COVERED SOURCE PERMIT REVIEW – 0007-01-C
MINOR MODIFICATION – APPLICATION NO. 0007-02

Facility Title: Keahole Generating Station

Applicant: Hawaii Electric Light Company (HELCO)

Responsible Official: Mr. Warren H. W. Lee
President
Hawaii Electric Light Company, Inc.
P.O. Box 1027
Hilo, Hawaii 96721-1027

Point of Contact: Michael Watanabe
Environmental Division
P.O. Box 2750
Honolulu, Hawaii 96840-0001
543-4517

SICC: 4911

Background:
HELCO is currently installing two 20 MW combustion turbines (CTs) at the Keahole Generating Station. The LM 2500 CTs fire on diesel fuel no. 2, use water injection to control nitrogen dioxide, and are permitted to operate 8,760 hours per year. The CTs operate under CSP no. 0007-01-C.

Also operating at the Keahole Generating Station are four 2.5 MW diesel engine generators (DEGs). These DEGs fire on diesel fuel no. 2, use fuel injection timing retard to control nitrogen dioxides, and are currently permitted to operate 8,760 hour per year. Once the second CT is started up, one of the DEGs (D21) will have a fuel consumption limit of 70,000 gallons per rolling 12 months. The DEGs are operating under CSP no. 0256-01-C.

Proposed Modification:
HELCO is applying for a minor modification to allow the combustion turbines, CT-4 and CT-5, to start-up and shutdown up to four times per calendar day. The current permit condition allows only one start-up and shutdown per calendar day.

The proposed modification meets the following criteria for a minor modification:
1) does not increase the emissions of any air pollutant above the permitted emission limits;
2) does not result in or increase the emissions of any air pollutant not limited by permit;
3) does not violate any applicable requirement;
4) does not involve significant changes to existing monitoring or recordkeeping requirements;

5) does not require or change a case-by-case determination of an emission limit or other standard;
6) does not seek to establish or change a permit term or condition for which there is no corresponding underlying applicable requirement; and
7) is not a modification pursuant to any provision of Title I of the Act.

The proposed modification will reduce actual emissions as the unit will not be operating at full load during the start-up and shutdown periods and will not be operating at all during the shutdown to start-up periods. The current monitoring and recordkeeping requirements are sufficient to monitor multiple, daily start-ups and shutdowns.

Air Pollution Controls:
No new air pollution controls are being proposed.

Applicable Requirements:
There are no new applicable requirements associated with this minor modification.

Non-Applicable Requirements:
The following are not applicable to the proposed change.

Hawaii Administrative Rules (HAR):
The proposed change does not affect the applicability of any HAR.

PSD:
PSD is not applicable to this facility because the proposed change is not significant as defined in 40 CFR 51.166.

NSR:
NSR is not applicable since the facility is located in an attainment area and PSD applicability has been reviewed.

CERR (Consolidated Emission Reporting Rule):
40 CFR part 51, Subpart A – Emission Inventory Reporting Requirements, determines applicability based on the emissions of each pollutant from any individual emission point within the facility that emits at the triggering levels. The facility is subject to CERR. The proposed change does not affect the applicability of the CERR.

CDS (Compliance Data System)
CDS is an inventory system for covered sources subject to annual inspections. The applicability of CDS is unaffected by the proposed change, as the facility remains a covered source.

NESHAP:

NESHAP for stationary combustion turbines is not applicable because the facility is not a major source of HAPs. The proposed change does not affect the applicability to the NESHAP

NSPS:

The combustion turbines are subject to Subpart GG. The proposed modification does not change the applicability of the subpart.

MACT:

MACT is not applicable because the facility is not a major source of HAPs.

CAM:

The purpose of Compliance Assurance Monitoring (CAM) is to provide a reasonable assurance that compliance is being achieved with large emissions units that rely on air pollution control device equipment to meet an emissions limit or standard. Pursuant to 40 Code of Federal Regulations, 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 100% of the major source level; and (5) not otherwise be exempt from CAM. The proposed change does not change the CAM applicability of the combustion turbines or the major source status of the facility.

BACT:

A Best Available Control Technology (BACT) analysis was not required because the net emissions are below the significant levels.

Synthetic minor:

A synthetic minor is a facility that without limiting conditions, physical or operational, emits above the major triggering levels as defined by HAR 11-60.1-1 for either criteria pollutant(s) or hazardous air pollutant(s). This facility is a major source.

Insignificant Activities/Exemptions:

No new insignificant activities were listed.

Alternate Operating Scenarios:

No new alternate operating scenarios were proposed with this modification.

Project Emissions:

The NO_x emission rate at low-load was estimated by using the permitted emission limit. The NO_x emission limit is based on the annual emission limit of 371 tons for both CTs. Emission rates for CO and SO_2 at low-load operations are from the initial application. The emission rate for PM_{10} was estimated by using the permitted emission rate limit and the measured maximum flow rate from a similar

unit operating at 25 percent load.

Table 1 - Emission Rates for CT-4 or CT-5 Operating at Idle

Pollutant	Emission Rate at Idle (lb/hr)	(g/s)	(TPY)	Permitted Emission Rate (TPY)	Emission Increase (TPY)
NO_x	42.3	5.33	185	185	0
CO	475.6	59.93	2,083	2,085	-2
SO_2	39.9	5.03	175	482	-307
PM_{10}	9.4	1.18	41	86	-45

Air Quality Assessment:

HELCO performed an air quality assessment to demonstrate that the proposed modification will not violate the state and national ambient air quality standards (SAAQS/NAAQS). The analysis also demonstrated compliance with the Prevention of Significant Deterioration (PSD) Class II increments.

USEPA's ISCST3 model was used in the analysis because it is capable of modeling the simple, intermediate, and complex terrains which surround the facility. A coarse receptor grid was used to locate the areas of maximum concentration. Refined grids were used in the areas of maximum concentration to find the maximum impact points. As recommended by the Department's modeling guidelines, a 30-meter receptor spacing was used for the refined grids. The rural classification followed the guidelines of 40 CFR Part 51, appendix W. The area was defined as rural because less than 50 percent of the surrounding area is not classified as urban.

Meteorological data set used in the model is the same data set that was used in the initial permit application. The data was collected from HELCO's monitoring station 061 located near the Keahole Generating Station. This data set was collected from March 1993 to February 1994. Hourly mixing heights were obtained from the Meteorological Processor for Regulatory Models which used the Hilo upper air data and the monitoring station surface data.

Emissions from stack are not affected by downwash because the stack is at the GEP stack height. GEP stack height was determined by USEPA Building Profile Input Program which uses the dimensions of the surrounding structure to calculate the GEP stack height.

The tables below lists the stack parameters and emission rates used in the modeling analysis.

Table 2 - Stack Parameters and Emission Rates for CT-4 or CT-5 at Idle

Pollutant	Emission Rate (g/s)	Base Elev. (m)	Stack Height (m)	Stack Dia. (m)	Exit Velocity (m)	Exit Temp. (°K)	UTM Easting (m)	UTM Northing (m)
SO_2	5.03	63.1	31.5	2.44	5.75	394.3	811,293	2,184,955
PM_{10}	1.18							
CO	59.93							

NO_x	5.33

Table 3 - Maximum Impacts from CT-4 & CT-5 at Idle, SIL Analysis

Pollutant	Avg. Period	Max. Impact ($\mu g/m^3$)	SIL ($\mu g/m^3$)	Radius of Impact (km)	UTM Easting (m)	UTM Northing (m)	Elev. (m)
SO_2	3-hour	183	25	7.1	811,833	2,185,251	94
	24-hour	52	5	6.6	811,833	2,184,281	94
	Annual	11	1	4.9	811,863	2,185,281	96
PM_{10}	24-hour	12	5	1.8	811,833	2,185,281	94
	Annual	3	1	1.4	811,863	2,184,281	96
CO	1-hour	4,311	2,000	3.4	813,000	2,184,200	152
	8-hour	1,361	500	2.2	811,833	2,185,251	94
NO_x	Annual	12	1	5.2	811,863	2,185,281	96

A preliminary analysis of the units operating at idle load determined the maximum impacts and the radius of impact. The modeling results are conservative as it assumes that the units are operating at 8,760 hours per year at idle. Further, it was assumed that all NO_x is converted to NO_2. As shown in Table 3 above, the maximum impacts for all averaging periods were greater than the significant impact levels (SIL). Because the maximum impacts were greater than the SILs, a full impact analysis against the ambient air quality standards and PSD Class II increments was necessary. The full impact analysis includes emissions from all sources within the radius of impact and background concentrations.

Stack parameters and emission rates for all other emission units within the radius of impact are shown below.

Table 4 - Stack Parameters for the Existing Emissions Units at the Keahole Generating Station

Emission Unit	Base Elev. (m)	Stack Height (m)	Stack Dia. (m)	Exit Velocity (m)	Exit Temp. (°K)	UTM Easting (m)	UTM Northing (m)
D21	63.6	12.2	0.90	18.3	677	811,255	2,184,884
D22	63.6	12.2	0.90	18.3	677	811,253	2,184,874
D23	63.6	12.2	0.90	18.3	677	811,251	2,184,869
BS	63.6	21.3	0.20	62.2	894	811,250	2,184,848
CT-2	63.6	21.3	3.40	19.8	647	811,250	2,184,848
FP	63.1	31.5	0.13	69.3	672	811,293	2,184,955

Table 5 - Emission Rates for the Existing Emissions Units at the Keahole Generating Station, SAAQS/NAAQS Analysis

Emission Unit	Emission Rate (g/s)					
	SO_2		PM_{10}		CO	NO_x
	Short-term	Long-term	Short-term	Long-term	Short-term	Long-term
D21	1.460	0.0581	0.640	0.0254	9.890	0.339
D22	1.460	1.4600	0.640	0.6400	9.890	8.630
D23	1.460	1.4600	0.640	0.6400	9.890	8.630
BS	0.360	0.0120	0.250	0.0090	0.300	0.054
CT-2	13.810	13.8100	2.520	2.5200	2.820	5.800
FP	0.104	0.0010	0.025	0.0002	0.346	0.010

Table 6 - Stack Parameters for the Existing Emissions Units within the Radius of Impact

Source	Base Elev. (m)	Stack Height (m)	Exit Velocity (m/s)	Stack Dia. (m)	Stack Temp. (°K)	UTM Easting (m)	UTM Northing (m)
West Hawaii Concrete - Waimea	18.3	15.0	3.2	0.51	505.0	830,542	2,209,217
West Hawaii Concrete - Waimea	18.3	1.0	15.6	0.34	296.9	830,542	2,209,217
Isemoto Contracting - Honokohau	40.0	1.0	15.6	0.34	296.9	813,000	2,174,200
Isemoto Contracting - Honokohau	40.0	5.0	14.7	0.2	843.0	813,000	2,174,200
West Hawaii Concrete - Mauna Kea *	4,154.7	1.0	15.6	0.34	296.9	869,047	2,194,276
Kawaihae Cogeneration Partnership **	15.2	30.5	11.8	4.27	408.0	832,136	2,218,733
Allied Aggregates - Honokohau *	73.2	1.0	15.6	0.34	296.9	811,732	2,179,752
Grace Pacific - Waikoloa	801.6	5.3	27.6	0.77	410.0	847,834	2,208,828
Grace Pacific - Waikoloa	801.6	2.3	199.6	0.12	703.0	847,834	2,208,828
Grace Pacific - Waikoloa	801.6	1.0	15.6	0.34	296.9	847,834	2,208,828
Allied Aggregates - Waikoloa *	36.6	1.0	15.6	0.34	296.9	828,780	2,205,686
Allied Aggregates - Waikoloa *	36.6	2.6	1244.5	0.15	783.0	828,780	2,205,686
Goodfellow Brothers *	38.0	1.0	15.6	0.34	296.9	832,453	2,215,156
Hawaiian Cement *	61.0	4.0	36.8	0.15	803.0	812,728	2,179,610
Hawaiian Cement *	61.0	1.0	15.6	0.34	296.9	812,728	2,179,610

* - no longer operating
** - operating permit no longer valid.

Table 7 - Emission Rates for the Existing Emissions within the Radius of Impact, SAAQS/NAAQS Analysis

Source	Emission Rate (g/s)			
	SO_2	PM_{10}	CO	NO_x
West Hawaii Concrete - Waimea	0.05			
West Hawaii Concrete - Waimea		0.28		
Isemoto Contracting - Honokohau		24.6		
Isemoto Contracting - Honokohau	0.10	0.01	0.15	0.59
West Hawaii Concrete - Mauna Kea *		0.04		
Kawaihae Cogeneration Partnership **	24.49	2.52	36.49	3.48
Allied Aggregates - Honokohau *		0.39		
Grace Pacific - Waikoloa	2.76	0.49	0.72	0.68
Grace Pacific - Waikoloa	0.46	0.07	0.73	2.78
Grace Pacific - Waikoloa		0.78		
Allied Aggregates - Waikoloa *		0.16		
Allied Aggregates - Waikoloa *				0.11
Goodfellow Brothers *		0.16		
Hawaiian Cement *	0.21	0.24	0.72	0.33
Hawaiian Cement *		3.57		

* - no longer operating
** - operating permit no longer valid.

Table 8 - Emission Rates for the Existing Emissions Units at the Keahole Generating Station, PSD Class II Increment Analysis

Emission Unit	Emission Rate (g/s)					
	SO_2		PM_{10}		CO	NO_x
	Short-term	Long-term	Short-term	Long-term	Short-term	Long-term
D21	1.460	0.0581	0.640	0.0254	9.890	0.339
D22	1.460	0.0403	0.640	0.0201	9.890	0.673
D23	1.460	0.0432	0.640	0.0230	9.890	0.699
BS	0.360	0.0120	0.250	0.0090	0.300	0.054
CT-2	13.810	1.1540	2.520	0.2500	2.820	1.628
FP	0.104	0.0010	0.025	0.0002	0.346	0.010

Emission rates used in the SAAQS/NAAQS analysis are the allowable emission rates. For the Keahole Generating Station emission units, the emission rates used in the PSD Class II increment analysis are the

average of the past two years. Emission rates for emission units outside of the Keahole Generating Station are the allowable emission rates. Using the allowable emission rates is conservative as the actual emission rates are usually much lower.

The background ambient air quality data set used in the analysis was collected by HELCO's Kakahiaka and Huehue monitoring stations. The Kakahiaka monitoring site was determined to be the best practical short-term monitoring location and the Huehue monitoring site was determined to be the best practical long-term monitor location. The monitoring stations collected data from February 1999 to May 2000. This data set was used to satisfy a remand by the USEPA Environmental Appeals Board.

Table 9 - Results of the Ambient Air Quality Analysis (SAAQS/NAAQS)

Pollutant	Avg. Period	Modeled Conc. ($\mu g/m^3$)	Background Conc. ($\mu g/m^3$)	Total Conc. ($\mu g/m^3$)	SAAQS/ NAAQS ($\mu g/m^3$)	% of SAAQS/ NAAQS	UTM Easting (m)	UTM Northing (m)	Elev. (m)
SO_2	3-hour	244	87	331	1,300	25%	811,833	2,185,251	94
	24-hour	73	34	107	365	29%	811,833	2,185,251	94
	Annual	15	4	19	80	24%	811,863	2,185,251	96
PM_{10}	24-hour	25	27	52	150	35%	811,803	2,185,161	92
	Annual	6	12	18	50	36%	811,683	2,185,191	87
CO	1-hour	5,247	969	6,216	10,000	62%	812,750	2,185,150	138
	8-hour	1,672	736	2,408	5,000	48%	811,833	2,185,251	94
NO_2	Annual	27	2	29	70	42%	811,683	2,185,161	85

Table 10 - Results of the PSD Class II Increment Analysis

Pollutant	Avg. Period	Modeled Conc. ($\mu g/^{m3}$)	PSD Class II Increment. ($\mu g/m^3$)	% of PSD Class II Increment	UTM Easting (m)	UTM Northing (m)	Elev. (m)
SO_2	3-hour	244	512	48%	811,833	2,185,251	94
	24-hour	73	91	80%	811,833	2,185,251	94
	Annual	12	20	59%	811,863	2,185,281	96
PM_{10}	24-hour	24	30	81%	811,713	2,185,191	87
	Annual	4	17	24%	811,863	2,185,281	96
NO_2	Annual	11	25	43%	811,863	2,185,281	96

As shown in the tables 9 and 10 above, the operation of the CTs at idle load will not violate the SAAQS/NAAQS and PSD Class II increment.

Amended Permit Condition:

Attachment II

C.1.a. "Start-up and Shutdown"

1) The "start-up" time shall not exceed twenty (20) minutes for any combustion turbine generator operating in simple cycle and sixty (60) minutes for any combustion turbine

generator operating in combined cycle. Except during maintenance (e.g., equipment installations and inspections, and electrical switching work), testing, and emergency power demands due to sudden loss of a power generating unit, each combustion turbine generator shall not be started up more than four times per calendar day. A "start-up" sequence shall be from the time fuel use at the combustion turbine generator begins, until the time the combustion turbine generator is initially brought up to 25 percent load at which time the operation of the air pollution control equipment shall commence.

2) The "shutdown" time for any combustion turbine generator operating in either simple or combined cycle shall not exceed twenty (20) minutes. Except during maintenance (e.g., equipment installations and inspections, and electrical switching work), testing, and emergency power demands due to sudden loss of a power generating unit, each combustion turbine generator shall not be shut down more than four (4) times per calendar day. A "shutdown" sequence shall be considered from the time when the combustion turbine generator is below 25 percent load, until fuel use at the combustion turbine generator ceases.

All other permit conditions are not affected by the modification and remain unchanged.

Conclusion and Recommendation:

HELCO demonstrated that the combustion turbines will not violate the SAAQS/NAAQS while operating at low-loads. The demonstration is a conservative approach to prove that multiple start-ups and shutdowns per calendar day will not violate any of the ambient air quality standards. HELCO's modeling analysis is conservative as it uses allowable emission rates of the existing sources, does not take credits for emission reductions, and includes sources that are no longer operating. The past-actual emission rates used for the existing Keahole Generating Station emission units in the PSD increment analysis is also conservative because those units are expected to operate below the historical levels once the CTs are put into service.