PERMIT APPLICATION REVIEW
COVERED SOURCE PERMIT (CSP) NO. 0548-01-C
APPLICATION FOR MODIFICATION NO. 0548-02

Company: Hawaiian Electric Company, Inc. (HECO)
Facility: Campbell Industrial Park Generating Station
Located at: 91-196 Hanua Street, Kapolei, Oahu

Mailing Address: P.O. Box 2750
Honolulu, Hawaii 96840-0001

Responsible Official: Mr. Thomas C. Simmons
Company: HECO
Title: Vice President, Power Supply
Phone: (808) 543-4304

Contact: Ms. Sherri-Ann Loo
Company: HECO
Title: Manager, Environmental Department Operations and Management
Phone: (808) 543-4500

Contact: Mr. Dan Giovanni
Company: HECO
Title: Manager, Power Supply Operations and Management
Phone: (808) 543-4500

Contact: Mr. Rodney S. Chong
Company: HECO
Title: Principle Environmental Scientist
Phone: (808) 543-4515

Contact: Mr. Jim Clary
Company: Jim Clary & Associates
Title: Consultant
Phone: 214-707-3377

Contact: Mr. J. Stephen Beene
Company: Jim Clary & Associates
Title: Environmental Engineer
Phone: 972-386-5995, Ext. 4

Equipment:

Equipment	Manufacturer	Model No.	Serial No.	Capacity
Combustion Turbine Generator (CIP1)	Siemens Westinghouse Power Corporation	SGT6-3000E W501D5A	37A7724	135 MW
Combustion Turbine Generator (CIP2)	Siemens Westinghouse Power Corporation	SGT6-3000E W501D5A	Not Available	135 MW
Black Start Diesel Engine Generator (BSG1)	Kohler Power Systems Detroit Diesel/MTU	2250REOZDC 16V4000G83	Not Available	2,250 kW
Black Start Diesel Engine Generator (BSG2)	Kohler Power Systems Detroit Diesel/MTU	2250REOZDC 16V4000G83	Not Available	2,250 kW
Internal Floating Roof Storage Tank (Tank No. 1)	----------	----------	----------	4,146,000 gallons
Internal Floating Roof Storage Tank (Tank No. 2)	----------	----------	----------	4,146,000 gallons

1. Background.

1.1 HECO has submitted a permit application for a significant modification for Campbell Industrial Park Generating Station that is currently under construction. Equipment for the generating station will include two 135 MW Siemens Westinghouse Power Corporation simple cycle combustion turbine generators (CIP1 and CIP2), two 2,250 kW Kohler Power Systems black start diesel engine generators (BSG1 and BSG2), and two internal floating roof storage tanks. The Standard Industrial Classification Code for this facility is 4911 (Electrical Power Generation Through Combustion of Fossil Fuels). Modifications include:

a. A change in selection of black start diesel engine generators (two 2,250 kW units are proposed for the project instead of two 1,500 kW units);

b. Revision of the NO_X emissions limit for CIP1 and CIP2 (New Source Performance Standards (NSPS), Subpart KKKK specifies a 96 ppm NO_X emission limit for new combustion turbines greater than 30 MW for operating loads less than 75% of peak load and a 42 ppm NO_X emission limit for new combustion turbines greater than 850 MMBtu/hr operating at loads greater than or equal to 75% of peak load);

c. Updating the modeling assessment based on design changes that include new black start diesel engine generators and revisions in stack location and diameter of the combustion turbine generators;

d. Incorporating CO_2 correction factor equations to correct the NO_X emission rate to 15 percent O_2 when measuring CO_2 in lieu of O_2 pursuant to HECO's April 3, 2008 permit amendment requests; and

e. Adding a vapor mitigation system and 5,000 gallon fuel oil No. 2 storage tank to the insignificant activity section of the permit based on information provided by HECO on October 10, 2008 and information from the application for permit modification, respectively.

1.2 Fuels fired at the generating station include naphtha and fuel oil No. 2 as primary fuels for CIP1 and CIP2 and fuel oil No. 2 for BSG1 and BSG2. The sulfur content of the primary fuels fired by CIP1 and CIP2 will be limited to 0.05%. The sulfur content of fuel fired by BSG1 and BSG2 will be a low sulfur fuel in accordance with 40 CFR, Part 60, Subpart IIII.

1.3 Operating limits include a 24.8 x 10^6 MMBtu/yr total combined firing rate restriction for CIP1 and CIP2 and a 500 hr/yr operating restriction for BSG1 and BSG2.

1.4 A site inspection of the Campbell Industrial Park Generating Station that is now being constructed was performed on January 30, 2009. Pictures from the site inspection are shown in Enclosure (1).

2. Applicable Requirements.

2.1 Hawaii Administrative Rules (HAR)
- Chapter 11-59, Ambient Air Quality Standards
- Chapter 11-60.1, Subchapter 1, General Requirements
- Chapter 11-60.1, 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
Chapter 11-60.1, Subchapter 5, Covered Sources
Chapter 11-60.1, 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
Chapter 11-60.1, Subchapter 8, Standards of Performance for Stationary Sources
11-60.1-161, New Source Performance Standards
Chapter 11-60.1, Subchapter 9, Hazardous Air Pollutant Sources

2.2 40 CFR Part 60 - New Source Performance Standard (NSPS), Subpart KKKK, Standards of Performance for Stationary Combustion Turbines is applicable to CIP1 and CIP2 because the heat input of the units at peak load is greater than 10 MMBtu/hr. Maximum heat input at peak load is 1,482.4 MMBtu/hr based on International Organization for Standardization (ISO) standard day conditions (59 ^{O}F, 60% relative humidity, and 1 atm) and the HHV for fuel oil No. 2 worst-case.

2.3 40 CFR Part 60 - NSPS, Subpart IIII, Standards of Performance for Stationary Compression Ignition Internal Combustion Engines is applicable to BSG1 and BSG2 because the units were ordered after July 11, 2005 and manufactured after April 1, 2006.

2.4 40 CFR Part 60 - NSPS, Subpart Kb, Standards of Performance for Volatile Organic Liquid Storage Vessels (Including Petroleum Liquid Storage Vessels) for Which Construction, Reconstruction, or Modification Commenced After July 23, 1984 is applicable to the two tanks that will store fuel for the combustion turbine generators because the tanks are greater than 151 m^3 (greater than 40,000 gallons) and will be storing naphtha (whole straight run gasoline) worst-case with a true vapor pressure greater than 0.507 psi. The working volume of each fuel storage tank is 4,146,000 gallons. Per AP-42, Section 7.1 (9/97), the true vapor pressure of gasoline with Reid vapor pressure of 10, representative of naphtha, is 7.4 psi at 80 ^{o}F.

2.5 40 CFR Part 63 - National Emission Standards for Hazardous Air Pollutants (NESHAP), Subpart YYYY - National Emission Standards for Hazardous Air Pollutants for Stationary Combustion Turbines is not applicable to this project because worst-case facility- wide HAP emissions are less than 10 TPY single HAP and 25 TPY combined HAP. The total combined fuel firing rate for CIP1 and CIP2 is limited to 24.8 x 10^6 MMBtu/hr to restrict HAP emissions of manganese below the major source threshold of 10 TPY for any single HAP as worst-case scenario.

2.6 40 CFR Part 63 - (NESHAP), Subpart ZZZZ - National Emissions Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines is applicable to BSG1 and BSG2 because the units are located at an area source of HAP emissions and the units were ordered after June 12, 2006. Pursuant to 40 CFR §63.6590 (c), new stationary reciprocating internal combustion engines (RICE) operating at area sources must meet the requirements of 40 CFR, Part 63, Subpart ZZZZ by meeting the requirements of 40 CFR, Part 60, Subpart IIII.

2.6 The purpose of Compliance Assurance Monitoring (CAM) is to provide reasonable assurance that compliance is being achieved with large emission units that rely on air pollution control device equipment to meet an emissions limit or standard. Pursuant to 40 CFR, Part 64, for CAM to be applicable, the emissions unit must: (1) be located at a major source; (2) be subject to an emissions limit or standard; (3) use a control device to achieve compliance; (4) have potential

pre-control emissions that are greater than the major source level; and (5) not otherwise be exempt from CAM. Although the combustion turbine generators rely on a water injection system to achieve compliance with the federal NO_X standard required by 40 CFR 60, Subpart KKKK and have potential pre-control emissions greater than the major source level for NO_X, CAM is not applicable to the combustion turbine generators because a continuous emission monitoring system (CEMS) will be used to determine compliance with the NO_X emissions standard. As such, the combustion turbine generators are exempt from CAM.

2.7 A best available control technology (BACT) analysis is not required because potential emissions from the modification to replace BSG1 and BSG2 with different units and revise the NO_X emission limit for CIP1 and CIP2 do not exceed significant emission levels as defined in HAR, Section 11- 60.1.

2.9 The Consolidated Emissions Reporting Rule (CERR) is applicable because potential emissions from the generating station exceed reporting levels pursuant to 40 CFR 51, Subpart A for Type A sources (see table below).

CERR APPLICABILITY[a]			
Pollutant	Potential Emissions (TPY)	CERR Triggering Levels (TPY)	
		1 year cycle (Type A sources)	3 year cycle (Type B sources)
PM-10	701.0	≥250	≥100
PM-2.5	657.2	≥250	≥100
SO_2	4,403.8	≥2,500	≥100
NO_x	2,084.7	≥2,500	≥100
VOC	347.4	≥250	≥100
CO	3,521.5	≥2,500	≥1,000

a: See Paragraph 6.4 total emissions [limited] for emission rates.

2.10 Prevention of Significant Deterioration (PSD) review does not apply to this modification because changes proposed to the facility do not increase emissions above significant levels as defined in HAR, Section 11- 60.1.

2.11 Annual emissions reporting is required because this facility is a covered source.

3. Insignificant Activities and Exemptions

3.1 The following are a list of insignificant activities identified by the applicant that meet the exemption criteria specified in HAR, §11-60.1-82(f):

a. Three (3) 345,000 barrel fixed roof storage tanks storing fuel oil No. 6 for HECO's Kahe Generating Station are considered exempt pursuant to HAR, §11-60.1-82(f)(7).
b. One 5,000 gallon fuel oil No. 2 storage tank and other tanks less than 40,000 gallons in capacity are considered exempt pursuant to HAR, §11-60.1-82(f)(1).

c. A vapor mitigation system is considered exempt in accordance with HAR, §11-60.1-82(f)(7).

d. Fuel burning equipment less than 1 MMBtu/hr, other than smoke house generators and

gasoline fired industrial equipment, are exempt in accordance with HAR, §11-60.1-82(f)(2).

e. Standby emergency generators are exempt in accordance with HAR, §11-60.1-82(f)(5).

f. Paint spray booths that emit less than two tons per year of any regulated air pollutant are exempt pursuant to HAR, §11-60.1-82(f)(6).

g. Activities that emit less than 500 lb/yr of HAP, 25% of the significant amount of emissions as defined in HAR §11-60.1-1, 5 TPY CO, and 2 TPY of each regulated air pollutant other than CO, and which are determined on a case by case basis to be insignificant activities are exempt pursuant to HAR, §11-60.1-82(f)(7).

4. Alternate Operating Scenarios

4.1 No alternate operating scenarios were proposed for the permit modification.

5. Air Pollution Control

5.1 Water injection will be used to control NO_X emissions from the combustion turbine generators. The air pollution control system injects demineralized water into the turbine generator's combustion chamber. The moisture acts as a heat sink, reducing the peak flame temperature and in turn reducing the formation of thermal NO_X. Thermal NO_X results during combustion from atmospheric air, consisting mostly of nitrogen, reacting with oxygen in the air to form NO_X.

5.2 Tanks storing fuel for the combustion turbine generators will be equipped with tank seal systems and internal floating roofs to control VOC and HAP emissions.

6. Project Emissions

6.1.1 Emissions of NO_X, CO, VOC, PM, PM_{10}, and $PM_{2.5}$ from the combustion turbine generators were based on the lb/hr emission rates from manufacturer's specifications. A mass balance calculation was used to determine SO_2 emissions from information on the fuel sulfur content and fuel flow rate in lb/hr. For H_2SO_4, it was assumed that 6.5% fuel sulfur converts to sulfuric acid mist based on information from General Electric. For fluorides, emissions were based on April 11, 1985 test results from an analysis of fuel oil No. 2 that indicated a 0.2 ppm fluoride concentration. Worst-case emission rates were based on ISO standard day conditions (59 ^oF and 60% relative humidity). A 24.8 x 10^6 MMBtu/yr total combined firing rate limit to ensure potential manganese emissions are kept below 10 TPY was also applied. It was assumed that 96% of the total particulate was PM-10 based on AP-42 Appendix B.2, Table B.2-2 for gasoline and diesel fired internal combustion engines. It was assumed that 90% of the total particulate was PM-2.5 based on AP-42 Appendix B.2, Table B.2-2 for gasoline and diesel fired internal combustion engines. Minimum load with water injection for the turbines is 25% of peak load. Emissions were also calculated based on operating conditions at 86 ^oF ambient temperature and 70% relative humidity for information that may be more representative of conditions in Hawaii. Emission estimates for the combustion turbine generators are shown in Enclosure (2).

6.1.2 Emission factors from AP-42, Section 3.1 (4/00), Stationary Gas Turbines were used to determine HAP emissions from the combustion turbine generators. Emission factors from AP-42, Section 3.4 (10/96), Large Stationary Diesel and All Stationary Dual-Fuel Engines were used to determine HAP emissions not listed in AP-42, Section 3.1. Emission factors for fuel oil No. 2 were used as worst-case because there are no emission factors for naphtha. For beryllium, emissions were based on April 11, 1985 test results from an analysis of fuel oil No. 2 that indicated a 0.003 ppm beryllium concentration. The g/s and lb/hr HAP emissions were based on a worst-case firing rate of 1,482.4 MMBtu/hr for firing fuel oil No. 2 at ISO standard day conditions. A 24.8×10^6 MMBtu/yr firing rate limit was applied to determine the total combined ton per year HAP emissions. Worst-case HAP emissions are shown in Enclosure (3).

6.1.3 Maximum potential emissions are shown in the table below for operation between 25% to peak load with application of water injection for controlling NO_X.

COMBUSTION TURBINE EMISSIONS					
Pollutant	Fuel Fired	Emission Rate Each Unit		Emission TPY (2 units)	
		lb/hr	g/s	Limited	No Limits
				Total Combined 24.8 x 10^6 MMBtu/yr (Siemens scenario only)	Total Combined 8,760 hr/yr
SO_2	fuel oil #2	526.3	66.4	4,403.2[a]	4,610.0[a]
NO_X	fuel oil #2	246.8	31.2	2,065.0[a]	2,162.6[a]
CO	fuel oil #2	401.7	50.7	3,518.9[b]	3,518.9[b]
VOC	fuel oil #2	38.3	4.8	335.5[b]	335.5[b]
PM (see note c)	fuel oil #2	83.3	10.5	730.0[b,c]	730.0[b,c]
PM_{10}	fuel oil #2	80	10.1	700.8[b]	700.8[b]
$PM_{2.5}$ (see note d)	fuel oil #2	75.0	9.5	657.0[b,d]	657.0[b,d]
H_2SO_4	fuel oil #2	52.4	6.6	438.2[a]	458.9[a]
Fluorides	fuel oil #2	0.015	1.90E-03	0.126[a]	0.132[a]
Arsenic	fuel oil #2	0.016	0.002	0.136[a]	0.142[a]
Benzene	fuel oil #2	0.082	0.010	0.682[a]	0.711[a]
Beryllium	fuel oil #2	2.26E-04	2.85E-05	0.002[a]	0.002[a]
Mercury	fuel oil #2	1.78E-03	2.25E-04	0.015[a]	0.016[a]
Lead	fuel oil #2	2.08E-02	2.62E-03	0.174[a]	0.182[a]
Manganese (max. single HAP)	fuel oil #2	1.171	0.148	9.8[a]	10.3[a]
Total Haps	fuel oil #2	--------	--------	22.3[a]	23.3[a]

a: Based on operating each unit at peak load, 59 °F, 60% relative humidity, and firing fuel oil No. 2.
Also, a 24.8 x10^6 MMBtu/yr total combined firing limit was applied to determine the emissions with operation limit.
b: Based on operating each unit at 25% load, 59 °F, 60% relative humidity, and firing fuel oil No. 2.
c: It was assumed that 96% of the total particulate was PM-10 based on AP-42 Appendix B.2, Table B.2-2 for gasoline and diesel fired internal combustion engines.
d: It was assumed that 90% of the total particulate was PM-2.5 based on AP-42 Appendix B.2, Table B.2-2 for gasoline and diesel fired internal combustion engines.

6.2.1 Emissions of NO_X, CO, VOC, PM, PM_{10}, and $PM_{2.5}$ from the black start diesel engine generators were based on the gram per second emission rates from manufacturer's specifications. A mass balance calculation was used to determine SO_2 emissions based on the maximum 0.05% fuel sulfur content and a 163.7 gal/hr fuel consumption for each diesel engine generator at maximum standby power rating. A fuel heating value of 140,000 Btu/gal and a fuel oil No. 2

density of 7.05 lb/gal (from AP-42, Appendix A) were used to determine worst-case emissions. For H_2SO_4, it was assumed that 13.83% of the SO_2 converts to sulfuric acid mist based on information from SCEC report from Maalaea M3. For fluorides, emissions were based on April 11, 1985 test results from an analysis of fuel oil No. 2 that indicated a 0.2 ppm fluoride concentration. It was assumed that 96% of the total particulate was PM-10 based on AP-42 Appendix B.2, Table B.2-2 for gasoline and diesel fired internal combustion engines. It was assumed that 90% of the total particulate was PM-2.5 based on AP-42 Appendix B.2, Table B.2-2 for gasoline and diesel fired internal combustion engines. Emission estimates are shown in Enclosure (4).

6.2.2 Emission factors from AP-42, Section 3.4 (10/96), Large Stationary Diesel and All Stationary Duel-Fuel Engines were used to determine HAP emissions from the black start diesel engine generators. Emission factors from AP-42, Section 3.1 (4/00), Stationary Gas Turbines were used to determine HAP emissions not listed in AP-42, Section 3.4. Emission factors for fuel oil No. 2 were used as worst-case because there are no emission factors for naphtha. Beryllium emissions were based on April 11, 1985 test results from a fuel oil No. 2 analysis that indicated 0.003 ppm beryllium concentration. The g/s and lb/hr emissions were based on a worst case firing rate of 22.9 MMBtu/hr for each diesel engine generator. Calculations are shown in Enclosure (5).

6.2.3 Maximum potential emissions for the black start diesel engine generators are shown in the table below.

BLACK START DIESEL ENGINE GENERATOR EMISSIONS				
Pollutant	Emission Rate Each Unit		Emission TPY (2 units)	
	lb/hr	g/s	Limited	No Limits
			500 hr/yr per generator	8,760 hr/yr per generator
SO_2	1.153	0.146	0.6	10.5
NO_X	39.457	4.982	19.7	345.1
CO	5.187	0.655	2.6	45.6
VOC	0.660	0.083	0.3	5.3
PM	0.358	0.045	0.2	3.5
PM_{10} (see note a)	0.344	0.043	0.2	3.0
$PM_{2.5}$ (see note b)	0.322	0.040	0.2	2.8
H_2SO_4	0.159	0.201	0.1	1.4
Fluorides	2.00E-04	2.53E-05	1.00E-04	1.75E-03
Arsenic	2.52E-04	3.18E-05	1.26E-04	2.21E-03
Benzene	1.78E-02	2.24E-03	8.89E-03	0.156
Beryllium	3.46E-06	4.37E-07	1.73E-06	3.03E-05
Lead	3.21E-04	4.05E-05	1.60E-04	2.80E-03
Mercury	2.75E-05	3.47E-06	1.37E-05	2.40E-04
Manganese (max. single HAP)	1.81E-02	2.28E-03	9.05E-03	0.159
Total Haps	--------	--------	0.030	0.526

a: It was assumed that 96% of the total particulate was PM-10 based on AP-42 Appendix B.2, Table B.2-2 for gasoline and diesel fired internal combustion engines.
b: It was assumed that 90% of the total particulate was PM-2.5 based on AP-42 Appendix B.2, Table B.2-2 for gasoline and diesel fired internal combustion engines.

6.3 Potential emissions from the internal floating roof storage tanks were based on storing naphtha (whole straight run gasoline) worst-case with a Reid vapor pressure of 11 psi and a 225,454,545 gallon per year total combined tank throughput which correlates to about 27 tank turnovers per year per tank. The total combined gallon/yr throughput is based on a 24.8 x 10^6 MMBtu/yr total combined firing rate limit and a heating value for naphtha that was indicated in the application to be 110,000 Btu/gallon. Vapor mass fractions of components for naphtha were multiplied by the total VOC emissions from each tank to determine maximum potential HAP emissions. The vapor mass fraction data was obtained from Chevron Products Company's most recent permit application submittal for its Port

Allen Terminal that has been processed under permit application No. 0080-06. Potential emissions from the tanks are shown in Enclosure (6) and summarized below.

TANK EMISSIONS			
Pollutant	Tank No. 1	Tank No. 2	Emissions (TPY)
VOC	5.8	5.8	11.6
Hexane (n) [max. single HAP]	0.095	0.095	0.189
HAPs	0.178	0.178	0.355

6.4 Worst-case yearly emissions of criteria pollutant and HAPs from operating permitted equipment at the facility are as follows (see tables from Paragraphs 6.1.3, 6.2.3, and 6.3 for emission rates):

FACILITY-WIDE EMISSIONS							
Pollutant	Emissions (TPY)						
	Combustion Turbines		Black Start Diesel Engine Generators		Tanks	Total Emissions [limited]	Total Emissions [no limits]
	limited	no limits	limited	no limits			
SO_2	4,403.2	4,610.0	0.6	10.5	-------	4,403.8	4,620.5
NO_X	2,065.0	2,162.6	19.7	345.1	-------	2,084.7	2,507.7
CO	3,518.9	3,518.9	2.6	45.6	-------	3,521.5	3,564.5
VOC	335.5	335.5	0.3	5.3	11.6	347.4	352.4
PM	730.0	730.0	0.2	3.5	-------	730.2	733.5
PM_{10}	700.8	700.8	0.2	3.0	-------	701.0	703.8
$PM_{2.5}$	657.0	657.0	0.2	2.8	-------	657.2	659.8
Manganese (max. single HAP)	9.8	10.3	9.05E-03	0.159	-------	9.81	10.5
Total Haps	22.3	23.3	0.030	0.526	0.355	22.7	24.2

7. Air Quality Assessment

7.1 The preliminary and full ambient air modeling impact analysis was update based on changes to the project that affect modeling results. Changes include revisions in stack diameter and locations for CIP1 and CIP2 and operating black start diesel engine generators that are different than those initially proposed for the project. An ISC_RTDM model was used to assess emissions for the permit modification. The model combines two EPA guideline models; ISCST3 (EPA 1995) and RTDM (Environmental Research and Technology 1987). The ISC_RTDM model program is capable of modeling simple, intermediate, and complex terrain receptors. ISC_RTDM is considered a refined model in simple terrain and a screening model in complex terrain. A CTDMPLUS model was used to determine impacts from HECO's Kahe Generating Plant that were added to the total impacts for the full air modeling analysis for SO_2. The following apply to the ISC_RTDM modeling parameters:

a. One year of meteorological data collected from October 1, 1992 through September 30, 1993 from HECO's No. 064 monitoring station at Ewa Beach was used for the modeling analysis. The 64 meter wind speed and direction measurements were collected and used as representative stack top transport winds.

b. Selection of rural dispersion coefficients were used for the model based on the land use method of classification per 40 CFR, Part 51, Appendix W (it was found that more than 50% of the area in a 3 kilometer radius of the Campbell Industrial Park area is either water or agriculture).

c. Background concentrations of SO_2 and ozone for the various averaging periods for the full impact analysis were taken from the following monitoring locations to determine compliance with state and federal ambient air quality standards:

   i. SO_2 (3 hr, 24 hr) - collected in 2003 from the Makaiwa monitoring station;
   ii. O_3 (1hr) - collected in 2003 from the Sand Island monitoring station.

d. A good engineering practice (GEP) stack height analysis was conducted by evaluating nearby structures to determine whether or not stack emissions may be affected by downwash from the structures. Combustion turbine generator and black start diesel engine generator stacks are 210 feet high. All proposed structures for the project will be less than 83.5 feet tall (40% of the stack height). As such, CIP1, CIP2, BSG1, and BSG2 are not subject to downwash from structures proposed for the project. Additional off-property structures from AES and H-Power were evaluated using EPA's building profile input program (BPIP). The BPIP outputs show all project sources are located greater than 5L (where L is the lesser dimension between the structure's height and projected width) from the structures. Therefore, there are no downwash effects from these off-property structures.

e. The table below presents the emission rates and stack parameters used for the AAQIA for the combustion turbine generators at the various equipment loads. The range of loads are 25% to 100% of peak load.

SOURCE			EMISSION RATES				STACK PARAMETERS			
Equipment	Stack No.	Load	NO_2 (g/s)	SO_2 (g/s)	CO (g/s)	PM_{10} (g/s)	Velocity (m/s)	Temp. ^{O}K (^{O}F)	Height (m)	Dia. (m)
CIP1 or CIP2	1&2	Peak	31.1	66.4	9.01	6.82	39.0	826 (1,027)	64	5.74
		Base	29.6	63.3	10.7	6.83	38.0	810 (999)		
		75%	23.9	51.4	17.3	7.23	31.9	838 (1,049)		
		50%	17.9	38.3	38.8	10.0	27.1	775 (936)		
		25%	11.6	25.2	50.6	10.1	22.8	654 (718)		

f. The table below presents the emission rates and stack parameters used for the AAQIA for the black start diesel engine generators for various averaging periods. Each black start diesel engine generator is limited to 500 hr/yr operation and was assumed to operate at 100% load. The g/s emission rate for the annual averaging period was adjusted to account for a 500 hr/yr limit.

SOURCE			EMISSION RATES[a]				STACK PARAMETERS			
Equipment	Stack No.	Averaging Period	NO_2 (g/s)	SO_2 (g/s)	CO (g/s)	PM_{10} (g/s)	Velocity (m/s)	Temp. ^{O}K (^{O}F)	Height (m)	Dia. (m)
BSG1 or BSG2	3&4	1 hour	-------	--------	0.653	--------				
		3 hour	-------	0.145	-------	--------				
		8 hour	-------	--------	0.653	--------	28.8	778 (941)	64	0.6096
		24 hour	-------	0.145	-------	0.0486				
		Annual	0.286[a]	0.008[a]	-------	0.00278[a]				

a: Maximum g/s emission rates factored by 500/8,760 to account for 500 hr/yr operation limit for each black start diesel engine generator.

7.2.1 The preliminary modeling analysis was updated for pollutants exceeding significant emission levels in the initial permit application review for which monitoring and modeling thresholds exist. Significant emission levels were exceeded for CO, NO_x, SO_2, H_2SO_4, PM, PM_{10}, VOCs , As, benzene, and Be. Among these pollutants, monitoring and modeling thresholds exist for CO, NO_x, SO_2, PM, PM_{10}, VOCs , and Be. Other pollutants (H_2SO_4, As, and benzene) for which there are no modeling or monitoring threshold are addressed in air modeling assessments to determine compliance with air standards specified in HAR §11-60.1-179 for carcinogenic and non-carcinogenic HAPs. Sulfuric acid mist impacts are evaluated with thresholds provided by the Hazardous Evaluation and Emergency Response (HEER) Branch toxicologist. See Paragraphs 7.1 and 7.4.1 through 7.4.5 for the modeling assessments. The preliminary modeling analysis was conducted to determine: (1) whether or not preconstruction monitoring is required; (2) if further modeling from a full impact analysis is applicable; and (3) to define the impact area within which a full impact analysis must be carried out. The preliminary analysis compares the maximum impacts at worst-case operating scenarios with the modeling significant impact levels and the thresholds triggering preconstruction monitoring. If the monitoring thresholds are exceeded, preconstruction monitoring is required for that pollutant and averaging period. If the modeling significant impact level is exceeded, a full impact analysis for that pollutant and averaging period is required.

7.2.2 For the preliminary analysis, worst-case operating conditions were identified by evaluating CIP1 and CIP2 at 25% load to 100% peak load combined with BSG1 and BSG2 operating at 100% load. The ISC_RTDM program was used to predict maximum impacts in simple and complex terrain for the various operating conditions using coarse grid receptors in 250 meter increments. Fine grid receptors for simple terrain in 50 meter spacing and fine grid receptors for complex terrain in 25 meter spacing were added to areas of maximum impacts to ensure maximum impacts were identified. Maximum impacts after fine grid placement were compared to the modeling and monitoring thresholds.

7.2.3 Maximum project impacts from the preliminary modeling analysis are shown below for the 135 MW combustion turbine generators combined with operation of the black start diesel engine generators. The impacts are shown in comparison to the thresholds triggering preconstruction monitoring. Results show no exceedence of the monitoring thresholds for SO_2, CO, PM, PM_{10}, NO_2, and Be. As such, preconstruction monitoring is not required for these pollutants. Because VOC emissions for the proposed generating station are above

100 TPY, preconstruction monitoring is required for ozone (O_3). For preconstruction monitoring of ozone, the Department concurs with the use of O_3 concentrations measured at its Sand Island monitoring station to satisfy the monitoring requirements of HAR, §11-60.1-143 and 40 CFR §52.21(m).

MAXIMUM IMPACTS AND AMBIENT AIR MONITORING THRESHOLDS				
Pollutant	Averaging Period	[a]Maximum Impact (ug/m^3)	[b]Monitoring Level (ug/m^3)	Percent Threshold
SO_2	24 hour	11.5	13	88
PM/PM_{10}	24 hour	2.30	10	23
NO_2	Annual	0.341	14	2
CO	8 hour	26.7	575	5
Beryllium	24- hour	4.95E-06	0.001	<1
O_3	see note c	---------	see note e	---------

a: Impacts are from operation of CIP1, CIP2, BSG1, and BSG2.
b: Air monitoring threshold listed in HAR, §11-60.1-133(e)(1) and New Source Review Workshop Manual, Table C-3, Page C.17.
c: No significant air quality concentration for ozone has been established. Instead, any net emissions increase of 100 tons per year of VOC requires an ambient impact analysis that includes pre-application monitoring data.

7.2.4 Maximum project impacts from the preliminary analysis are shown below for the combustion turbine generators combined with operation of the black start diesel engine generators in comparison to the modeling significant thresholds for Class II areas. Results indicate that the maximum impacts are above the 3-hour and 24-hour SO_2 significant impact levels. As such, a full impact modeling analysis is required for SO_2 for the 3-hour and 24-hour averaging periods (see Paragraphs 7.1 and 7.3.1 through 7.3.5). As per the New Source Review Workshop Manual (Page C.27), ambient air concentrations of the remaining pollutants that are below the air quality significant levels require no further modeling to determine compliance with state and federal ambient air quality standards or PSD Class II increment for that pollutant and averaging period. Also, because VOC emissions are greater than 100 TPY, a full ambient air quality impact analysis (AAQIA) is required for O_3 (see Paragraph 7.3.5).

MAXIMUM IMPACTS AND MODELING SIGNIFICANT LEVELS				
Pollutant	Averaging Period	[a]Maximum Impacts (ug/m^3)	[b]Modeling Significant Levels Class II Area (ug/m^3)	Percent Threshold
SO_2	3 hour 24 hour Annual	65.6 11.5 0.818	25 5 1	> 100 > 100 82
PM/PM_{10}	24 hour Annual	2.30 0.268	5 1	46 27
NO_X	Annual	0.341	1	34
CO	1 hour 8 hour	197 26.7	2,000 500	10 5
O_3	see note (c)	---------	see note (d)	see note (d)

a: Impacts are from operation of CIP1, CIP2, BSG1, and BSG2.
b: Modeling Significant Level listed in New Source Review Workshop Manual, Table C-4, Page C.28.
c: No significant ambient impact concentration has been established. Instead, any net emissions increase of 100 tons per year of VOC requires an ambient impact analysis. Because emissions are greater than 100 TPY VOC from this project, a full impact analysis for ozone is required.

7.2.5 The $PM_{2.5}$ impacts were not evaluated because EPA had not yet developed modeling techniques specific to the national ambient air quality standards for particulate matter smaller than 2.5 microns ($PM_{2.5}$) at the time of the initial permit application review

7.3.1 A full air dispersion modeling impact analysis was performed for the 3-hour and 24-hour SO_2 averaging periods that indicate a significant ambient air quality impact as shown in Paragraph 7.2.4. The full impact analysis expands the preliminary analysis with further modeling that includes additional emissions from existing sources combined with CIP1, CIP2, BSG1, and BSG2 to determine compliance with the state and federal ambient air quality standards and PSD Class II increments. As indicated in the application, downwash effects from existing structures were considered negligible due to the distance and elevation of the significant impact area. As such, building dimensions from existing Campbell Industrial Park structures were not provided for the full impact analysis.

7.3.2 For the full impact air dispersion modeling analysis to determine short-term SO_2 impacts, the impact area was that with maximum impacts above the modeling significant levels. The area of impact for the full air dispersion modeling analysis was defined with significant impact level isopleths for SO_2 of 5 $\mu g/m^3$ and 25 $\mu g/m^3$ for the 24-hour and 3-hour modeling significant levels, respectively. Increment-affecting sources located within 50 kilometers of the impact area must be included in the increment inventory if the sources individually or collectively affect the amount of PSD increment consumed.

7.3.3 The full impact analysis used ISC_RTDM to determine compliance with state and federal ambient air quality standards for the 3-hour and 24-hour SO_2 impacts. Short-term highest second high SO_2 impacts for CIP1, CIP2, BSG1, and BSG2 combined with operation of existing Campbell Industrial Park sources were determined inside the significant impact area. Pursuant to HAR §11-59-4 and 40 CFR, Part 51, Appendix W, Paragraph 8.2.1,

selection of the highest second high SO_2 concentration is allowed because short-term limiting concentrations are not to be exceeded more than once in any calendar year. A CTDMPLUS model was used for HECO's Kahe Generating Station to determine short-term SO_2 impacts with onsite meteorological data that is more representative than that from Campbell Industrial Park. The Kahe Generating Station, located west of the proposed project, was considered a source that may individually affect air impacts within the project's significant impact area. The maximum impact from the Kahe Generating Station, based on emissions from all sources at the plant, was determined separately and added to the ISC_RTDM results. Air impacts from the Kahe Generating Station were added to determine the total impact. Results from the full impact analysis, shown below, indicate compliance with state and federal ambient air quality standards for SO_2.

MAXIMUM IMPACTS COMPARED TO STATE AND FEDERAL AIR STANDARDS							
Pollutant	Averaging Period	Maximum Impacts (µg/m^3)				Air Standard (ug/m^3)	Percent Standard
		[a]CIP	Kahe	Background	Total		
SO_2	3 hour 24 hour	319 64.9	539 139	91 18	949 222	1,300 365	73 61

a: Impacts are from operation of CIP1, CIP2, BSG1, and BSG2 combined with operation of existing CIP sources.

7.3.4 The full impact analysis used ISC_RTDM to determine compliance with ambient air increments for SO_2. Conservatively, for PSD increment consumption, the analysis did not take credit for any baseline emissions from the existing Campbell Industrial Park sources. Short-term highest second high SO_2 impacts for CIP1, CIP2, BSG1, and BSG2 combined with operation of existing Campbell Industrial Park sources in the significant impact area were determined. Pursuant to HAR §11-60.1-134, for any period other than an annual period, the applicable maximum allowable increase may be exceeded during one such period per year at any one location. HECO's Kahe Generating Station, located west of the proposed project, was considered a source that may individually affect the amount of PSD increment consumed. A CTDMPLUS model was used for HECO's Kahe Generating Station to determine SO_2 impacts. Short-term first highest high SO_2 impacts from the Kahe Generating Station were added to the ISC_RTDM results to determine the total impact. Only increment consuming sources were considered (142 MW boiler unit 6, 2.5 MW black start diesel engine generator unit A, and 2.5 MW black start diesel engine generator unit B). Results from the full impact analysis, shown below, indicate compliance with PSD Class II increments for SO_2.

MAXIMUM IMPACTS AND PSD CLASS II INCREMENTS						
Pollutant	Averaging Period	Maximum Impacts (µg/m^3)			Class II Increment (µg/m^3)	Percent Increment
		[a]CIP	Kahe	Total		
SO_2	3 hour 24 hour	319 64.9	109 4.60	428 69.5	512 91	84 76

a: Impacts are from operation of CIP1, CIP2, BSG1, and BSG2 combined with operation of existing CIP sources.

7.3.5 An AAQIA for ozone is required because VOC emissions potentially exceed 100 TPY. EPA has not yet developed modeling techniques specific to the 8-hour ozone national ambient air quality standards. Therefore, the Texas Commission on Environmental Quality's 1-hour ozone screening technique was used as a surrogate for the 8-hour ozone standard PSD review. The Environmental Appeals Board affirmed the use of a 1-hour ozone impact analysis as a surrogate for the 8-hour ozone analysis in its order denying review of PSD Appeal No. 05-05, decided August 24, 2006. The procedure found the site to be NO_X dominated and there should not be a significant change to the current ozone levels in the local area. The project was demonstrated to be NO_X dominated as follows:

1) Calendar year 2003 air monitoring data from the Department's Sand Island monitoring station was used to determine if the ozone screening technique could be applied. The maximum background concentration is 106 ug/m^3 or (106 ug/m^3)(0.02404/molecular weight of 48) = 5.309 x 10^{-2} ppm or (5.309 x 10^{-2} (10^9/10^6) = 53 ppb.

2) The non methane organic carbon (NMOC)/NO_X ratio was determined based on estimated annual emissions that assume permit limits (see table from Paragraph 6.4).

$$NMOC/NO_X = 336 \text{ tpy NMOC}/2{,}084 \text{ tpy } NO_X = 0.16$$

3) The ratio was multiplied by 2.875 to determine whether the site is NO_X dominated.

$$(0.16)(2.875) = 0.5$$

4) Because the adjusted ratio is less than 2:1, the site is NO_X dominated and the demonstration is complete because there should not be a significant change to the current ozone levels in the local area.

7.4.1 An air modeling assessment using ISC_RTDM was conducted for CIP1, CIP2, BSG1, and BSG2 to determine compliance with standards specified in HAR §11-60.1-179 for non-carcinogenic and carcinogenic HAPs. For the modeling assessment, a 1 g/s emissions rate was proportioned among CIP1, CIP2, BSG1, and BSG2 with various maximum MMBtu/hr firing rates. The model output for the 8-hour and annual averaging period was multiplied by the total combined g/s emission rate for CIP1, CIP2, BSG1, and BSG2. Adjustment to the g/s emission rate was made to account for a 500 hr/yr limit on BSG1 and BSG2 for the annual averaging period. A 24.8 x 10^6 MMBtu/yr firing limit was accounted for in the g/s emission rate for CIP1 and CIP2 for the annual averaging period.

7.4.2 The predicted concentrations in the table below show that emission impacts from CIP1, CIP2, BSG1, and BSG2 are below the significant ambient air concentration for the 8-hour averaging period for each non-carcinogenic HAP. The time limited value-time weighted average (TLV-TWA) values were based on information from the previous permit application review and updated as applicable with information from the "2008 Guide to Occupational Exposure Values" compiled by the ACGIH. Maximum 8-hour model output was 0.2129 µg/m^{3}per g/s.

COMPARISON OF 1/100 TLV-TWA TO 8-HOUR CONCENTRATION				
Pollutant	TLV-TWA ($\mu g/m^3$)	8-hour Impact ($\mu g/m^3$)	1/100 TLV-TWA ($\mu g/m^3$)	Percent Standard
Acrolein	230	6.36E-04	2.3	< 1
Lead	50	1.13E-03	0.5	< 1
Manganese	200	6.38E-02	2	3
Mercury	10	9.69E-05	0.1	< 1
Naphthalene	53,324	2.94E-03	533	< 1
Selenium	200	2.02E-03	2	< 1
Toluene	76,647	2.27E-02	766	< 1
Xylene	441,597	1.56E-02	4,416	< 1

7.4.3 The predicted concentrations in the table below show that emission impacts from CIP1, CIP2, BSG1, and BSG2 are below the significant ambient air concentration for the annual averaging period for each non-carcinogenic HAP. The time limited value-time weighted average (TLV-TWA) values were based on information from the previous permit application review and updated as applicable with information from the "2008 Guide to Occupational Exposure Values" compiled by the ACGIH. Maximum annual model output was 0.00626 $\mu g/m^3$per g/s.

COMPARISON OF 1/420 TLV-TWA TO ANNUAL CONCENTRATION				
Pollutant	TLV-TWA ($\mu g/m^3$)	Annual Impact ($\mu g/m^3$)	1/420 TLV-TWA ($\mu g/m^3$)	Percent Standard
Acrolein	230	1.76E-05	0.548	< 1
Lead	50	3.13E-05	0.119	< 1
Manganese	200	1.77E-03	0.476	< 1
Mercury	10	2.68E-06	0.024	< 1
Naphthalene	53,324	7.84E-05	127	< 1
Selenium	200	5.59E-05	0.476	< 1
Toluene	76,647	6.28E-04	448	< 1
Xylene	441,597	4.31E-04	1,051	< 1

7.4.4 An ambient air screening analysis in the table below shows that pollutant emissions from CIP1 CIP2, BSG1, and BSG2 are below the individual lifetime cancer risk of more than ten in one million assuming continuous exposure for seventy years as defined in HAR 11-60.1,

Subchapter 9 for carcinogenic hazardous air pollutants. For the analysis, the ambient annual air concentration was compared to the Preliminary Remediation Goals (PRG) concentration. The 2008 Region 9 PRG table was used for the analysis which combines EPA toxicity values with "standard" exposure factors to estimate the risk to inhalation exposure to the carcinogenic hazardous air contaminant. The toxicity values are protective of humans, including sensitive groups, over a lifetime. Maximum annual model output was 0.00626 µg/m^{3}per g/s.

Ambient Air Screening Analysis Ratio of Annual Ambient Air Concentration to PRG Concentration						
Pollutant	Annual Impact (µg/m^3)	Ambient Air PRG (µg/m^3)	Cancer Risk[a]		Risk Standard	Percent Risk Standard
1,3-Butadiene	3.58E-05	8.1E-02	4.42E-10		---------	---------
Acetaldehyde	5.63E-05	1.1	5.51E-11		---------	---------
Arsenic	2.46E-05	5.7E-04	4.32E-08		---------	--------
Benzene	1.24E-04	3.1E-01	4.00E-10		----------	---------
Beryllium	3.37E-07	1.0E-03	3.37E-10		----------	---------
Cadmium	1.07E-05	1.4E-03	7.64E-09		---------	---------
Chromium	2.46E-05	2.9E-05	8.48E-07		---------	---------
Formaldehyde	6.26E-04	1.9E-01	3.29E-09		---------	---------
Polycyclic Organic Matter[b]	8.98E-05	8.0E-04	1.12E-07		---------	---------
[a]Total---------->			1.02E-06		1E-05	10

a: Risk = [(conc$_X$/PRG$_X$) + (conc$_Y$/PRG$_Y$) (conc$_Z$/PRG$_Z$) + ·····] x 10^{-6}.
b: PRG based on that for dibenz[a,h]anthracene as worst-case polycyclic organic matter pollutant.

7.4.5 Because sulfuric acid mist exceeds significant emission levels, H_2SO_4 impacts were evaluated to determine compliance with pollutant thresholds. Sulfuric acid mist is not among the 188 chemicals regulated under the Clean Air Act as a HAP and no federal or Hawaii State ambient air quality standards are specified for this pollutant. There are also no monitoring, modeling, or PSD increment thresholds specified for H_2SO_4. As such, the 24-hour California Ambient Air Quality Standard (CAAQS) for sulfates of 25 ug/m^3 was used to evaluate short term impacts. For evaluating annual impacts, the inhalation reference exposure level of 1 ug/m^3 for sulfuric acid, that is a "present all the time" threshold, was used. The 24-hour ISC_RTDM model output was 0.0861 µg/m^{3}per g/s. The maximum annual ISC_RTDM model output for modeling CIPI, CIP2, and BSGI, and BSG2 together was 0.00626 µg/m^{3}per g/s. Results listed in the tables below show that 24-hour and annual impacts do not exceed air thresholds provided by HEER Branch toxicologist for H_2SO_4.

Pollutant	24 Hour Standard (ug/m^3)	24 Hour Impact (ug/m^3)	Percent Standard
H_2SO_4	25	1.16	5

Pollutant	Annual Standard (ug/m^3)	Annual Impact (ug/m^3)	Percent Standard
H_2SO_4	1	0.079	8

8. Significant Permit Conditions

8.1 Incorporate NSPS, Subpart IIII and NESHAP, Subpart ZZZZ regulations for BSG1 and BSG2.

Reason for 8.1: Required as determined in Paragraphs 2.3 and 2.4.

8.2 The permittee shall not discharge or cause the discharge into the atmosphere from each combustion turbine generator, a rolling four hour-average NO_X emission in excess of 42 ppmvd @ 15% O_2 when operating at loads greater than or equal to 75% of peak load for all four operating hours. For operating periods during which the unit operates at or above and below 75% of peak load, the applicable emission standard shall be determined in accordance with 40 CFR §60.4380(b)(3).

8.3 The permittee shall not discharge or cause the discharge into the atmosphere from each combustion turbine generator, a rolling four-hour average NO_X emission in excess of 96 ppmvd @ 15% O_2 at loads less than 75% of peak load for all four operating hours. For operating periods during which the unit operates at or above and below 75% of peak load, the applicable emission standard shall be determined in accordance with 40 CFR §60.4380(b)(3).

Reason for 8.2 and 8.3: Revise the NO_X emissions limits for consistency with the NO_X emissions limits specified for the combustion turbine generators in accordance with NSPS, Subpart KKKK. The regulation was misinterpreted during the initial review for this facility.

8.4 Incorporate CO_2 correction factor equations referenced in NSPS, Subpart IIII to correct the NO_X emission rate for CIP1 and CIP2 to 15 percent O_2 when measuring CO_2 in lieu of O_2.

Reason for 8.4: The equations will be incorporated pursuant to HECO's April 3, 2008 request for permit amendment. Although it is stated in 40 CFR Part 60 §60.4345 (c) that correction of measured NO_X concentrations to 15 percent O_2 is not allowed, pursuant to conversation with EPA personnel, it was indicated that 40 CFR Part 60 §60.4345 (c) is in error and will be changed. As such, correction factor equations were incorporated into the permit as requested.

9. Conclusion and Recommendation

9.1 Actual emissions from the proposed Campbell Industrial Park Generating Station should be less than those estimated. Maximum potential emissions were based on operating the combustion turbine generators at ISO standard day conditions (59 ^oF and 60% relative humidity). Emissions determined for operation at 86 ^oF and 70% relative humidity, that may be more representative of conditions in Hawaii, are lower than those for ISO standard day conditions due to a lower combustion turbine generator fuel burning capacity at the higher ambient temperature and relative humidity. Conservatively, emissions from the black start diesel engine generators were based on operation at maximum rated capacity. An update of the air modeling assessments for the combustion turbine generators operating with the black start diesel engine generators show compliance with the state and federal air quality

standards and PSD Class II increment thresholds based on the higher emission rates at ISO standard day conditions and maximum unit capacities. Recommend issuance of the covered source permit modification subject to the significant permit conditions, the thirty day public comment period and forty-five day EPA review period.

Mike Madsen
2-17-2009