case determination of Maximum Achievable Control Technology (MACT) would be required for the source. MACT would require limitations for several HAP or surrogates for those HAP such as PM for metals or CO/VOC for organics. If a source is a minor (area) source of HAP and a NESHAP is available then the source must meet the emissions standards in the NESHAP. If no NESHAP is available, no HAP emission limits are required.

It should be noted that on March 21, 2011, the EPA Administrator signed NESHAP 40 CFR 63, Subpart DDDDD - National Emission Standards for Major Sources: Industrial/Commercial/Institutional Boilers and Process Heaters and NESHAP 40 CFR 63, Subpart JJJJJJ - National Emission Standards for Area Sources: Industrial/Commercial/Institutional Boilers. These NESHAP would apply to bioenergy projects that utilize boilers to burn biomass to generate steam for electrical power generation or other purposes.

There are 187 HAP listed by the EPA. A link to the current list of HAP at the EPA is given below.

www.epa.state.oh.us/portals/27/general/haplist.pdf

Generally, bioenergy projects are minor for HAP, but acid gases such HCl and to a lesser extent HF can approach the 10 TPY limit. Also because of the combined emissions of acid gases along with other HAP, bioenegy projects can approach the 25 TPY limit. As shown below, HCl emissions from a typical bioenergy plant can be significant.

Untreated woody biomass will contain less than 0.02% chloride (Cl)[3]*. The Cl can be released as HCl in a boiler or it can be bound to the ash. Cl can also condense in the form of alkali salts (NaCl and KCl) or as* NH_4Cl *in the presence of* NH_3*. Some Cl can react further with organic species forming organic HAP including dioxin and furans (D/F). Fortunately, if an SCR unit is installed for* NO_X *control it will tend to destroy D/F.*

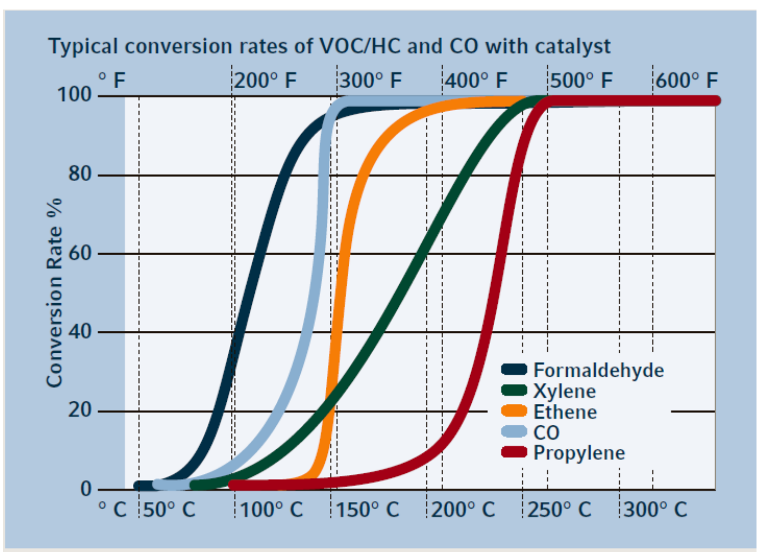
If all Cl is converted to HCl, then the pre-control annual HCl emissions from the biomass boiler burning 47 TPH of biomass are calculated as follows:

[(0.02 lb Cl/100 lb biomass)x(2000 lb biomass/ton biomass)x(36.45 lb HCl/35.45 lb Cl)]x [(ton HCl/2000 lb HCl)x(47 tons biomass/hr)x(8,760 hr/year)] = 84.7 TPY HCl

A conservative estimate is that as much as half of Cl will actually be converted to HCl. To insure that the PTE is limited to a value less than 10 TPY it will be necessary add on equipment to control HCl.

HCl and HF emissions and acid gases in general can be controlled by the same pollution control equipment used to control SO_2 emissions. The Department has found IDSIS to be adequate, especially if used in conjunction with a FF baghouse. The ash cake on the bags in the FF baghouse increases the absorption of acid gases[4]. Also LSI in a BFB boiler helps control acid gas HAP emissions

Figure 6. Typical Conversion Rates of Organic HAP with Ox-Cat.



Organic HAP emissions such as D/F are controlled by GCP and (if used) an Ox-Cat and SCR. As seen from Figure 6 above, an Ox-Cat can provide control of over 90% if the temperature profile is correct[5]. A surrogate for organic HAP emissions is VOC[6]. Metal HAP emissions are typically controlled by the PM control device. A FF baghouse is preferred over an ESP due to its ability to better control fine particulates[7]. In addition, activated carbon injection (ACI) to control mercury (Hg), such as used for the Geoplasma and PBREC-II, will also aid in the control of other metal HAP[8].

POLLUTION MONITORING REQUIREMENTS

Federal NSPS requirements dictate most pollution monitoring requirements for the criteria pollutants (NO_X, SO_2, CO, PM/PM_{10} and VOC) for the permitted bioenergy projects. Typically, the bioenergy projects were required to install CEMS for NO_X, SO_2 and CO while a COMS was required for VE. Annual stack testing was required for VOC and PM/PM_{10}.

HCl and HF CEMS were required for the bioenergy projects where these acid gas HAP emissions were close to the individual10 TPY threshold or to provide reasonable assurance that the 25 TPY total HAP threshold was not exceeded when other HAP emissions were of concern. Where organic HAP emission were an issue, for instance formaldehyde, annual and in some cases quarterly stack tests were required. The HAP CEMS and stack testing were required to provide reasonable assurance per Rules 62-4.070(3), F.A.C.

The two WTE project permitted by the Department, Geo Plasma and PBREC-II, were required to install an Hg CEMS. In the case of Geo Plasma, the CEMS was required through and agreement with St. Lucie County, while for PBREC-II the CEMS provided reasonable assurance that the State of Florida two hundred pounds per year PSD emission threshold for Hg was not exceeded.

The requirement to use CEMS for pollutant monitoring helps in providing reasonable assurance that Department rules will be met, while also helping assure the public that the project will meet its emission limits and not violate NAAQS and state AAQS..

PUBLIC CONCERNS

The experience of the Department indicates that bioenergy projects can be controversial in the eyes of the public. Two of the bioenergy projects permitted by the Department (GREC and FB Energy) received request for administrative hearings to dispute the issuance of the draft permits. A settlement was reached prior to a hearing for the FB Energy project and a final permit was issued in July 2010. A hearing was held in Gainesville in late September 2010 for the GREC project with a final permit was issued in late December of 2010.

There are several reasons for this controversy. First, there is a misconception that bioenergy projects are incinerators in disguise. Some of the public perceives that building a bioenergy plant is equivalent to building a large MWC in their community. Second, because most bioenergy projects are not subject to the 100 TPY PSD triggering threshold, the public perceives that they will be very large polluters for the amount of power generated. Third, there are concerns about truck traffic for fuel delivery, fugitive dust, odors and biomass suitability. Finally, it simply comes down in many cases to NIMBY (not in my back yard).

While it is impossible to address all these concerns the Department has determined that requiring a notice of application in a local newspaper along with posting all information (application, RAI, daft permit package, public comments etc.) on a publically accessible web page helps alleviate many of the public's concerns. Also when necessary, a public meeting, prior to permit issuance or after, can be used for informational and educational purposes. Still no matter what is done, the likelihood of a petition requesting a public hearing needs to be considered when determining the timeline for the issuance of a final permit package.

Another public issue and concern involved in bioenergy projects is Environmental Justice. Accordingly to the EPA, Environmental Justice is the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. The intent of Environmental Justice requirements is to:

- Avoid, minimize, or mitigate disproportionately high and adverse health, environmental, and social effects on minority and low-income populations;
- Ensure the full and fair participation by all potentially affected communities in the planning and decision-making process; and
- Prevent the denial of, reduction in or significant delay in the receipt of benefits by minority and low-income populations.

While the goals of Environmental Justice are admirable, they are addressed at the Federal level and not the State's. Florida Rules and Statues dealing with the issuance of air construction permits do not address Environmental Justice issues.

CONCLUSIONS

Do to the lessons learned described in the paper, the Department has become much more efficient in permitting bioenergy projects. The key factor mainly involves good communication. First, good communication with the applicant prior to receiving a permit application to ensure that the application contains the necessary information, including what type of pollution control equipment is expected by the Department. Second, maintaining communication with the application while the air construction permit application is being processing. Finally, communication with the public to keep the public inform about receiving an bioenergy air permit application, the status of the application and their rights once a draft permit has been issued, including their right to legally changed the issuance of the permit.

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KEY WORDS

Florida, Power Plants, biomass, bioenergy, permitting, PSD, BACT, NSPS, NESHAP, MACT, HAP, CEMS, HCl, HF

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