PROPOSED

Initial Covered Source Permit Review Summary

Application File No.: 0724-01

Permit No.: 0724-01-C

Applicant: Hu Honua Bioenergy, LLC

Facility Title: Hu Honua Bioenergy Facility
Located at 28-283 Sugar Mill Road, Pepeekeo, Hawaii
UTM Coordinates: 281,250 m E, 2,195,900 m N, NAD-27

Mailing Address: Hu Honua Bioenergy, LLC
201 Merchant Street, Suite 1830
Honolulu, HI 96813

Responsible Official: Mr. Richard McQuain
President
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Consultant: Environmental Resources Management
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Application Date: Received on August 28, 2009. Additional information submitted on January 5, 2010, January 11, 2010, January 12, 2010, January 22, 2010, February 23, 2010, May 19, 2010, May 24, 2010, June 7, 2010 and June 14, 2010. Revised application dated December 27, 2010. Additional information submitted on December 28, 2010, January 24, 2011, January 31, 2011 and February 7, 2011.

Proposed Project:

SICC 4911 (Electric Services)

The applicant, Hu Honua Bioenergy, LLC (Hu Honua) is applying for an Initial Covered Source Permit for its biomass electricity generating facility (Hu Honua Bioenergy Facility) in Pepeekeo, Hawaii. The plant will have a net power output of 21.5 MW to the grid. Hu Honua is proposing to burn biomass in the form of wood in the boiler and burn 100% biodiesel during startups and as a supplemental fuel during low-load operation of the boiler. An 836 kW electrical generator will be operated only during emergencies and will only combust 100% biodiesel.

The facility was originally constructed in 1971 and operated by Hilo Coast Processing Company (HCPC) starting in 1974. The boiler was initially fueled by bagasse (a biomass), with fuel oil as a backup, producing 23.8 MW of gross electrical power and 22 MW of net electrical power to the grid. In 1985, the facility was permitted to burn coal along with bagasse and fuel oil. In 2000, biomass was removed from the permit as an allowable fuel after HCPC's sugar plantation ceased operations. At that time, the company changed its name to Hilo Coast Power Co and

burned coal in the boiler to generate power. Although the facility temporarily stopped operations on December 31, 2004 and has not operated since, all applicable permits have been continuously maintained in active status. Since 2004, ownership has been held by several companies, Hu Honua now owns the assets and leases the land from Maukaloa Farms, LLC.

Formerly, the facility was permitted under CSP No. 0229-02-C, but Hu Honua has agreed to apply for a new stationary source for the biomass electricity generating facility and relinquished the permit on September 16, 2010. The Hu Honua Bioenergy facility will generate electricity for Hawaii Electric Light Company, Inc. (HELCO) and consists of a steam boiler, a steam turbine generator, and an 836 kW emergency generator.

The facility will only combust non-fossil fuels. The boiler will only burn wood and 100% biodiesel, and the generator will only burn 100% biodiesel. The primary type of wood fired in the boiler will be eucalyptus (approximately 90%), but other clean woods will also be used.

These woods, as burned, will typically have a moisture content within the 40% to 50% range. While only wood will be burned at full load, at lower loads during normal operation (approximately 60% of maximum load or less), wood pellets or biodiesel may be burned. Given the relatively low heat content of the unpelletized wood, wood pellets or biodiesel may be needed to stabilize the fire in the boiler at the lower loads.

During startups, only biodiesel will be used in the boiler. Each startup will require on the order of 1,100 gallons of biodiesel. Hu Honua estimates that there may be up to three startups per year (each lasting 3 to 4 hours). The total amount of biodiesel used during startup will not exceed 3,300 gallons per year.

The 836 kW generator will provide on-site power only during emergencies such as when the HELCO transmission system is not available.

The wood and biodiesel fuels will be stored on-site. The biodiesel will be stored in a 10,000 gallon polyethylene tank and a 250 gallon day tank. The wood will be brought on site as logs or chips. If brought on as logs, they will be chipped by an electric chipper within an enclosed chipper building, and then conveyed to an on-site chip storage facility. It is expected that 25 to 30 percent of the wood would be chipped on-site. Wood transported to the site as chips will be conveyed directly to the on-site chip storage facility. Ash, a byproduct of burning wood, will be shipped off-site for beneficial/soil amendment or returned to the forest to enhance the soil.

In addition, five (5) wells provide cooling water for the condenser in a once-through system where the water is eventually sent to the outfall and into the ocean.

An application filing fee of $5000.00 was received and processed.

A revised covered source application was subsequently submitted on December 27, 2010 after a public hearing on September 15, 2010 and public comment period from August 13, 2010 to October 12, 2010. The main change was the addition of a baghouse downstream of the ESP for the boiler. This change reduced HCl emissions to 5.47 tpy, which changed the facility from a major source of HAPs to an area source of HAPs. Therefore, the vacated Boiler MACT for major sources, 40 CFR Part 63, Subpart DDDDD, would no longer be applicable, but the Boiler MACT for area sources, 40 CFR Part 63, Subpart JJJJJJ, would.

A second public comment period was held from February 17, 2011 to March 21, 2011. Also, on February 21, 2011, the Industrial Boiler MACT was finalized.

Equipment Description:

1. One (1) 407 MMBtu/hr Babcock and Wilcox Boiler (250,800 lb/hr of steam) equipped with:
   - Electrostatic Precipitator and Baghouse for PM reduction (also metals)
   - Nalco Rotating Opposed Fire Air (ROFA) System or equivalent for NO_x and CO reduction and increasing thermal efficiency.
   - Nalco Rotating Mix (ROTAMIX) Urea Injection System or equivalent for NO_x reduction (Selective Non-Catalytic Reduction (SNCR) system)
   - Dry sorbent injection system or equivalent to reduce hydrogen chloride (HCl) and sulfur oxide (SO_x) emissions. Trona (sodium sesquicarbonate), lime or equivalent, will be used as the dry sorbent. The sorbent will be injected downstream of the ESP where the HCl and SO_x will react with the sorbent and be captured in the baghouse. HCl is also expected to be absorbed by the ash. The dry sorbent injection system will be used as needed to further control HCl emissions to 0.004 lb/MMBtu or less.

2. One (1) steam powered turbine generator (23.8 MW gross, 21.5 MW net)

Fuel:

1. Boiler – wood (chipped and pelletized form) and biodiesel (B100), Grade S15
   Fuel consumption – 407 MMBtu/hr (wood)
   Startup – biodiesel – 3,300 gallons/yr, 1,100 gallons per startup, three (3) startups per year, 367 gallons/hr, 51 MMBtu/hr
   Full load – wood only
   Normal load – wood and biodiesel – 2,800,000 MMBtu/yr

2. Emergency generator – biodiesel

Insignificant Activities:

1. One (1) 836 kW emergency biodiesel engine generator, Detroit Diesel, 12V-2000 G60, 1,120 bhp, 54.7 gal/hr, HAR §11-60.1-82(f)(5)
2. One (1) 10,000 gallon biodiesel polyethylene storage tank, HAR §11-60.1-82(f)(1)
3. One (1) 250 gallon biodiesel day tank, HAR §11-60.1-82(f)(1)
4. One (1) electric chipper operating within an enclosed chipper building with building dust collector. Contract will require wood to be received with a moisture content not greater than 45 percent, thereby further limiting PM_{10} emissions, HAR §11-60.1-82(f)(7)

Applicable Requirements:

<u>Hawaii Administrative Rules (HAR)</u>

Title 11, Chapter 59	Ambient Air Quality Standards	
Title 11, Chapter 60.1	Air Pollution Control	
Subchapter 1	General Requirements	
Subchapter 2	General Prohibition	
HAR §11-60.1-31	Applicability	
HAR §11-60.1-32	Visible Emissions	

HAR §11-60.1-38 Sulfur Oxides from Fuel Combustion
Subchapter 5 Covered Sources
Subchapter 6 Fees for Covered Sources, Noncovered Sources, and Agricultural Burning
HAR §11-60.1-111 Definitions
HAR §11-60.1-112 General Fee Provisions for Covered Sources
HAR §11-60.1-113 Application Fees for Covered Sources
HAR §11-60.1-114 Annual Fees for Covered Sources
HAR §11-60.1-115 Basis of Annual Fees for Covered Sources
Subchapter 8 Standards of Performance for Stationary Sources
Subchapter 9 Hazardous Air Pollutant Sources

Federal Requirements

40 CFR Part 60 - Standards of Performance for New Stationary Sources (NSPS)
Subpart A – General Provisions
Subpart Db – Standards of Performance for Industrial-Commercial-Institutional Steam Generating Units

40 CFR Part 63 – National Emission Standards for Hazardous Air Pollutants for Source Categories
Subpart A – General Provisions
Subpart JJJJJJ – National Emission Standards for Hazardous Air Pollutants for Area Sources: Industrial, Commercial, and Institutional Boilers

Non-Applicable Requirements:

Hawaii Administrative Rules (HAR)
Title 11, Chapter 60.1 Air Pollution Control
Subchapter 7 Prevention of Significant Deterioration Review

Federal Requirements
40 CFR Part 52.21 – Prevention of Significant Deterioration of Air Quality

40 CFR Part 60 - Standards of Performance for New Stationary Sources (NSPS)
The requirements of 40 CFR Part 60 Subpart IIII (Standards of Performance for Stationary Compression Ignition Internal Combustion Engines) are not applicable to the biodiesel generator since the generator was manufactured prior to the April 1, 2006 or model year 2007 applicability date.

40 CFR Part 61 - National Emission Standards for Hazardous Air Pollutants (NESHAPS)

40 CFR Part 63 – National Emission Standards for Hazardous Air Pollutants for Source Categories
The biodiesel generator will be located at an area source of HAPs and is subject to the requirements of 40 CFR Part 63, Subpart ZZZZ (National Emission Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines. Under 40 CFR Part 63, Subpart ZZZZ, new or reconstructed engines need to meet the requirements of 40 CFR Part 60, Subpart IIII. However, as described above, the requirements of 40 CFR Part 60 Subpart IIII (Standards of Performance for Stationary Compression Ignition Internal Combustion Engines)

are not applicable to the biodiesel generator since the generator was manufactured prior to the April 1, 2006 or model year 2007 applicability date.

Best Available Control Technology (BACT):

A Best Available Control Technology (BACT) analysis is required for new covered sources and significant modifications to covered sources that have the potential to emit or cause a net emissions increase above significant levels as defined in HAR §11-60.1-1. The potential to emit for NO_x, CO, PM and PM_{10} are greater than the significant levels for these pollutants. Thus, BACT analyses are required for these pollutants.

Pollutant	Potential to Emit (PTE) (tpy)	Significant Level (tpy)	Significant?
NO_x	210.0	40	yes
SO_2	39.2	40	no
CO	246.4	100	yes
PM	33.6	25	yes
PM_{10}	33.6	15	yes
VOC	39.2	40	no
Pb	3.29 E-03	0.6	no

Pollutant	lb/MMBtu	Equivalent Control Technology
NO_x	0.15	Equivalent to Nalco ROFA and ROTAMIX
CO	0.176	Good combustion practices, Nalco ROFA equivalent air mixing
FPM_{10} (filterable)	0.012	ESP and baghouse

Prevention of Significant Deterioration (PSD):

This source is not a major stationary source. Therefore, PSD is not applicable.

Consolidated Emissions Reporting Rule (CERR):

40 CFR Part 51, Subpart A - Emission Inventory Reporting Requirements, determines CER based on the emissions of criteria air pollutants from Type B point sources (as defined in 40 CFR Part 51, Subpart A), that emit at the CER triggering levels as shown in the table.

CERR/IN-HOUSE REPORTING APPLICABILITY

Pollutant	Type B CER Triggering Levels [1] (tpy)	Pollutant	In-house Total Facility Triggering Levels [2] (tpy)	Total Facility Emissions (tpy)
NO_x	≥100	NO_x	≥25	210.0
SO_x	≥100	SO_x	≥25	39.2
CO	≥1000	CO	≥250	246.4
$PM_{10}/PM_{2.5}$	≥100/100	PM/PM_{10}	≥25/25	$PM/PM_{10}/PM_{2.5}$ = 33.6
VOC	≥100	VOC	≥25	39.2
Pb	≥5	Pb	≥5	3.29 E-03
		HAPs	≥5	23.8

[1] Based on actual emissions
[2] Based on potential emissions

The facility exceeds the CER triggering level for NO_x. Therefore, CER requirements are applicable.

The Clean Air Branch also requests annual emissions reporting for all covered sources and from those facilities that have facility-wide emissions of a single pollutant exceeding in-house triggering levels. Annual emissions reporting is required for this facility for in-house recordkeeping purposes because it is a covered source and facility-wide emissions exceed the in-house triggering levels for NO_x, SO_x, PM/PM_{10}, VOC and HAPs.

Compliance Assurance Monitoring (CAM):

40 CFR Part 64

Applicability of the CAM rule is determined on a pollutant specific basis for each affected emission unit. Each determination is based upon a series of evaluation criteria. In order for a source to be subject to CAM, each source must:

- Be located at a major source per Title V of the Clean Air Act Amendments of 1990;
- Be subject to federally enforceable applicable requirements;
- Have pre-control device potential emissions that exceed applicable major source thresholds;
- Be fitted with an “active” air pollution control device; and
- Not be subject to certain regulations that specifically exempt it from CAM.

Emission units are any part or activity of a stationary source that emits or has the potential to emit any air pollutant.

As shown in the table below, Compliance Assurance Monitoring (CAM) for the proposed project is only applicable for NO_x.

TABLE 2 – CAM APPLICABILITY FOR BOILER

CAM Criteria	NO_x	CO	SO_2	PM	VOC
Be located at a major source per Title V of the Clean Air Act Amendments of 1990	Yes	Yes	Yes	Yes	Yes
Be subject to federally enforceable applicable requirements	Yes	Yes	Yes	Yes	Yes
Have pre-control device potential emissions that exceed applicable major source thresholds	Yes	Yes	No	No	No
Be fitted with an “active” air pollution control device	Yes	No	Yes	Yes	No
Not be subject to certain regulations that specifically exempt it from CAM.	Yes	Yes	Yes	Yes	Yes
Subject to CAM?	Yes	No	No	No	No

Major Source Applicability:

A major source as defined in HAR §11-60.1-1, has the potential to emit 100 TPY or more of any air pollutant, or 10 TPY or more of any individual HAP or 25 TPY or more of any combination of HAPs. This facility is classified as a major source.

Synthetic Minor Applicability:

A synthetic minor source is a facility that is potentially major (as defined in HAR §11-60.1-1), but is made nonmajor through federally enforceable permit conditions. This facility is a major source and not a synthetic minor.

Alternate Operating Scenarios:

This project did not propose any alternate operating scenarios.

Project Emissions:

Boiler

Biomass Boiler Heat Input at Peak Load * - 407 MMBtu/hr	Max Days of Boiler Operation – 335 days/yr
Biomass Boiler Heat Input at Min Load *– 163 MMBtu/hr	Typical Time at Peak Load – 14 hrs/day
Biodiesel Boiler Heat Input at Min Load *– 41 MMBtu/hr	Typical Time at Minimum Load – 10 hrs/day
Boiler Hours of Normal Operation – 8040 hrs/yr	Startups – 3 per year
Annual Boiler Heat Input During Normal Operation – 2,800,000 MMBtu/yr	Startup – 3 hrs/startup
Biodiesel HHV – 0.019 MMBtu/lb	Startup Fuel Usage – 1100 gallons/startup
Biodiesel Density – 7.34 lbs/gal	Startup Firing Rate – 51 MMBtu/hr
Sulfur Content of Biodiesel – 15 ppm	
Biomass Boiler Annual Heat Input – 2,732,800 MMBtu/yr	
Biodiesel Boiler Annual Heat Input – 67,200 MMBtu/yr	

* Peak Load would only burn biomass. Minimum load would burn a combination of biomass and biodiesel

Boiler Criteria Pollutant Emission Factors

Pollutant	Biomass (controlled) [a]	100% S15 Biodiesel (uncontrolled) [d]
	lb/MMBTU	lb/MMBTU
NO_x	0.15	0.109
CO	0.176	0.055
SO_2	0.028 [b]	0.002
FPM_{10} (filterable)	0.012	0.002
TPM_{10} (filterable and condensable)	0.024	0.002
$PM_{2.5}$ [c]	0.024	0.002
VOC	0.028	0.007

[a] Biomass emission factors for NO_x, CO, and FPM_{10} are proposed as Best Available Control Technology (BACT). TPM_{10} are assumed to be equal to twice the FPM_{10} emission rate.

[b] Average uncontrolled SO_2 emissions expected to be 0.045 lb/MMBtu based on an average sulfur content of 0.01% in the wood but would vary depending on the wood. As needed, 0.028 lb/MMBtu would be achieved through trona or lime injection.

[c] Assuming $PM_{2.5}$ is equivalent to TPM_{10}.

[d] S15 Biodiesel Emission Factor Basis: PM, NO_x, and CO emission factors for the boiler are from the Minnesota Air Pollution Biofuels Report. VOC based on EPA AP-42, Chapter 1.3. SO_2 based on a sulfur content of 15 ppm in the fuel for S15 biodiesel and 100% conversion of sulfur to SO_2.

Potential Emissions - Criteria Pollutants

Pollutant	Boiler Peak Load (Biomass Only)			Boiler Minimum Load [b] (Biomass + Biodiesel) [c]			Boiler Startup [d] (100% Biodiesel)			
	Hourly Emissions (lbs/hr)	Daily Emissions (lbs/day) [f]	Annual Emissions (tons/year) [a]	Hourly Emissions (lbs/hr)	Daily Emissions (lbs/day)	Annual Emissions (tons/year	Hourly Emissions (lbs/hr)	Daily Emissions [e] (lbs/day)	Annual Emissions (tons/year)	Total Annual Emissions (tons/yr) [a]
NO_x	61.1	1465.2	210.0	30.5	732.6	NA	5.6	1298.8	0.025	210.0
CO	71.6	1719.2	246.4	35.8	859.6	NA	2.8	1512.7	0.013	246.4
SO_2	11.4	273.5	39.2	5.7	136.8	NA	0.1	239.6	0.00036	39.2
PM	9.8	234.4	33.6	4.9	117.2	NA	0.1	205.4	0.00046	33.6
TPM_{10}	9.8	234.4	33.6	4.9	117.2	NA	0.1	205.4	0.00046	33.6
$PM_{2.5}$	9.8	234.4	33.6	4.9	117.2	NA	0.1	205.4	0.00046	33.6
VOC	11.4	273.5	39.2	5.7	137	NA	0.4	240.5	0.0017	39.2

[a] Annual emissions from the boiler assumes a maximum annual firing rate of 2,800,000 MMBtu/yr and is accounted for under boiler peak load. Total annual facility emissions is the sum of the annual emissions listed under boiler peak load and startup.

[b] At minimum load, firing rates of 163 MMBtu/hr and 41 MMBtu/hr for burning biomass and S15 biodiesel, respectively, are used.

[c] As shown in the Boiler Criteria Pollutant Emission Factors table, emission factors for the boiler when burning biomass are higher than when burning S15 biodiesel. In this case, the emission factors when burning biomass are conservatively assumed to apply when burning a combination of biomass plus S15 biodiesel.

[d] The following conditions are assumed while starting up the boiler with 100% S15 biodiesel: A firing rate of 51MMBtu/hr, 1100 gallons/startup, 3 hours per startup and 3 startups per year.

[e] Listed daily emissions for the boiler startups include 3 hours of startup and 21 hours of peak load. These values are used in one of the 24-hour average modeling scenarios presented in the Ambient Air Quality Assessment section.

[f] Listed daily emissions for boiler peak load and boiler minimum load assume 24 hours of operation under each load and are the basis for two of the 24-hour average modeling scenarios presented in the Ambient Air Quality Assessment section. Typical operations expected to be 14 hours per day at full load and 10 hours per day at partial load.

HAP Emissions

Pollutant	Percent Control (%)	Wood			Biodiesel			Emissions		
		Uncontrolled Emission Factor (lb/MMBtu)	Controlled Emission Factor (lb/MMBtu)	Emission Factor Source (see notes)	Uncontrolled Emission Factor (lb/MMBtu)	Controlled Emission Factor (lb/MMBtu)	Emission Factor Source (see notes)	Hourly at Peak Load [8] (lb/hr)	Hourly at Minimum Load [9] (lb/hr)	Annual [10] (tons/year)
Acetaldehyde	0	8.30E-04	8.30E-04	1	2.51E-06	2.51E-06	7	3.38E-01	1.35E-01	1.13
Acetophenone	0	3.20E-09	3.20E-09	1	NA	NA	NA	1.30E-06	5.21E-07	4.37E-06
Acrolein	0	8.22E-05	8.22E-05	2,3	2.51E-06	2.51E-06	7	3.35E-02	1.35E-02	1.12E-01
Benzene	0	4.20E-03	4.20E-03	1	3.15E-08	3.15E-08	7	1.71	6.84E-01	5.74
bis(2-Ethylhexyl) phthalate	0	4.70E-08	4.70E-08	1	NA	NA	NA	1.91E-05	7.65E-06	6.42E-05
Bromomethane	0	1.50E-05	1.50E-05	1	NA	NA	NA	6.11E-03	2.44E-03	2.05E-02
1,3 Butadiene	0	NA	NA	NA	1.06E-07	1.06E-07	7	NA	4.31E-06	3.56E-06
Carbon tetrachloride	0	4.50E-05	4.50E-05	1	NA	NA	NA	1.83E-02	7.33E-03	6.15E-02
Chlorine	0	0	0	1,4	NA	NA	NA	0	0	0
Chlorobenzene	0	3.30E-05	3.30E-05	1	1.43E-09	1.43E-09	7	1.34E-02	5.37E-03	4.51E-02
Chloroform	0	2.80E-05	2.80E-05	1	NA	NA	NA	1.14E-02	4.56E-03	3.83E-02
Chloromethane	0	2.30E-05	2.30E-05	1	NA	NA	NA	9.36E-03	3.74E-03	3.14E-02
2-Chloronaphthalene	0	2.40E-09	2.40E-09	1	1.32E-07	1.32E-07	6	9.77E-07	5.75E-06	7.71E-06
Dichloromethane	0	2.90E-04	2.90E-04	1	NA	NA	NA	1.18E-01	4.72E-02	3.96E-01
1,2-Dichloropropane	0	3.30E-05	3.30E-05	1	NA	NA	NA	1.34E-02	5.37E-03	4.51E-02
2,4-Dinitrophenol	0	1.80E-07	1.80E-07	1	NA	NA	NA	7.33E-05	2.93E-05	2.46E-04
Ethylbenzene	0	3.10E-05	3.10E-05	1	1.07E-05	1.07E-05	6	1.26E-02	5.48E-03	4.27E-02
Ethylene dichloride	0	2.90E-05	2.90E-05	1	NA	NA	NA	1.18E-02	4.72E-03	3.96E-02
Formaldehyde	0	4.40E-03	4.40E-03	1	2.50E-03	2.50E-03	6	1.79	8.18E-01	6.10
Hexane	0	NA	NA	NA	2.51E-08	2.51E-08	7	NA	1.02E-06	8.42E-07
Hydrogen chloride	94	6.89E-02	4.00E-03	4	NA	NA	NA	1.63	6.51E-01	5.47
4-Nitrophenol	0	1.10E-07	1.10E-07	1	NA	NA	NA	4.48E-05	1.79E-05	1.50E-04
2,4,6-Trichlorophenol	0	2.20E-08	2.20E-08	1	NA	NA	NA	8.95E-06	3.58E-06	3.01E-05
Pentachlorophenol	0	5.10E-08	5.10E-08	1	NA	NA	NA	2.08E-05	8.30E-06	6.97E-05
Phenol	0	5.10E-05	5.10E-05	1	NA	NA	NA	2.08E-02	8.30E-03	6.97E-02
Propionaldehyde	0	6.10E-05	6.10E-05	1	NA	NA	NA	2.48E-02	9.93E-03	8.34E-02
Styrene	0	1.90E-03	1.90E-03	1	NA	NA	NA	7.73E-01	3.09E-01	2.60
Toluene	0	9.20E-04	9.20E-04	1	3.15E-08	3.15E-08	7	3.74E-01	1.50E-01	1.26
Tetrachloroethane	0	3.80E-05	3.80E-05	1	NA	NA	NA	1.55E-02	6.19E-03	5.19E-02
Trichloroethane	0	3.00E-05	3.00E-05	1	NA	NA	NA	1.22E-02	4.88E-03	4.10E-02
Vinyl Chloride	0	1.80E-05	1.80E-05	1	NA	NA	NA	7.33E-03	2.93E-03	2.46E-02
o-Xylene	0	2.50E-05	2.50E-05	1	NA	NA	NA	1.02E-02	4.07E-03	3.42E-02
Xylene (total)	0	NA	NA	NA	1.07E-05	1.07E-05	6	NA	4.34E-04	3.59E-04

HAP Emissions

Pollutant	Percent Control (%)	Wood			Biodiesel			Emissions		
		Uncontrolled Emission Factor (lb/MMBtu)	Controlled Emission Factor (lb/MMBtu)	Emission Factor Source (see notes)	Uncontrolled Emission Factor (lb/MMBtu)	Controlled Emission Factor (lb/MMBtu)	Emission Factor Source (see notes)	Hourly at Peak Load [8] (lb/hr)	Hourly at Minimum Load [9] (lb/hr)	Annual [10] (tons/year)
Metals										
Antimony	95	7.90E-06	3.95E-07	1	NA	NA	NA	1.61E-04	6.43E-05	5.40E-04
Arsenic	95	2.20E-05	1.10E-06	1	4.00E-06	2.00E-07	5	4.48E-04	1.87E-04	1.51E-03
Beryllium	95	1.10E-06	5.50E-08	1	3.00E-06	1.50E-07	5	2.24E-05	1.51E-05	8.02E-05
Cadmium	95	4.10E-06	2.05E-07	1	3.00E-06	1.50E-07	5	8.34E-05	3.95E-05	2.85E-04
Chromium	95	2.10E-05	1.05E-06	1	3.00E-06	1.50E-07	5	4.27E-04	1.77E-04	1.44E-03
Chromium (VI)	95	3.50E-06	1.75E-07	1	NA	NA	NA	7.12E-05	2.85E-05	2.39E-04
Lead	95	4.80E-05	2.40E-06	1	9.00E-06	4.50E-07	5	9.77E-04	4.09E-04	3.29E-03
Manganese	95	1.60E-03	8.00E-05	1	6.00E-06	3.00E-07	5	3.26E-02	1.30E-02	1.09E-01
Mercury	0	3.50E-06	3.50E-06	1	3.00E-06	3.00E-07	5	1.42E-03	6.92E-04	4.88E-03
Nickel	95	3.30E-05	1.65E-06	1	3.00E-06	1.50E-07	5	6.72E-04	2.75E-04	2.26E-03
Phosphorus	95	2.70E-05	1.35E-06	1	NA	NA	NA	5.49E-04	2.20E-04	1.84E-03
Selenium	95	2.80E-06	1.40E-07	1	1.50E-05	7.50E-07	5	5.70E-05	5.33E-05	2.16E-04
PAHs										
Acenaphthene	0	9.10E-07	9.10E-07	1	1.51E-06	1.51E-06	6	3.70E-04	2.10E-04	1.29E-03
Acenaphthylene	0	5.00E-06	5.00E-06	1	4.66E-07	4.66E-07	6	2.04E-03	8.33E-04	6.85E-03
Anthracene	0	3.00E-06	3.00E-06	1	1.71E-07	1.71E-07	6	1.22E-03	4.95E-04	4.10E-03
Benzo(a)anthracene	0	6.50E-08	6.50E-08	1	9.67E-08	9.67E-08	6	2.65E-05	1.45E-05	9.21E-05
Benzo(a)pyrene	0	2.60E-06	2.60E-06	1	5.41E-08	5.41E-08	6	1.06E-03	4.25E-04	3.55E-03
Benzo(b)fluoranthene	0	1.00E-07	1.00E-07	1	4.78E-08	4.78E-08	6	4.07E-05	1.82E-05	1.38E-04
Benzo(e)pyrene	0	2.60E-09	2.60E-09	1	1.00E-07	1.00E-07	6	1.06E-06	4.50E-06	6.92E-06
Benzo(g,h,i)perylene	0	9.30E-08	9.30E-08	1	6.09E-08	6.09E-08	6	3.79E-05	1.76E-05	1.29E-04
Benzo(j,k)fluoranthene	0	1.60E-07	1.60E-07	1	NA	NA	NA	6.51E-05	2.60E-05	2.19E-04
Benzo(k)fluoranthene	0	3.60E-08	3.60E-08	1	5.95E-07	5.95E-07	6	1.47E-05	3.01E-05	6.92E-05
Chrysene	0	3.80E-08	3.80E-08	1	9.17E-08	9.17E-08	6	1.55E-05	9.92E-06	5.50E-05
Dibenzo(a,h)anthracene	0	9.10E-09	9.10E-09	1	4.65E-08	4.65E-08	6	3.70E-06	3.37E-06	1.40E-05
Fluoranthene	0	1.60E-06	1.60E-06	1	2.38E-07	2.38E-07	6	6.51E-04	2.70E-04	2.19E-03
Fluorene	0	3.40E-06	3.40E-06	1	8.38E-07	8.38E-07	6	1.38E-03	5.88E-04	4.67E-03
Indeno(1,2,3-cd)pyrene	0	8.70E-08	8.70E-08	1	4.76E-08	4.76E-08	6	3.54E-05	1.61E-05	1.20E-04
2-Methylnaphthalene	0	1.60E-07	1.60E-07	1	1.00E-06	1.00E-06	6	6.51E-05	6.69E-05	2.52E-04
Naphthalene	0	9.70E-05	9.70E-05	1	2.63E-03	2.63E-03	6	3.95E-02	1.23E-01	2.21E-01
Perylene	0	5.20E-10	5.20E-10	1	1.94E-07	1.94E-07	6	2.12E-07	7.99E-06	7.23E-06
Phenanthrene	0	7.00E-06	7.00E-06	1	2.66E-06	2.66E-06	6	2.85E-03	1.25E-03	9.65E-03
Pyrene	0	3.70E-06	3.70E-06	1	2.92E-07	2.92E-07	6	1.51E-03	6.14E-04	5.07E-03

HAP Emissions

Pollutant	Percent Control (%)	Wood			Biodiesel			Emissions		
		Uncontrolled Emission Factor (lb/MMBtu)	Controlled Emission Factor (lb/MMBtu)	Emission Factor Source (see notes)	Uncontrolled Emission Factor (lb/MMBtu)	Controlled Emission Factor (lb/MMBtu)	Emission Factor Source (see notes)	Hourly at Peak Load [8] (lb/hr)	Hourly at Minimum Load [9] (lb/hr)	Annual [10] (tons/year)
Dioxins/Furans										
2,3,7,8 -TCDD	0	1.00E-11	1.00E-11	11	NA	NA	NA	4.16E-09	1.66E-09	1.40E-08
Tetrachorodibenzo-p-dioxins	0	2.20E-10	2.20E-10	11	NA	NA	NA	8.77E-08	3.51E-08	2.95E-07
Pentachlorodibenzo-p-dioxins	0	3.40E-10	3.40E-10	11	NA	NA	NA	1.39E-07	5.55E-08	4.65E-07
Hexachlorodibenzo-p-dioxins	0	1.10E-10	1.10E-10	11	NA	NA	NA	4.39E-08	1.75E-08	1.47E-07
Heptachlorodibenzo-p-dioxins	0	4.10E-10	4.10E-10	11	NA	NA	NA	1.65E-07	6.60E-08	5.54E-07
Octachlorodibenzo-p-dioxins	0	7.30E-11	7.30E-11	11	NA	NA	NA	2.98E-08	1.19E-08	9.99E-08
2,3,7,8-TCDF	0	1.50E-10	1.50E-10	11	NA	NA	NA	6.24E-08	2.50E-08	2.10E-07
Tetrachorodibenzo-p-furans	0	9.70E-10	9.70E-10	11	NA	NA	NA	3.95E-07	1.58E-07	1.33E-06
Pentachlorodibenzo-p-furans	0	1.10E-09	1.10E-09	11	NA	NA	NA	4.46E-07	1.78E-07	1.50E-06
Hexachlorodibenzo-p-furans	0	7.40E-10	7.40E-10	11	NA	NA	NA	3.00E-07	1.20E-07	1.01E-06
Heptachlorodibenzo-p-furans	0	3.70E-10	3.70E-10	11	NA	NA	NA	1.51E-07	6.06E-08	5.08E-07
Octachlorodibenzo-p-furans	0	1.50E-10	1.50E-10	11	NA	NA	NA	6.16E-08	2.46E-08	2.07E-07
Polychlorinated Biphenyls (PCBs)										
Monochlorobiphenyl	0	2.20 E-10	2.20 E-10	1	NA	NA	NA	8.95 E-08	3.58 E-08	3.01 E-07
Dichlorobiphenyl	0	7.40 E-10	7.40 E-10	1	NA	NA	NA	3.01 E-07	1.20 E-07	1.01 E-06
2,4,4-Trichlorobiphenyl	0	2.60 E-09	2.60 E-09	1	NA	NA	NA	1.06 E-06	4.23 E-07	3.55 E-06
Tetrachlorobiphenyls, total	0	2.50 E-09	2.50 E-09	1	NA	NA	NA	1.02 E-06	4.07 E-07	3.42 E-06
Pentachlorobiphenyls, total	0	1.20 E-09	1.20 E-09	1	NA	NA	NA	4.88 E-07	1.95 E-07	1.64 E-06
Hexachlorobiphenyls, total	0	5.50 E-10	5.50 E-10	1	NA	NA	NA	2.24 E-07	8.95 E-08	7.52 E-07
Heptachlorobiphenyls, total	0	6.60 E-11	6.60 E-11	1	NA	NA	NA	2.69 E-08	1.07 E-08	9.02 E-08
Decachlorobiphenyl	0	2.70 E-10	2.70 E-10	1	NA	NA	NA	1.10 E-07	4.40 E-08	3.69 E-07
Maximum HAP (Formaldehyde) (tpy)										6.10

Maximum Total HAPs (tpy)										23.8

1 US EPA AP-42, Section 1.6, Tables 1.6-3, 1.6-4
2 Maine Department of Environmental Protection, Bureau of Air Quality
3 Acrolein emission factor for wood calculated using an emission factor of 7.4 E-04 lbs/ton $_{wood}$ and a HHV of 4500 Btu/lb $_{wood}$
4 Based on wood analysis where average Cl content was 0.03% wt. Assume all chlorine is emitted as HCl
5 US EPA AP-42, Section 1.3, Tables 1.3-10 assuming biodiesel emission factors same as distillate fuel oil
6 California Toxic Emission Factors (CATEF), Boiler, Diesel
7 2003 Permit Renewal Application for Covered Source Permit No. 0229-02-C, which was based on Ventura County APCD Emission Factors
8 Maximum hourly based on peak load of 407 MMBtu/hr
9 Minimum hourly based on 163 MMBtu/hr on biomass and 41 MMBtu/hr on S15 biodiesel
10 Annual based on 97.6% of annual heat input burning biomass and 2.4% of annual heat input burning S15 biodiesel
11 US EPA, Table 4-14, “An Inventory of Sources and Environmental Releases of Dioxin-Like Compounds in the United States for the Years 1987, 1995, and 2000”, Nov. 2001

Ambient Air Quality Assessment:

The applicant performed an ambient air quality impact assessment to estimate maximum off-site concentrations of CO, NO_2, PM_{10}, $PM_{2.5}$, and SO_2. The analysis was performed to demonstrate that the operations of Hu Honua will not cause or add to an exceedance of an NAAQS or SAAQS. The impact analysis was performed for multiple operating scenarios to illustrate that the maximum potential concentrations have been identified. The operating scenarios vary depending on the pollutant and averaging times and represent the boiler at maximum firing load, minimum firing load, and during startup conditions. The modeling scenarios were as follows:

- 1-hour concentrations of CO, NO_2 and SO_2 during boiler startup, minimum load and full load;
- 8-hour concentrations of CO assuming boiler is operating at full load;
- 8-hour concentrations of CO assuming boiler is operating at minimum load;
- 8-hour concentrations of CO assuming 3 hours of boiler startup and 5 hours at full load;
- 3-hour concentrations of SO_2 assuming boiler is operating at full load;
- 3-hour concentrations of SO_2 assuming boiler is operating at minimum load;
- 3-hour concentrations of SO_2 during boiler startup;
- 24-hour concentrations of PM_{10} and SO_2 assuming boiler is operating at full load;
- 24-hour concentrations of PM_{10} and SO_2 assuming boiler is operating at minimum load;
- 24-hour concentrations of PM_{10} and SO_2 assuming 3 hours of boiler startup and 21 hours at full load; and
- Annual concentrations of NO_2, PM_{10}, and SO_2 accounting for expected annual normal operations of the boiler and 9 hours of boiler startup (3 startups).

<u>Methodology</u>

The dispersion modeling was performed using the AERMOD modeling system. AERMOD incorporates air dispersion for both surface and elevated sources and for areas with either simple and/or complex terrain. The AERMOD modeling system includes two regulatory components which include a meteorological data preprocessor, AERMET, and a terrain data preprocessor, AERMAP.

AERMET was used to process the most recent available 5 years of surface meteorological data (2003-2007) which were obtained from the National Oceanic and Atmospheric Association (NOAA). The Integrated Surface Hourly data were collected at the Hilo International Airport located approximately 8.7 miles to south-southeast of Hu Honua. As both the Hu Honua facility and the Hilo International Airport are located on the eastern coast of the Island of Hawaii, wind flow patterns are comparable. The winds along the eastern coast are dominated by northeasterly trade winds during the day and by the persistent, slower winds from the southwest due to the drainage of cool air flowing down the slope of Mauna Kea.

Upper air soundings from the Hilo Airport were downloaded (for all levels) from the Radiosonde Database Access website (http://raob.fsl/noaa.gov/). Meteorological data processing using AERMET requires the input of surface characteristics which include surface roughness length, bowen ratio, and albedo. These surface characteristics can be determined using a USEPA program called AERSURFACE, which supports the use of land cover data from the USGS National Land Cover Data 1992 archives (NLCD92). These data, however, are not available for Hawaii, and therefore AERSURFACE is not a viable option. However, land cover data are available for 2001. These data were used in conjunction with the guidance described in the AERMOD Implementation Guide to calculate the necessary AERMET inputs. The Alaska Department of Environmental Conservation has developed specific guidance for implementing

this technique. This guidance was used in developing the necessary surface characteristics for input to AERMET.

A receptor grid was placed in locations surrounding the proposed facility. Receptors were placed at 25 meter increments out to a distance of approximately 75 meters, at 50 meter increments to a distance of 300 meters, at 100 meter increments to a distance of 2500 meters, at 250 meter increments out to a distance of approximately 5000 meters, and at 500 meter increments to a distance of 10 kilometers. When necessary, a fine receptor grid of 25 meter increments was used to better define the locations of maximum impacts. Receptor elevations were obtained from USGS digital elevation models. As part of the AERMOD modeling system, AERMAP (version 09040) was run to calculate Terrain Maximum heights for each modeled receptor. The modeling domain used for calculating the terrain heights extended west beyond Mauna Kea, south to include Hilo, north to Papaaloa, and to the east 9 kilometers over the ocean. This required input to AERMOD, and must be completed before the AERMOD model can be executed.

Regulatory default technical options were selected for the AERMOD modeling. These regulatory default options are found in the AERMOD User's manual. They include stack tip downwash and a routine for processing concentrations averages during calm winds and when there are missing data.

The AERMOD dispersion model can simulate the transport of emissions from multiple sources including point sources, area sources, and volume sources. The model requires specific inputs for each source type. Air emissions sources for this analysis have been characterized as point sources (stacks). For point sources, the model requires the input of the source location, stack base elevation, stack height, stack inner diameter, stack gas exit velocity, and stack gas exit temperature. Source locations were identified using the Universal Transverse Mercator (UTM) coordinate system. Stack parameters are shown in the table below.

Source	Stack Base Elevation (m)	Stack Height (m)	Stack Inner Diameter (m)	Stack Gas Exit Temperature (k)	Stack Gas Exit Velocity (m/s)
Boiler - Peak	24.64	42.67	2.29	447.04	18.29
Boiler – Low Load and Startup	24.64	42.67	2.29	430.37	6.10

The USEPA provides specific guidance to determine whether or not a structure potentially affects pollutant dispersion from a nearby emission source. The guidance states that, if a structure is located within a certain distance from the emissions sources, downwash effects on the dispersion of stack emissions must be considered. A Good Engineering Practice (GEP) stack height is defined as the height at which nearby building downwash effects are not expected to influence plume behavior.

The Building Profile Input Program Prime (BPIP Prime), a software program, calculates the GEP formula heights and direction-specific building dimensions for input into the AERMOD model. BPIP Prime requires the input of building/structure corner coordinates and point source coordinates and heights. The UTM coordinate system was used to identify source and building/structure locations. The AERMOD model uses BPIP Prime outputs as input for calculating the aerodynamic building downwash from multiple buildings.

Emissions from criteria pollutants were developed for each of the modeling scenarios summarized above. The emission rates and modeling scenarios developed for the criteria

pollutant modeling were dependent on the various pollutants and averaging times for the various NAAQS and SAAQS.

To show compliance with the NAAQS and SAAQS, maximum modeled concentrations of CO, NO_2, PM_{10}, $PM_{2.5}$, and SO_2 have been added to representative monitored background concentrations. With the exception of annual concentrations and 24-hour concentrations of $PM_{2.5}$, this analysis used the high-second-high modeling results. The table below summarizes the total pollutant concentrations and shows no exceedances of the NAAQS or SAAQS.

Project Impacts for the Boiler

Pollutant	Averaging Period	Maximum Modeled Concentration ($\mu g/m^3$)	Measured Background Concentration [a] ($\mu g/m^3$)	Maximum Total Concentration ($\mu g/m^3$)	AAQS [b] ($\mu g/m^3$)	Percent of AAQS
NO_2	Annual	1.1	9	10.1	75	13.5
	1-hour	32.9	68	100.9	188	53.7
SO_2	Annual	0.2	13	13.2	80	16.5
	24-hour	1.9	267	268.9	365	73.7
	3-hour	13.5	1191	1204.5	1300	92.7
	1-hour	12.9	44	56.9	196	29.0
CO	8-hour	31.8	1374	1405.8	5000	28.1
	1-hour	223.4	4343	4566.4	10000	45.7
PM_{10}	Annual	0.2	18	18.2	50	36.4
	24-hour	1.7	61	62.7	150	41.8
$PM_{2.5}$	Annual	0.2	6	6.2	15	41.3
	24-hour	2.6	21	23.6	35	67.4

[a] Background concentrations are based on the Kapolei Monitoring Station for SO_2 (1-hr), NO_x (1-hr, annual), CO (1-hr, 8-hr), PM_{10} (24-hr, annual) and $PM_{2.5}$ (24-hr, annual); and Hilo Monitoring Station for SO_2 (3-hr, 24-hr, annual). Data from 2007 was used for NO_x (1-hr, annual), CO (1-hr), 2008 for SO_2 (1-hr, 3-hr), PM_{10} (24-hr, annual), $PM_{2.5}$ (24-hr), 2009 for CO (8-hr), SO_2 (24-hr, annual), $PM_{2.5}$ (annual)

[b] Only the more restrictive of the National Ambient Air Quality Standards or State Ambient Air Quality Standards are shown.

Risk Assessment:

In order to evaluate HAP concentration levels, the DOH requested that a HAP screening assessment be performed in accordance with HAR §11-60.1-179 to determine whether any HAP concentration is at or near a significant ambient air concentration level.

The applicant submitted modeling and calculations for the following:

1. A comparison of the maximum 8-hour ambient air concentration to 1/100 of the TLV-TWA threshold limit values for all non-carcinogenic HAPs for the boiler.

2. A comparison of the maximum annual average ambient air concentration to 1/420 of the TLV-TWA threshold limit values for all non-carcinogenic HAPs for the boiler.

3. A comparison to a risk threshold limit of 10 in a million for all carcinogenic HAPs for the boiler using the maximum annual average ambient air concentration and the Preliminary Remediation Goals unit risk factors.

The modeling and calculations indicate that all HAP concentrations will be below the significant ambient air concentration levels.

Ammonia (NH_3) Slip:

O_2 Concentration (%)	NH_3 Concentration (ppmvd)	NH_3 Emissions (lb/hr)	NH_3 Emissions, 8760 hrs/yr at peak load (tpy)	NH_3 Emissions, based on MMBtu/yr (tpy)
3[a]	40	11.1	48.6	38.2
4.3[b]	37.1	10.3	45.1	35.4

[a] The permit has a ammonia slip limit of 40 ppmvd at 3% O_2
[b] This is the expected actual O_2 concentration in the flue gas

Pollutant	Averaging Period	Maximum Modeled Concentration ($\mu g/m^3$)	Measured Background Concentration ($\mu g/m^3$)	Maximum Total Concentration ($\mu g/m^3$)	Odor Threshold ($\mu g/m^3$)	Percent of Odor Threshold (%)
NH_3	1-hour	35.41	0	35.41	11,320	0.3

The maximum modeled concentration is based upon a NH_3 concentration of 37.1 ppmvd and 10.3 lb/hr.

Significant Permit Conditions:

1. Significant permit conditions for the boiler included incorporating the emission limits, monitoring requirements, test methods and procedures, and reporting/recordkeeping requirements of NSPS Subparts A and Db.

2. Significant permit conditions for the boiler included incorporating the emission limits, monitoring requirements, test methods and procedures, and reporting/recordkeeping requirements of MACT Subparts A and JJJJJJ.

3. The applicant has also proposed provisions for HCl emissions, including a Continuous Parameter Monitoring System (CPMS) to measure sorbent injection rate and a HCl Continuous Emissions Monitoring System (CEMS). Also the installation of a NO_x and CO Continuous Emissions Monitoring System (CEMS).

Conclusion and Recommendations:

Recommend issuing an initial covered source permit for the proposed biomass electricity generating facility. The emissions from the facility are not significant to trigger PSD. In addition, HAP emissions are now below the 10 tpy for a single HAP and 25 tpy for combined HAPs such that this source is now considered an area source of HAPs, and not a major source of HAPs. The ambient air quality impacts from the proposed biomass electricity generating facility are within the State and Federal Ambient Air Quality Standards. A 30-day public comment period and a 45-day EPA review period are also required.

Reviewer: Darin Lum
Date: May 2011