PROPOSED

Minor Modification to a Covered Source
Review Summary

Application File No.: 0097-09 (Minor Modification)

Permit No.: 0097-01-C

Applicant: Kauai Island Utility Cooperative (KIUC)

Facility: Port Allen Generating Station
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UTM Coordinates: 2,422,222 N, 439,251.6 E
Eleele, Kauai, Hawaii 96705

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Responsible Official: Mr. David Bissell
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Application Dates: June 21, 2013

Proposed Project:

The Standard Industrial Classification (SIC) Code is 4911 under *Electric Services*.

This application is for a minor modification of Covered Source Permit (CSP) No. 0097-01-C, issued on December 11, 2012. A check for $200.00 was submitted by the applicant for a minor modification of a covered source (PSD source) and processed.

When the Stork Wartsila Diesel (SWD) engines at Port Allen were originally permitted in 1988, KIUC intended to operate the engines as base load units. The original Prevention of Significant Deterioration (PSD) permit included a minimum allowable operating load of 50% of rated load, or about 4 MW. Since their initial operation in the early 1990s, the engine have functioned asplanned, operating at between 85% and 90% of rated load.

Currently, KIUC faces the challenge of integrating renewable generating resources into the island's generating resource mix. The most significant elements of the renewable portfolio are large new additions of photovoltaic (PV) solar generating capacity and hydropower, island-wide, which will be phased in over the next four (4) years. Most renewable energy facilities such as wind and solar are intermittent sources, meaning these resources are not available to generate in all hours and have limited operating capacity, flexibility, or predictability. For example, PV generation can drop from 6 MW to almost zero when clouds obscure the sun, only to return to 6 MW minutes later when the sky clears. Furthermore, most renewable resources have no ability to provide regulation – the ability to ramp up and down quickly at the system operator's direction to maintain line voltage and frequency adequate to ensure electric system reliability. Therefore, KIUC needs to increase its ability to firm the renewable resources by having flexible generation that is always available under all operating conditions to ramp up or ramp down, as necessary, to balance load and generation. The proposed modification would allow the SWD engine generators – which are currently KIUC's most efficient flexible generating units – to be operated at very low loads, making them available to ramp up quickly to maintain system reliability as increasing amounts of renewable resources are integrated into the utility's generating system. The SWDs will no longer be used as base load units, but will be used for intermediate load support (at night when there is no PV power available, for example).

Based on this operating experience and continuous emissions monitoring data, KIUC is requesting the following changes to the covered source permit:

- Reduce the minimum operating load from 50% (or approximately 4 MW) to 25% (approximately 2 MW) and add language to clarify that the minimum load limitation applies on a fifteen (15) minute average basis; and

- Add new lb/hr NO_x and PM limits applicable during low-load operations.

KIUC is not proposing to change any other hourly limits or any daily or annual permitted emission limits as a result of the requested changes.

This modification is considered a minor modification since it:

(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 to levels equal to or above:

    (A) 500 pounds per year of a hazardous air pollutant;
    (B) twenty-five (25) percent of significant amounts of emission as defined in Section 11-60.1-1, paragraph (1) in the definition of "significant";
    (C) five (5) tons per year of carbon monoxide; or
    (D) two (2) tons per year of each regulated air pollutant other than carbon monoxide;

(3) Does not violate any applicable requirement;
(4) Does not involve significant changes to existing monitoring requirements or any relaxation or significant change to existing reporting or recordkeeping requirements in the permit. Any change to the existing monitoring, reporting, or recordkeeping requirements that reduces the enforceability of the permit is considered a significant change;
(5) Does not require or change a case-by-case determination of an emission limitation or other standard, a source-specific determination for temporary sources of ambient impacts, or a visibility or increment analysis;

(6) Does not seek to establish or change a permit term or condition for which there is no corresponding underlying applicable requirement, and that the source has assumed to avoid an applicable requirement to which the source would otherwise be subject. Such terms and conditions include:

(A) A federally enforceable emissions cap assumed to avoid classification as a modification pursuant to any provision of Title I of the Act or subchapter 7; and
(B) An alternative emissions limit approved pursuant to regulations promulgated pursuant to Section 112(i)(5) of the Act or Subchapter 9; and

(7) Is not a modification pursuant to any provision of Title I of the Act.

Equipment:

Unit Number	Manufacturer	Model/ Serial Number	Rated Capacity		
			MW	MMBtu/hr	gal/hr
D-6 through D-9	Stork-Wartsila Diesel Generator	6TM620/ 60600, 60700, 60800, 60900	7.86 each	69.5 each	505 each

The large diesel engine generators (D-6 through D-9) are used for baseload generation, along with the steam boiler and steam turbine generator.

Air Pollution Controls:

1. Diesel engine generators D-6 through D-8 are equipped with Variable Fuel Injection Timing Retard (FITR).
2. Diesel engine generator D-9 is equipped with a Selective Catalytic Reduction (SCR) System as part of a NO_x control technology demonstration project. This project was deemed successful and shows the *technical* feasibility of a SCR system. The economic feasibility was not shown, however.
3. Low sulfur fuel (0.4%) fuel oil no. 2, and/or biodiesel is used for diesel engine generators D-1 through D-9.
4. Diesel engine generators D-1 thru D-5 are equipped with Miratech V-Cat oxidation catalyst systems and EMD lube oil separators and will utilize ultra-low sulfur (0.0015%) fuel oil to comply with 40 CFR Part 63, Subpart ZZZZ, effective May 3, 2013.

5. Diesel engine generators D-6 thru D-9 are equipped with oxidation catalyst systems and crankcase controls to comply with 40 CFR Part 63, Subpart ZZZZ, effective May 3, 2013.

Alternate Operating Scenarios:

No change from the previous covered source renewal application regarding any alternate operating scenarios.

Applicable Requirements:

Hawaii Administrative Rules (HAR)

Title 11, Chapter 59	Ambient Air Quality Standards
Title 11, Chapter 60.1	Air Pollution Control
Subchapter 1	General Requirements
Subchapter 2	General Prohibitions
HAR 11-60.1-31	Applicability
HAR 11-60.1-32	Visible Emissions
HAR 11-60.1-38	Sulfur Dioxides from Fuel Combustion
Subchapter 5	Covered Sources
Subchapter 6	Fees for Covered Sources, Noncovered Sources, and Agricultural Burning
HAR 11-60.1-111	Definitions
HAR 11-60.1-112	General Fee Provisions for Covered Sources
HAR 11-60.1-113	Application Fees for Covered Sources
HAR 11-60.1-114	Annual Fees for Covered Sources
Subchapter 9	Hazardous Air Pollutant Sources

Federal Requirements

40 Code of Federal Regulations (CFR) Part 63 - National Emission Standards for Hazardous Air Pollutants for Source Categories (Maximum Achievable Control Technologies (MACT) Standards):

Subpart ZZZZ - National Emission Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines. (RICE NESHAP) - applicable to stationary RICE located at major or area sources of HAP emissions. This site is an area source of HAP emissions.

Non-applicable Requirements:

Hawaii Administrative Rules (HAR)

Title 11, Chapter 60.1	Air Pollution Control
Subchapter 7	Prevention of Significant Deterioration Review
Subchapter 8	Standards of Performance for New Stationary Sources (NSPS)
Subchapter 9	Hazardous Air Pollutant Sources

Federal Requirements

40 CFR Part 52.21 - Prevention of Significant Deterioration of Air Quality

40 CFR Part 60 - Standards of Performance for New Stationary Sources (NSPS)

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

Prevention of Significant Deterioration (PSD):

PSD is not applicable because this facility is not a *new* major stationary source nor does this application propose any modifications that by itself constitute a major stationary source that is subject to PSD review. Therefore, PSD is not applicable.

Best Available Control Technology (BACT):

A Best Available Control Technology (BACT) analysis is required for new covered sources or significant modifications to covered sources that have the potential to emit or increase emissions above significant levels as defined in HAR §11-60.1-1. Since this is not a new source nor are any modifications proposed that will cause a significant net increase in emissions, a BACT analysis is not required.

Air Emissions Reporting Requirements (AERR):

40 CFR Part 51, Subpart A – Air Emissions Reporting Requirements, is based on the emissions of criteria air pollutants from Type A or Type B point sources (as defined in 40 CFR Part 51, Subpart A), that emit at the AERR triggering levels as shown in the table below.

Pollutant	Type A AERR Triggering Levels [1] (tpy)	Type B AERR Triggering Levels [1] (tpy)	Pollutant	In-house Total Facility Triggering Levels [1] (tpy)	Total Facility Emissions (tpy)
NO_x	≥2500	≥100	NO_x	≥25	6683.7
SO_2	≥2500	≥100	SO_2	≥25	1874.2
CO	≥2500	≥1000	CO	≥250	370.6
$PM_{10}/PM_{2.5}$	≥250/≥250	≥100/100	PM/PM_{10}	≥25/25	PM = 203.6 PM_{10} = 203.6 $PM_{2.5}$ = 203.6
VOC	≥250	≥100	VOC	≥25	447.2
			HAPS	≥5	18.67

[1] Based on potential emissions

This facility emits above the AERR triggering levels. Therefore, AERR requirements are applicable.

The Clean Air Branch also requests annual emissions reporting from those facilities that have facility-wide emissions of a single air pollutant exceeding in-house triggering levels or is a covered source. Annual emissions reporting is required for this facility for in-house recordkeeping purposes since it is a covered source.

Compliance Assurance Monitoring CAM):

40 CFR Part 64

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

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

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

There is no change from the previous covered source renewal application regarding CAM requirements.

Synthetic Minor Source:

Not applicable, this facility is a major source.

Project Emissions:

Comparison of 25% Performance Test Results with Permitted Limits

Engine	Pollutant	Test Result [1]	Permit Limit
D-8	NO_x (ppmvd [2])	534.4	n/a [3]
	NO_x (lb/hr)	36.26	185.22
	CO (ppmvd)	11.49	23 [4]
	CO (lb/hr)	0.47	7.2
D-9	NO_x (ppmvd)	180.1	n/a [3]
	NO_x (lb/hr)	13.91	68.28
	CO (ppmvd)	15.02	23 [4]
	CO (lb/hr)	0.71	13.5

[1] Average of three (3) thirty-minute (30-minute) test runs at approximately 25% of rated engine load.
[2] Parts per million by volume, dry, corrected to 15% O_2. Limits apply only at full load (100% to 110% of rated load).
[3] NO_x concentration limits apply only at full load (100% to 110% of rated load).
[4] CO limits are 23 ppmvd or 70% reduction across oxidation catalyst.

Ambient Air Quality Impact Analysis:

The applicant prepared an ambient air quality impact analysis to demonstrate that low-load operation of the engines will not result in the violation of any ambient air quality standards. Because fuel flow to the engines are lower during low-load operation, exhaust gas flow rates and thus stack velocities are reduced and dispersion is affected. This analysis uses stack parameters that reflect operation of all four engines at the proposed new minimum operating load of 25% of rated load and compares impacts at 25% load with impacts at the current minimum load of 50%. The fuel flow rates, stack gas oxygen contents, and exhaust gas temperatures were collected during the low load test program and thus reflect actual engine operating data. The facility layout, receptor grid, and meteorological data used in the ambient air quality modeling analysis were identical to those used in the most recent submittal. The engines are modeled as operating simultaneously at minimum load to represent the anticipated worst case. The emission rates, stack parameters, and results of the ambient air quality modeling analysis are shown in the tables below. The modeling results for the engines at 25% and 50% of rated load are below the SAAQS/NAAQS.

The following procedures were used for the modeling:

AERMOD

AERMOD model was used to model the air quality impacts from the proposed modified sources (D6, D7, D8, and D9) for all averaging periods. To obtain the 1 hour NO_2 impacts, the Ozone Limiting Method (OLM) option was used within AERMOD to estimate the one-hour (1 hour) NO_2 ambient impacts for both the maximum and highest 8th highest (98^{th} percentile) modeled impacts. To obtain the one-hour (1 hour) SO_2 impacts, both the maximum and highest 4th highest (99^{th} percentile) modeled impacts were output from AERMOD. Maximum impacts were located in complex terrain, at receptors whose height are above the top of stack height, to the north to the KIUC Port Allen Generating Station power plant.

CTSCREEN

CTSCREEN was then used for a more refined assessment of short-term (one-hour (1-hour) average NO_2 and one-hour (1-hour) average SO_2) project impacts in terrain above stack top elevation. CTSCREEN maximum short-term impacts from the projects occur in elevated terrain to the North of the project. Because CTSCREEN is a screening model, 98^{th} and 99^{th} percentile values could not be generated (for one-hour (1-hour) NO_x and one-hour (1-hour) SO_2 impacts, respectively), and the highest modeled concentrations were used. Further, the CTSCREEN results for one-hour (1-hour) average NO_2 were in the form of NO_x, with no OLM adjustment. Unlike AERMOD, CTSCREEN does not have the capability of performing ozone limiting internally within the model. Therefore, if the CTSCREEN results were used without ozone limiting, it would erroneously be assuming that all of the NO_x emitted from the power plant units is converted to NO_2. This is obviously an overly conservative assumption, which can be addressed in a manner consistent with Appendix W by applying ozone limiting techniques.

The June 28, 2010, Tyler Fox memo (part of the June 29, 2010, Stephen Page memo at http://www.epa.gov/nsr/documents/20100629no2guidance.pdf) addresses the applicability of OLM (and PVMRM) in a generic sense as well as in the context of AERMOD. The memo discusses the three-tier screening approach in Appendix W—Tier 3, the most detailed approach, utilizes OLM as "a detailed screening technique for point sources." The discussion goes on to indicate that "key model inputs for OLM are the in-stack ratios of NO_2/NO_x emissions and background ozone concentrations." In AERMOD, these are model inputs; however, as discussed above, CTSCREEN does not have the capability of using these inputs and performing the ozone limiting calculations internal to the model, so it must be done manually, external to the model. The ozone value used for ozone limiting was the average of the highest hourly ozone measurements for the most recent three years, 2010, 2011, and 2012:

Ozone (ppm)			
2010	2011	2012	Average
0.055	0.053	0.047	0.052

The highest modeled 1-hour average NO_x impact from CTSCREEN was converted from $\mu g/m^3$ (model output) to ppm. The ozone limiting equation NO_2 (ppm, total) = 0.1 * NO_x (ppm) + O_3 (ppm) was used to calculate the total modeled concentrations of NO_2 for the 25% and 50% cases.

PROPOSED

Emission Rates Used for Modeling

Engine	Pollutant	Emission Rate 25% Load (lb/hr)	Emission Rate 50% Load (lb/hr)
D-6, D-7, D-8	NO_x	**110**	**125**
D-6, D-7, D-8	CO	7.2	7.2
D-9	NO_x	**40.55**	**61.76**
D-9	CO	13.5	13.5
All	SO_2	8.2	15.1
	$PM_{10}/PM_{2.5}$	**5.23**	7.85

Proposed new limits are shown in bold.

Stack Parameters and Emission Rates Used for Modeling

Unit	Engine Load (%)	Exhaust Temp. (K)	Exhaust Gas Flow Rate (m^3/s)	Velocity (m/s)	NO_x (g/s)	SO_x (g/s)	CO (g/s)	PM (g/s)
D-6,7,8	25	669.61	10.365	10.69	13.860	1.030	0.907	0.659
D-9	25	669.61	10.365	10.69	5.109	1.030	1.701	0.659
D-6,7,8	50	637.40	16.248	16.76	15.750	1.908	0.907	0.989
D-9	50	637.40	16.248	16.76	7.782	1.908	1.701	0.989

Note: Stack height and diameter for all units remains unchanged at 28.96 m and 1.11 m, respectively.

Results of the Air Quality Modeling Analysis

Pollutant	Average Period	Engine Load 50% ($\mu g/m^3$)	Engine Load 25% ($\mu g/m^3$)	Federal Standard ($\mu g/m^3$)	State Standard ($\mu g/m^3$)
NO_2	1-hr (98^{th} pctl)	183	184	188	-
	annual	27	34	100	75
SO_2	1-hr (99^{th} pctl)	119	77	196	-
	3-hr	227	140	1300	1300
	24-hr	74	54	-	365
	annual	13.6	12.3	-	80
CO	1-hr	69	385	40,000	10,000
	8-hr	56	321	10,000	5,000
PM_{10}	24-hr	27	26	150	150
	annual	7.0	7.9	-	50
$PM_{2.5}$	24-hr (98^{th} pctl)	27	26	35	-
	annual	7.0	7.9	12	-

Significant Permit Conditions and Discussion:

The following permit conditions in the covered source permit were modified. As is custom when modifying regulatory language, new language is underlined, while [deleted language is shown in brackets].

1. Attachment II(C), Special Condition No. C.4.

    4. Operating Load Limits

    The permittee shall not allow the operation of diesel engine generators D-6, D-7, D-8, and D-9,below [fifty (50)] twenty-five (25) percent of rated load, except during equipment startup, shutdown, maintenance, or testing. The permittee shall not allow

the operation of diesel engine generators D-6, D-7, D-8, and D-9, above 110 percent of rated loads at any time. Engine load shall be determined on a 15-minute average basis.

(Auth.: HAR §11-60.1-3, §11-60.1-90, §11-60.1-132; 40 CFR §52.21)[1]

2. Attachment II(C), Special Condition No. C.5.

5. Maximum Emission Limits

The permittee shall not discharge or cause the discharge into the atmosphere from each of diesel engine generators D-6, D-7, D-8, and D-9, nitrogen oxides, sulfur dioxide, carbon monoxide, volatile organic compounds and particulate matter in excess of the following specified limits:

Compound	Maximum Emission Limits* (lbs/hr)
Sulfur Dioxide	33.14
Nitrogen Oxides (as NO_2)(above 50% of rated load)	
Units D-6, D-7, and D-8	185.22
Unit D-9	68.28
Nitrogen Oxides (as NO_2)(at 50% of rated load)	
Units D-6, D-7, and D-8	125
Unit D-9	61.76
Nitrogen Oxides (as NO_2)(below 50% of rated load)	
Units D-6, D-7, and D-8	110
Unit D-9	40.55
Carbon Monoxide (prior to May 3, 2014)	
Units D-6, D-7, and D-8	23.90
Unit D-9	45.00
Carbon Monoxide (on and after May 3, 2014, except during startup)	
Units D-6, D-7, and D-8	7.2
Unit D-9	13.5
Volatile Organic Compounds as Carbon	22.80
Particulate Matter (at or above 50% of rated load)	7.85
Particulate Matter (below 50% of rated load)	5.23

*Three-hour (3-hour) averages.

(Auth.: HAR §11-60.1-3, §11-60.1-90, §11-60.1-132; 40 CFR §52.21, 40 CFR §63.6603)[1]

Conclusion:

Recommend issuing the minor modification to Covered Source Permit No. 0097-01-C, issued on December 11, 2012, and amended on April 10, 2013, and July 17, 2013. There are no increases in emissions with the proposed change and the diesel engines would remain in

compliance with the State and Federal ambient air quality standards. The permit would incorporate the significant permit conditions listed above and be subject to a 45-day EPA review period.

Reviewer: Darin Lum
Date: 11/2013