Initial Covered Source Permit No. 0641-02-C

Application No.: Initial Covered Source Application no. 0641-03
Amendment 01, May 17, 2011
Amendment 02, May 24, 2011
Amendment 03, July 11, 2011
Amendment 04, July 25, 2011

Organization Name: Big Island Carbon, LLC

Equipment Location: 61-3277 Maluokalani Street
Kawaihae, Hawaii 96743
UTM Coordinates: Zone 5
203,440 m East; 2,219,308 m North
NAD-83

Responsible Official: Rick Vidgen
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SIC Code: 2819 Industrial Inorganic Chemicals, Not Elsewhere Classified

BACKGROUND: The facility converts raw macadamia nut shells to activated carbon using a pyrolysis reactor and kiln activation system. Approximately 2,700 pounds of macadamia nut shells are used to produce approximately 470 pounds of activated carbon per hour. It was originally issued under noncovered source permit no. 0641-01-N on March 4, 2011. The applicant is proposing to add a 29.5 MMBTU/hr steam boiler which is subject to both an NSPS and the boiler MACT; thus, pursuant to Hawaii rules it requires a covered source permit.

Process

Macadamia nut shells are fed into a pyrolysis reactor where they are exposed to 850 F steam and nitrogen causing a destructive distillation which produces char, gases and vapors. The char is conveyed to storage bins and then on to a kiln where it is "activated" in an electrically heated cylinder facilitated by superheated steam, cooled and then conveyed to product storage bins. The off-gases and vapors from the reactor pass through a wet scrubber cyclone to remove particulate matter and then to a condenser where the gases and pyrolysis oil are separated. The gases are fired in either the 29.5 MMBTU/hr boiler or a 29 MMBTU/hr thermal oxidizer (flare). The pyrolysis oil is pumped through a rotary vacuum filter for removal of particles and then to a storage tank. The pyrolysis oil will be fired in the 29.5 MMBTU/hr boiler. The off-gases from the activation kiln pass through a cyclone, four (4) heat exchangers and then fired in either the 29.5 MMBTU/hr boiler or the 29 MMBTU/hr flare.

Equipment:

1. One 29.5 MMBtu/hr Steam Boiler with Steam Turbine

   Make: CB Nebraska
   Model: CB-NB-242D-56-600
   Serial No:CP-4136 Capacity: 29.5 MMBtu/hr
   Fuel type: pyrolysis oil & off-gas, kiln off-gas, diesel fuel oil no. 2 (ULSD)
   Fuel sulfur content: diesel fuel oil no. 2, 0.0015% maximum by weight
   pyrolysis oil, 0.06% by weight
   Fuel consumption: 29.5 MMBTU/hr

2. One primary 2,639 HP diesel engine generator with selective catalytic reduction and heat recovery steam generator (HSRG)

   Make: Cummins
   Model: QSK60-G6-NR2
   Serial No.: 33183292 (diesel engine serial number)
   Capacity: 2,639 HP
   Fuel type: diesel fuel oil no. 2 (ULSD)
   Fuel sulfur content: 0.0015% maximum by weight
   Fuel consumption: 124.1 gallons per hour

3. One 2.194 MMBtu/hr superheater
   Make: Broach
   Serial No.: 20091260
   Fuel type: LPG
   Fuel consumption: 24 gallons per hour

4. One backup 2,639 HP diesel engine generator.
   Make: Cummins
   Model: QSK60-G6-NR2
   Serial No.: number not available at time of permit issuance
   Capacity: 2,639 HP
   Fuel type: diesel no. 2
   Fuel sulfur content, % maximum by weight: 0.0015%
   Fuel consumption: 124.1 gallons per hour

5. Two backup 4.5 MMBtu/hr boilers.
   Make: Bryan
   Model: RVS-150
   Serial No.: 97925 and 97922
   Fuel type: LPG
   Fuel consumption: 49.2 gallons per hour each boiler

6. One backup 29 MMBtu/hr thermal oxidizer (flare)
   Make: Turner EnviroLogic Flare
   Model: ZCS-1-8-30-X-2/8-2/8
   Serial No.: T016CLF40R
   Fuel type: LPG, pyrolysis gas
   Fuel consumption: 29 MMBtu/hr

7. One 258,200 cfm cooling tower

8. One 122,060 cfm cooling tower

9. One rotary cooler with baghouse

10. One char bin with cartridge filter

11. Feed system with baghouse

12. Feed silo with cartridge filters

13. Two product silos with cartridge filters

Air Pollution Controls:

1. ULSD fuel oil no. 2, for SOx control for the 29.5 MMBTU/hr Boiler and diesel engine generators.
2. Selective catalytic reduction system on the primary 2,639 HP diesel engine generator for the control of NO_x emissions.
3. Pyrolysis reactor off-gas cyclone: The off-gas stream from the pyrolysis reactor is connected to a cyclone where pyrolysis-oil sprays may be used to scrub entrained solid particulate from the off-gas stream.
4. Activation kiln off-gas cyclone: The off-gas from the kiln is subjected to a cyclone for particulate control.
5. Baghouses and cartridge (vent) filters to control particulate emissions from the system:

    a. feed system baghouse
    b. silo cartridge filter on feed receiving bin
    c. char bin cartridge filter
    d. baghouse (dust collector) on rotary cooler
    e. two product bin cartridge filters (one each on product bin)

Applicable Requirements:

Hawaii Administrative Rules (HAR):

Chapter 11-59, Ambient Air Quality Standards
Chapter 11-60.1 Air Pollution Control
- Subchapter 1, General Requirements
- Subchapter 2, General Prohibitions
  - 11-60.1-31 Applicability
  - 11-60.1-32 Visible Emissions
  - 11-60.1-38 Sulfur Oxides from Fuel Combustion
  - 11-60.1-39 Storage of Volatile Organic Compounds
- Subchapter 5, Covered Sources
- Subchapter 6, Fees for Covered Sources, Noncovered Sources, and Agricultural Burning
  - 11-60.1-111 Definitions
  - 11-60.1-112 General Fee Provisions for Covered Sources
  - 11-60.1-113 Application Fees for Covered Sources

11-60.1-114 Annual Fees for Covered Sources
Subchapter 7, Prevention of Significant Deterioration Review
Subchapter 8, Standards of Performance for Stationary Sources
11-60.1-161 (1) Subpart A, General Provisions
11-60.1-161 (5) Subpart Dc, Standards of Performance for Small Industrial-Commercial-Institutional Steam Generating Units
Subchapter 9, Hazardous Air Pollutant Sources

NSPS, 40 CFR Part 60 and NESHAP, 40 CFR Part 63 applicability:

The 29.5 MMBtu/hr Steam Boiler is subject to 40 CFR Part 60, Subpart A and Dc, Standards of Performance for Small Industrial-Commercial-Institutional Steam Generating Units (NSPS). Subpart Dc, applies to any boiler for which construction, modification, or reconstruction is commenced after June 9, 1989 that has a maximum design heat input capacity of 100 MMBtu/hr or less but greater than or equal to 10 MMBtu/hr. The boiler fired on fuel oil no. 2, a distillate oil, would be required to comply with fuel oil sulfur limits specified at §60.42c(d).

The 29.5 MMBtu/hr Waste Boiler is subject to 40 CFR Part 63, Subpart JJJJJJ, National Emission Standards for Hazardous Air Pollutions for Area Sources: Industrial, Commercial, and Institutional Boilers (HAPS). In accordance with Subpart JJJJJJ, the boiler would be required to meet particulate emission limits, work practice standards, notification and reporting requirements, and maintain written records.

The two 2,639 bhp diesel engine generators are subject to 40 CFR Part 60, Subpart IIII Standards of Performance for Stationary Compression Ignition Internal Combustion Engines (CI ICE). According to subpart IIII, to be subject to the regulation a diesel engine would have to be constructed (ordered by the owner or operator) after July 11, 2005 and manufactured after April 1, 2006. The subject diesel engine generators were constructed and manufactured after the listed dates.

The two diesel engine generators are subject to 40 CFR Part 63, Subpart ZZZZ National Emissions Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines (RICE). Both diesel engine generators are considered new stationary RICE located at an area source of HAPs based on the DEGs commencing construction after June 12, 2006. As new stationary RICE, the only applicable requirement of Subpart ZZZZ is that the diesel engine generators are subject to the requirements of Subpart IIII.

In-house annual emissions reporting:

The Clean Air Branch requests annual emissions from those facilities that have facility wide emissions exceeding in-house reporting levels and for all covered sources. Annual emissions reporting will be required because this facility is a covered source..

Synthetic minor status:

A synthetic minor source is a facility that is potentially major (as defined in HAR § 11-60.1-1), but is made non-major through federally enforceable permit conditions.

This facility is a synthetic minor based on potential emissions that are greater than major source levels when the equipment are operated at their maximum capacity for 8,760 hours per year.

Non-Applicable Requirements:

PSD applicability:

PSD does not apply since the facility is not a major source. Emissions from the source are less than the 250 ton per year trigger level for PSD (non-listed sources).

NESHAP, 40 CFR Part 61 applicability:

The facility is not subject to NESHAP because there are no standards in 40 CFR Part 61, applicable to this facility.

CAM applicability:
The facility is not subject to Compliance Assurance Monitoring since it is not a major source.

40 CFR Part 51, Subpart A, Emission Inventory Reporting Requirements – Consolidated Emissions Reporting Rule (CERR):

The CERR determines the applicability of compliance emissions reporting (CER) based on the emissions of each air pollutant from the facility that emits at the CER triggering levels shown in the table below:

Minimum Point Source Reporting Thresholds by Pollutant

pollutant	annual cycle type A sources (tpy)	three-year cycle type B sources (tpy)	facility emissions (tpy)
SO_x	≥ 2500	≥ 100	15.9
VOC	≥ 250	≥ 100	19.9
NO_x	≥ 2500	≥ 100	37.7
CO	≥ 2500	≥1000	30.3
Pb		≥ 5	no emission factor
PM_{10}	≥ 250	≥ 100	15.01
$PM_{2.5}$	≥ 250	≥ 100	5.38
Ammonia	≥ 250	≥ 100	1.41

The facility is not subject to the CER rule.

BACT Applicability:

A Best Available Control Technology (BACT) analysis is required for new or modified sources if the net increase in pollutant emissions exceeds significant levels as defined in HAR §11-60.1-1. The facility is not subject to a BACT analysis because emissions from all of the equipment combined are less than significant levels as shown in the following table.

pollutant	emissions from all equipment (tons/yr)	significant level (tons/yr)
CO	30.3	100
NO_x	37.7	40
SO_2	15.9	40
PM	15.18	25
PM_{10}	15.01	15
O_3 (as VOC)	19.9	40
Pb	no emission factor	0.6
Asbestos	no emission factor	0.007
Beryllium	no emission factor	0.0004
Mercury	no emission factor	0.1
Vinyl chloride	no emission factor	1
Fluorides	no emission factor	3
Sulfuric acid mist	no emission factor	7
Hydrogen sulfide	no emission factor	10
Total reduced sulfur	no emission factor	10
Reduced sulfur compounds	no emission factor	10

For details on emissions calculations, see the **Project Emissions** section of this review.

Greenhouse Gas Tailoring Rule:

Title V and PSD permitting for green house gas (GHG) emissions is not applicable to this facility because the potential to emit of CO_2 equivalent (CO_2e) emissions is less than 100,000 tons per year. Under the Tailoring Rule, in no event are sources with the potential to emit less than 100,000 tons per year CO_2e subject to PSD or Title V permitting for GHG emissions after 2016. Total GHG emissions on a CO_2e basis using the global warming potential (GWP) of each GHG are determined in the table below.

GHG	GWP	GHG Mass-Based Emissions (TPY)	CO_2e Based Emissions (TPY)
carbon dioxide (CO_2)	1	30.3	30.3
		Total Emissions→	30.3

Insignificant Activities/Exemption:

1. 12,000 gallon diesel fuel tank
2. 30,000 gallon LPG tank
3. 4,000 gallon pyrolysis oil tank
4. 650 gallon diesel fuel day tank
5. 280 gallon lube oil tank

6. 385 gallon recovered oil tank
7. Welding equipment

The equipment are exempt per:

1. HAR § 11-60.1-62(d)(2)

   Any storage tank, reservoir, or other container of capacity equal to or less than forty thousand gallons storing volatile organic compounds, except those storage tanks, reservoirs, or other containers subject to any standard or other requirement pursuant to Sections 111 and 112 of the Act.
2. HAR § 11-60.1-62(d)(9)

   Welding booths.

Alternative Operating Scenarios:

<u>29.5 MMBTU/hr Boiler</u>

If the 29.5 MMBTU/hr boiler becomes temporarilly inoperable, the permittee may operate one (1) 4.5 MMBTU/hr LPG-fired boiler and the 29 MMBTU/hr thermal oxidize (flare) for up to 500 hours in a rolling twelve-month (12-month) period along with the normally operating superheater and diesel engine generator.

<u>Diesel Engines</u>

The permittee may replace the primary diesel engine with a temporary replacement unit of similar size with equal or lesser emissions if any repair reasonably warrants the removal of the diesel engine from its site (i.e., equipment failure, engine overhaul, or any major equipment problems requiring maintenance for efficient operation).

Project Emissions:

29.5 MMBtu/hr Waste Boiler, Primary Unit
Criteria Pollutant Emissions

pollutant	MMBtu/hr	emission rate[a]	emission rate at 8,760 hours/year [b]
		lb/hr	tons/year
SO2	29.5	0.645	2.8
PM	29.5	0.885	3.87
PM10	29.5	0.485	2.13
PM2.5	29.5	0.3717	1.62
CO	29.5	5.26	23.03
NO_2	29.5	5.2	22.55
HC	29.5	3.6	15.76

[a] Emission rate for NOx, SOx, CO, VOC manufacturer guarantee
Except, PM from 40 CFR 63 Subpart jjjjjj limit 0.03 lb/MMBtu
0.03 lb/MMBtu X 29.5 MMBtu/hr = 0.885 lb/hr

[b] Fuel mixture: fuel oil no. 2 (ULSD, sulfur not to exceed 15 ppm by weight), pyrolysis oil and off-gases from reactor and kiln Fuel oil no. 2 not to exceed 200,000 gal/yr

2,639 bhp Diesel Engine Generator with SCR, Primary Unit
Criteria Pollutant Emissions

pollutant	HP rating	emission rate [a]	emission rate	emission rate	emission rate	emission rate at 645,000 gal/year limit (5,197 hours/year [b])	emission rate at 8,760 hours/yr
		gr/hp-hr	gr/hr	lb/hr	gr/sec	tons/year	tons/yr
SO2	2,639		-	0.026 [d]	0.0033	0	0
PM	2,639	0.06	158.34	0.349	0.044	0.91	1.53
PM10	2,639	0.0576	152.01	0.335	0.042	0.87	1.47
PM2.5	2,639	0.054	142.51	0.314	0.040	0.82	1.38
CO	2,639	0.42	1,108.38	2.444	0.308	6.35	10.70
NO_2 [c]	2,639	0.562	1,483.12	3.270	0.412	8.50	14.32
HC	2,639	0.253	667.67	1.472	0.185	3.78	6.45

[a] Emission rate from manufacturer specification and calculation sheets.

[b] 5,197 hours/year based on fuel consumption limit of 645,000 gal/year and maximum fuel consumption rate of 124.1 gal/hour:

645,000 gal/year ÷ 124.1 gal/hour = 5,197 hours/year

[c] The NO_2 ton/year emission rate used in the **Summary of Facility Emissions** table at the end of this section is based upon the fuel consumption of 645,000 gal/year (5,197 hours/year) by this DEG (DEG with SCR):

690,000 gal/year – 45,000 gal/year (maximum for DEG without SCR) = 645,000 gal/year; or 5,197 hours/year

pollutant	HP rating	emission rate (g/hp-hr)	emission rate (g/hr)	emission rate (lb/hr)	emission rate (g/sec)	emission rate at 645,000 gal/year (5,197 hours/year)
NO_2	2,639	0.562	1,483.12	3.27	0.412	8.49

The DEG without the SCR burns the maximum permitted amount of fuel (45,000 gal/year) while the DEG with SCR burns the remaining permitted quantity of fuel. The permit contains the following limits:

1. The total fuel consumption of the two diesel engine generators shall not exceed 690,000 gallons in any rolling twelve month (12-month) period.
2. The total fuel consumption of the diesel engine generator without SCR shall not exceed 45,000 gallons (362 hrs at maximum operations) in any rolling twelve month (12-month) period.

[d] The SO_2 lb/hr emission rate is based on the maximum fuel sulfur content of 0.0015% by weight:

124.1 gal/hr x 7.05 lb/gal x 0.000015 = 0.01312 lbs SO/hr
0.01312 lbs SO/hr x 2 = 0.026 lbs SO_2/hr

2,639 bhp Diesel Engine Generator with SCR, Primary Unit
Hazardous Air Pollutant Emissions

pollutant	maximum fuel consumption	heal input [a]	emission factor [b]	emission rate	645,000 gal/year limit emission rate	emission rate at 8,760 hours/year
	gal/hr	MMBtu/hr	lb/MMBtu	lb/hr	tons/yr	tons/yr
Acetaldehyde	124.1	17.374	2.52E-05	4.38E-04	1.14E-03	1.92E-03
Acrolein	124.1	17.374	7.88E-06	1.37E-04	3.56E-04	6.00E-04
Benzene	124.1	17.374	7.76E-04	1.35E-02	3.50E-02	5.91E-02
Formaldehyde	124.1	17.374	7.89E-05	1.37E-03	3.56E-03	6.00E-03
Toluene	124.1	17.374	2.81E-04	4.88E-03	1.2E-02	2.14E-02
Xylenes	124.1	17.374	1.93E-04	3.35E-03	8.71E-03	1.47E-02
Total PAH	124.1	17.374	2.12E-04	3.68E-03	5.8E-02	1.61E-02

[a] Heat input based on:

fuel heating value = 0.14 MMBtu/gal
maximum fuel consumption = 124.1 gal/hour
maximum fuel consumption x fuel heating value = 124.1 gal/hour x 0.14 MMBtu/gal
= 17.37 MMBtu/hour

[b] Emission factor from AP-42 Table 3.4-3 Speciated Organic Compound Emission Factors for Large Uncontrolled Stationary Diesel Engines (10/96).

Ammonia emissions due to the use of the SCR:

0.321 lb/hr at outlet based on ammonia slip of 10 ppm @ 15% O2.
0.321 lb/hr x 8,760 hrs/yr ÷ 2000 lbs/ton = 1.41 tons/year

2,639 bhp Diesel Engine Generator without SCR, Backup Unit
Criteria Pollutant Emissions

pollutant	HP rating	emission rate [a]	emission rate	emission rate	emission rate	emission rate at 45,000 gal/yr limit (362 hours/year [b])	8,760 hrs/yr emission rate
		gr/HP-hour	gr/hr	lb/hour	gr/sec	tons/yr	tons/yr
SO2	2,639		13.02	0.026 [c]	3.28E-03	0	0.11
PM	2,639	0.03	79.17	0.175	2.20E-02	0.03	0.76
PM10	2,639	0.03	76.00	0.168	2.11E-02	0.03	0.73
PM2.5	2,639	0.03	71.25	0.157	1.98E-02	0.03	0.69
CO	2,639	0.16	422.24	0.931	1.17E-01	0.17	4.08
NO2	2,639	5.02	13247.78	29.206	3.68	5.29	127.92
HC	2,639	0.25	659.75	1.454	1.83E-01	0.26	6.37

[a] Emission rate from manufacturer specification sheet.

[b] 362 hours/year based on fuel consumption limit of 45,000 gal/year and maximum fuel consumption rate of 124.1 gal/hour:

45,000 gal/year ÷ 124.1 gal/hour = 362 hours/year < 500 hr/yr emergency genset

[c] The SO_2 lb/hr emission rate is based on the maximum fuel sulfur content of 0.0015% by weight:

124.1 gal/hr x 7.05 lb/gal x 0.000015 = 0.01312 lbs SO/hr
0.01312 lbs SO/hr x 2 = 0.026 lbs SO_2/hr

2,639 bhp Diesel Engine Generator without SCR, Backup Unit
Hazardous Air Pollutant Emissions

pollutant	maximum fuel consumption	heal input [a]	emission factor [b]	emission rate	45,000 gal/yr limit emission rate	8,760 hrs/yr emission rate
	gal/hour	MMBtu/hour	lb/MMBtu	lb/hour	tons/year	tons/year
Acetaldehyde	124.1	17.37	2.52E-05	4.38E-04	7.92E-05	1.92E-03
Acrolein	124.1	17.37	7.88E-06	1.37E-04	2.48E-05	6.00E-04
Benzene	124.1	17.37	7.76E-04	1.35E-02	2.44E-03	5.91E-02
Formaldehyde	124.1	17.37	7.89E-05	1.37E-03	2.48E-04	6.00E-03
Toluene	124.1	17.37	2.81E-04	4.88E-03	8.84E-04	2.14E-02
Xylenes	124.1	17.37	1.93E-04	3.35E-03	6.07E-04	1.47E-02
Total PAH	124.1	17.37	2.12E-04	3.68E-03	1.1E-03	1.61E-02

[a] Heat input based on:

fuel heating value = 0.14 MMBtu/gal
maximum fuel consumption = 124.1 gal/hour
maximum fuel consumption x fuel heating value = 124.1 gal/hour x 0.14 MMBtu/gal
= 17.37 MMBtu/hour

[b] Emission factor from AP-42 Table 3.4-3 Speciated Organic Compound Emission Factors for Large Uncontrolled Stationary Diesel Engines (10/96).

4.5 MMBtu/hr Boiler, Backup Unit with 500 hr/hr limit
Criteria Pollutant Emissions

		one boiler [a]				one boiler
pollutant	emission factor [b]	fuel consumption	emission rate	emission rate	500 hours/year emission rate	8,760 hours/year emission rate
	lb/1000 gal	gal/hour	lbs/hour	gr/sec	tons/year	tons/year
SO2	1.5	49.2	0.074	9.30E-03	0.012	0.32
PM	0.7	49.2	0.034	4.34E-03	0.009	0.15
PM10	0.553	49.2	0.027	3.43E-03	0.007	0.12
PM2.5	0.315	49.2	0.015	1.95E-03	0.004	0.07
CO	7.5	49.2	0.369	4.65E-02	0.092	1.62
NOx	13	49.2	0.640	8.06E-02	0.160	2.80
VOC	1	49.2	0.049	6.20E-03	0.0122	0.22

[a] Only one boiler is permitted to operate at any time. As backup, limit 500 hrs/yr between both backup boilers, cannot operate simultaneously with 29.5 MMBtu/hr Waste Boiler

[b] Emission factors are based on AP-42 Table 1.5-1 Emission Factors for LPG Combustion (07/08). PM_{10} and $PM_{2.5}$ emission factors are based on Appendix B.2 Generalized Particle Size Distributions, Category 2 where 79% of PM emissions are PM_{10} and 45% of PM emissions are $PM_{2.5}$.

2.194 MMBtu/hr Super Heater, Primary Unit
Criteria Pollutant Emissions

pollutant	emission factor [a]	fuel consumption	emission rate	emission rate	500 hours/year emission rate
	lb/1000 gal	gal/hour	lbs/hour	gr/sec	tons/year
NOx	13	23.98	0.312	3.93E-02	1.37
SO2	1.5	23.98	0.036	4.53E-03	0.10
CO	7.5	23.98	0.180	2.27E-02	0.79
PM	0.7	23.98	0.017	2.11E-03	0.07
PM10	0.553	23.98	0.013	1.67E-03	0.06
PM2.5	0.315	23.98	0.008	9.52E-04	0.03
VOC	1	23.98	0.024	3.02E-03	0.10

[a] Emission factors are based on AP-42 Table 1.5-1 Emission Factors for LPG Combustion (07/08). PM_{10} and $PM_{2.5}$ emission factors are based on Appendix B.2 Generalized Particle Size Distributions, Category 2 where 79% of PM emissions are PM_{10} and 45% of PM emissions are $PM_{2.5}$.

Flare - LPG Combustion, Backup Unit with 500 Hr/yr limit
Criteria Pollutant Emissions

pollutant	emission factor [a]	fuel consumption [b]	emission rate	emission rate	500[c] hours/year emission rate
	lb/1000 gal	1000 gal/hour	lbs/hour	gr/sec	tons/yr
NOx	13	0.1066	1.385	1.75E-01	0.34
SO2	1.5	0.1066	0.160	2.01E-02	0.027
CO	7.5	0.1066	0.799	1.01E-01	0.20
PM	0.7	0.1066	0.075	9.40E-03	0.019
PM_{10}	0.553	0.1066	0.059	7.42E-03	0.015
$PM_{2.5}$	0.315	0.1066	0.034	4.23E-03	0.008
VOC	1	0.1066	0.107	1.34E-02	0.027

[a] Emission factors are based on AP-42 Table 1.5-1 Emission Factors for LPG Combustion (07/08). PM_{10} and $PM_{2.5}$ emission factors are based on Appendix B.2 Generalized Particle Size Distributions, Category 2 where 79% of PM emissions are PM_{10} and 45% of PM emissions are $PM_{2.5}$.

[b] Fuel consumption is based on the following:

Maximum heat input contributed by LPG is 9.75 MMBtu/hour
Heating value of LPG is 0.0915 MMBtu/gal

9.75 MMBtu/hour ÷ 0.0915 MMBtu/gal = 0.1066 gal/hour

C Backup unit to 29.5 MMBtu/hr Waste Boiler with operating limitation of five hundred (500) hours per year

Flare – Bio Gas Combustion, Backup Unit with 500 Hr/yr limit
Criteria Pollutant Emissions

pollutant	emission factor [a]	heat input [b]	emission rate [c]	emission rate	500[d] hours/year emission rate
	lb/MMBtu	MMBtu/hr	lbs/hour	gr/sec	tons/yr
SO2	---	19.25	---	---	---
PM	---	19.25	0.098	1.23E-02	0.024
PM_{10}	---	19.25	0.098	1.23E-02	0.024
$PM_{2.5}$	---	19.25	0.098	1.23E-02	0.024
CO	0.37	19.25	7.123	8.97E-01	1.781
NOx	0.068	19.25	1.309	1.65E-01	0.323
VOC	0.14	19.25	2.695	3.40E-01	0.674

a CO, NOx, and VOC emission factors are based on AP-42 Table 13.5-1 Emission Factors for Flare Operations (09/91).

b Maximum heat input contributed by bio gas is 19.25 MMBtu/hour.

c PM emission rate is based on footnote c of AP-42 Table 13.5-1 Emission Factors for Flare Operations which states: Soot in concentration values for average smoking flares = 177 μg/L. The PM emission calculation is based on the following:

PM emission rate = 177 μg/L
Flow rate/hour = 250,254 L/hour (provided by the applicant)
Mass PM/hour = 44,294,958 μg/hour = 0.0977 lbs/hour

d Backup unit to 29.5 MMBtu/hr Waste Boiler with operating limitation of five hundred (500) hours per year

Feed System Baghouse:

exhaust flow	25,000	acfm				
baghouse efficiency	99.90%					
maximum output	0.01	grains/dscf	Provided by the manufacturer.			
maximum output	250	grain/min				
maximum output	16.2	gram/min				
Maximum output	972	gram/hour				
TSP = PM10	2.14	lbs/hour	2.70E-01	grams/sec	9.37	tons/year
PM2.5	0.321	lbs/hour	4.04E-02	grams/sec	1.41	tons/year

Rotary Cooler Baghouse

exhaust flow	15	acfm		
baghouse efficiency	99.99%			
maximum output	5.00E-03	grain/dscf	Provided by the manufacturer.	
maximum output	7.50E-02	grain/min		
maximum output	4.86E-03	gram/min		
Maximum output	2.92E-01	gram/hour		
TSP = PM10	6.44E-04	lbs/hour	2.82E-03	tons/year
PM2.5	9.66E-05	lbs/hour	4.23E-04	tons/year

Miscellaneous Baghouses/Cartridge Filters:

baghouse/cartridge filter	bin height	bin diameter	bin volume	EF	turnovers/year	PM/TSP	PM10	PM2.5	PM/TSP	PM10	PM2.5
	ft	ft	ft3	gr/dscf		grains/year	grains/year	grains/year	tons/year	tons/year	tons/year
raw shell silo	43	18	10,942	0.005	365	19,969	19,969	2,995	1.43E-03	1.43E-03	2.14E-04
char bin	30	6.5	995	0.005	365	1,817	1,817	273	1.30E-04	1.30E-04	1.95E-05
product silo #1	22	7	846	0.005	365	1,545	1,545	232	1.10E-04	1.10E-04	1.66E-05
product silo #2	22	7	846	0.005	365	1,545	1,545	232	1.10E-04	1.10E-04	1.66E-05

Review date: July 2011
Reviewed by: GS

Summary of Facility Emissions

	DEG (SCR)		DEG (no SCR)		4.5MM Boiler[r9]	Waste Boiler	Superheater	LPG – Flare[9]	Bio Gas – Flare[9]	Baghouses	Cooling Towers	facility wide [a]	all units[9] DEGs 8760 hr
pollutant	emission rate at 5,197 hours/year	emission rate at 8,760 hours/year	emission rate at 362 hours/year	emission rate at 8,760 hours/year	emission rate at 500 hours/year	emission rate at 8,760 hours/year	emission rate at 8,760 hours/year	emission rate at 500 hours/year	emission rate at 500 hours/year	emission rate at 8,760 hour/year	emission rate at 8,760 hours/year	emission rate with limits [b]	emission rate without limits
	tons/year	tons/year	tons/year	tons/year	tons/year	tons/year	tons/year	tons/year	tons/year	tons/year	tons/year	tons/year	tons/year
SO2	0.0	0.11	0.0	0.11	0.01	0.1	0.11	0.02	-	---	---	0.2	0.43
PM	0.91	1.53	0.03	0.76	0.01	3.8	0.07	0.02	0.02	9.38	3.50	17.68	19.04
PM10	0.87	1.47	0.03	0.73	0.01	2.1	0.06	0.02	0.02	9.38	3.50	15.98	17.24
PM2.5	0.82	1.38	0.03	0.69	0.0	1.6	0.03	0.01	0.02	1.41	2.10	6.01	7.21
CO	6.35	10.70	0.17	4.08	0.09	23	0.79	0.20	1.78	---	---	30.3	38.57
NOx	8.50	14.32	5.29	127.92	0.16	22.5	1.37	0.34	0.33	---	---	37.7	166.11
HC	3.78	6.45	0.26	6.37	0.01	15.7	0.11	0.03	0.67	---	---	19.9	28.63

[a] Facility wide emission rate with operation limits includes:

1. DEG with SCR (primary) emission rate at 5,197 hours/year.
   (NO_x emission rate based upon fuel consumption of 645,000 gal/year (5,197 hours/year) by DEG with SCR since NOx emissions from the DEG without the SCR are higher. 690,000 gal/year -450,000 gal/year = 645,000 gal/year)
2. DEG without SCR (backup) emission rate at 362 hours/year (45,000 gal/year).
3. 4.5 MMBtu/hr boiler emission rate at 500 hours/year.
4. Superheater emission rate at 8,760 hours/year.
5. Thermal oxidizer (flare) LPG emission rate at 500 hours/year (9.75 MMBtu/hr maximum contribution by LPG).
6. Thermal oxidizer (flare) Bio Gas emission rate at 500 hours/year (19.25 MMBtu/hr maximum contribution by bio gas).
7. Baghouse – Baghouse emission rate at 8,760 hours/year.
8. Cooling tower – emission rate at 8,760 hour/year.
9. 4.5 MMBtu/hr and Flare are backup units which cannot operate at same time as 29.5 MMBtu/hr Waste Boiler

[b] Facility wide emission rate with operation limits for SO_2, PM, PM_{10}, $PM_{2.5}$, CO and HC is conservative because it is based on the combined emissions of the DEG with SCR burning 645,000 gal/year and the DEG without SCR burning 45,000 gal/year (except for NOx, see this footnote note 1). All units are with both SCR and non-SCR DEGs at 8760 hrs/yr.

Review date: July 2011
Reviewed by: GS

Air Quality Assessment:

A revised ambient air quality assessment, Amendment 02 dated May 24, 2011, using AEMOD ver. 11103, was submitted by the applicant for the primary operating scenario:

1. Operation of the Waste Boiler, DEG (primary) with SCR, the 2.194 MMBtu/hr superheater, the feed system baghouse, and the EVAPCO cooling tower. All primary equipment was modeled at 8,760 hours per year.

   Backup equipment is under fuel or operating limits and would not have significant ambient air effects. The DEG without SCR (limited to 45,000 gal/yr or 362 hours at maximum operating rate of 124.1 gal/hr), the two 4.5 MMBtu/hr boilers, the 29 MMBtu/hr thermal oxidizer (flare), the feed system baghouse, and the 2-cell cooling tower all are under operating limitations and cannot be run simultaneously with the primary operating equipment.

Potential impacts were predicted using the refined air dispersion model AERMOD.

Background Air Quality Data

- SO_2 data from the Kona monitoring station 2008 for 3-hour, 24-hour, and annual averaging periods (2009 data awaiting Exceptional Events concurrence from EPA for volcanic eruptions)
- CO, PM_{10}, $PM_{2.5}$, NO_2 data for all averaging periods and SO_2 data for the maximum hourly concentration from the Kapolei monitoring station 2009
- $PM_{2.5}$ data is the 3-year average of the 98% value for the 24-hour averaging period.
- $PM_{2.5}$ data is the 3-year average for the annual averaging period.
- Ozone from the Sand Island Monitoring Station, 2005 through 2009

Terrain and Receptor Placement

Terrain data is from the USGS Seamless Data Warehouse. Data resolution is 1/3 arc-second (approximately 10 meters) with a horizontal datum of NAD-83. The receptor area is a 1,020 meter x 1,020 meter square with receptors spaced 30 meters apart, for a 35 receptor x 35 receptor grid. The applicant indicates a fence will be installed around the facility. A circular area centered at 203,444 meters E and 2,219,311 meters N (NAD-83) with a radius of 45.8 meters was used in the model to approximate the fenced area. The seven receptors within the circular area are not included in the analysis.

Building Input Data

The EPA Building Profile Input Program was used to derive direction specific building dimensions for importing into the model. Structures near the stack that could potentially cause downwash were assessed for downwash effects.

Stack Parameters and Emission Rates Input into the Model

stack	emission rate					stack parameter			
	SO_2 (g/s)	NO_x (g/s)	CO (g/s)	PM_{10} (g/s)	$PM_{2.5}$ (g/s)	height (m)	temp (K)	vel (m/s)	diam (m)
Waste Boiler [a]	0.0813	0.649	0.739	0.205	0.122	10.52	435	12.86	0.762
DEG with SCR [a]	0.0032	0.41	0.308	0.044	0.0396	11.58	469	14.03	0.609
Boiler	0.009	0.0806	0.046	0.0043	0.002	10.52	505	2.49	0.70
Superheater [a]	0.0044	0.0393	0.0227	0.0021	0.00095	11.58	775	7.46	0.305
Flare	0.02	0.339	0.998	0.022	0.017	12.19	1255	8.72	1.68
Baghouse [a]	0.00	0.00	0.00	0.27	0.0405	6.096	300	20.75	0.851
Cooling Tower	0.00	0.00	0.00	0.0503	0.0302	6.400	300	10.97	1.83
Cooling Tower	0.00	0.00	0.00	0.0503	0.0302	6.400	300	10.97	1.83
EVAPCO Tower [a]	0.00	0.00	0.00	0.0217	0.01304	8.077	300	3.02	7.162

Note a. Primary Unit

Ambient Air Quality Impacts

SO2 1-Hour Ambient Air Quality Impacts
Primary equipment

Applicant's five year (2005 - 2009) average of annual fourth highest 1-hr SO^2 concentrations was 18.01 µg/m^3 (6.88 ppb).

NO2 1-Hour Ambient Air Quality Impacts
Primary equipment

year	applicant's concentration ($\mu g/m^3$)
2005	120.9
2006	120.5
2007	123.1
2008	131.7
2009	139.5
5-year average	127.1

Applicant's Modeled Results
Primary equipment

pollutant	averaging period	model impact ($\mu g/m^3$)	background concentration ($\mu g/m^3$)	total impact [a] ($\mu g/m^3$)	ambient air quality standards ($\mu g/m^3$)	percentage of standard
SO_2	1-Hour	6.88	49	55.9	75[d]	75%
	3-Hour	15.1	26	41.1	1,300	3.2%
	24-Hour	5.66	8	13.7	365	3.8%
	Annual	1.52	3	4.5	80	5.6%
NO_x	1-hour	67.6	26[c]	93.6	100[d]	93.6%
	Annual	11.9	8	19.9	70	28.4%
CO	1-Hour	241	4233	4474	10,000	44.7%
	8-hour	106	1373	1499	5,000	29.5%
PM_{10}	24-Hour	69.2	37	106.2	150	70.8%
	Annual	14.8	16	30.8	50	61.6%
$PM_{2.5}$	24-Hour	11.2	13	24.2	35	69.1%
	Annual	2.5	5.5	8	15	53.3%

Model Impact Notes:

1. The NOx concentration for the 1-hour period is based upon:
   a. The use of the Ozone Limiting Method with ozone data from 2005 through 2009.
   b. The average of the 98% NOx concentration over a five (5) year modeling period, 2005 through 2009.
   c. NOx background 8th highest, see page 17 of EPA March 01, 2011 memorandum "Additional Clarification Regarding Application of Appendix W Modeling Guidance for the 1-hour NO2 National Ambient Air Quality Standard
   d. NOx ratios of 0.10 for primary equipment.
   d. Sox and NOx 1-hour concentrations in PPB.

2. Model concentrations for the 3-hour, 8-hour, 24-hour and annual averaging periods are based upon meteorological data from 2009.

3. The SO2 concentration for the 1-hour period represents the maximum concentration and is the average concentration over a five (5) year modeling period, 2005 through 2009.

4. The Department of Health ran duplicate modeling runs using the AERMOD model (software produced by Lakes Environmental). <u>The results, although not identical, were comparable and also demonstrated that the facility is projected to operate in compliance with the ambient air quality standards</u>.

Significant Permit Conditions:

Operating Limitations

1. Sulfur content of diesel fuel fired in the 2,639 HP diesel engine generators and 29.5 MMBTU/hr waste boiler shall not exceed 15 ppm (ULSD).
2. The total combined fuel consumption of the two (2) diesel engine generators shall not exceed 690,000 gallons in any rolling twelve-month (12-month) period.
3. The total fuel consumption of the diesel engine generator that is not equipped with an SCR system (Special Condition No. A.1.d.) shall not exceed 45,000 gallons in any rolling twelve-month (12-month) period.
4. The total diesel fuel use of the 29.5 MMBTU/hr waste boiler shall not exceed 200,000 gallons in any rolling 12-month period.
5. Only one 4.5 MMBTU/hr boiler shall be operated at any time. At no time shall both 4.5 MMBTU/hr boilers be operated simultaneously.
6. The 4.5 MMBTU/hr boiler and the 29 MMBTU/hr thermal oxidizer (flare) shall not operate simultaneously with the 29.5 MMBTU/hr waste boiler.
7. The 4.5 MMBTU/hr boilers and the 29 MMBTU/hr thermal oxidizer (flare) shall not exceed 500 operating hours in any rolling twelve (12) month period.

Air Pollution Controls

The permittee shall operate and maintain a selective catalytic reduction (SCR) system on the diesel engine generator in accordance to Special Condition No. A.1.c. The SCR system shall be utilized for NOx emissions control at all times the diesel engine generator of Special Condition No. A.1.c. is in operation.

Monitoring

The permittee shall monitor, record and report the monthly usage of pyrolysis oil, diesel fuel no. 2 and steam production. in order to assure compliance with the NESHAP Part 63 PM standard. The following equation will be used to compute the monthly average PM emission rate (lb/MMBTU):

$$E = \frac{0.00211*P + 0.002*D + 0.00745*G}{0.00317*S}$$

where: E = PM emission rate (lb/MMBTU)
P = pyrolysis gas (gal)
D = ULSD (gal)
G = reactor & kiln off-gases (MMBTU)
= 0.00137*S - 0.1357*P - 0.1372*D
S = steam (lb)

The PM emission rates (lb/gal) for pyrolysis oil and ULSD are based on ash content and AP-42 factor, respectively. The PM emission rate for off-gases is based on the AP-42 emission factor for natural gas converted to a lb/MMBTU value. Total heat input is computed from the steam production and design heat rate of 1317 BTU/lb steam. Heat input from the off-gases is computed from the total heat input minus the heat inputs from the two oils (pyrolysis oil - 0.1357 MMBTU/gal, DF2 - 0.1372 MMBTU/gal).

Testing

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The Department of Health shall require annual testing of the ash content (% by weight) of the pyrolysis oil to assure compliance with the NESHAP, Part 63 PM standard.

The Department of Health shall require a test to determine the NO2/NOx ratio in the exhaust gases of the 29.5 MMBTU/hr boiler, the superheater, and the SCR-equipped DEG.

The Department of Health shall require source performance testing for particulate emissions from the waste boiler in accordance to standard of 40 CFR 63, Subpart JJJJJJ. The standard is 0.03 lb/MMBTU heat input.

Conclusion:

The application for a modification to CSP 0641-02-C includes operational limitations on a significant portion of the equipment permitted. This review is based on the operation of the facility with those operational limitations. The ambient air quality analysis demonstrates the facility, as proposed in the application and amendments will operate in compliance with the state and federal ambient air quality standards.

Issuance of a Covered Source Permit (CSP) is recommended based on the review of the information provided by the applicant and subject to the conditions of the permit.