

ADMINISTRATIVE RECORD

HAMAKUA ENERGY, LLC
65 MW Cogeneration Facility

Application for Significant Modification No. 0243-07

Located At: 45-300 Lehua Street, Honokaa, Hawaii

CSP No. 0243-01-C

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PUBLIC NOTICE

**REQUEST FOR PUBLIC COMMENTS
ON DRAFT AIR PERMITS
REGULATING THE EMISSIONS OF AIR POLLUTANTS**

(Docket No. 20-CA-PA-06)

Pursuant to Hawaii Revised Statutes (HRS), Chapter 342B-13, and Hawaii Administrative Rules (HAR), Chapter 11-60.1, the Department of Health, State of Hawaii (DOH), is requesting public comments on **DRAFT PERMITS** presently under review for the following affected facilities subject to greenhouse gas (GHG) emission reductions:

A. Independent Power Producers (IPPs)

(1) Amendment of Covered Source Permit (CSP) No. 0087-02-C

Application for Significant Modification No. 0087-09
AES Hawaii, LLC (AES)
203 MW Coal-Fired Cogeneration Plant
Located At: 91-086 Kaomi Loop, Kapolei, Oahu

(2) Amendment of Covered Source Permit (CSP) No. 0243-01-C

Application for Significant Modification No. 0243-07
Hamakua Energy, LLC (Hamakua Energy)
Hamakua Energy Plant (HEP)
65 MW Cogeneration Facility
Located At: 45-300 Lehua Street, Honokaa, Hawaii

(3) Amendment of Covered Source Permit (CSP) No. 0214-01-C

Application for Significant Modification No. 0214-10
Kalaeloa Partners, L.P. (KPLP)
Kalaeloa Cogeneration Plant (KCP)
223.5 MW Kalaeloa Cogeneration Plant
Located At: 91-111 Kalaeloa Boulevard, Kapolei, Oahu

B. Hawaiian Electric Companies

(1) Amendment of Covered Source Permit (CSP) No. 0548-01-C

Application for Significant Modification No. 0548-09
Hawaiian Electric Company, Inc. (HECO)
Campbell Industrial Park (CIP) Generating Station
Located At: 91-196 Hanua Street, Kapolei, Oahu

(2) Amendment of Covered Source Permit (CSP) No. 0240-01-C

Application for Significant Modification No. 0240-08
Hawaiian Electric Company, Inc. (HECO)
Kahe Generating Station
Located At: 92-200 Farrington Highway, Waianae, Oahu

- (3) Amendment of Covered Source Permit (CSP) No. 0238-01-C**
Application for Significant Modification No. 0238-05
Hawaiian Electric Company, Inc. (HECO)
Honolulu Generating Station
Located At: 170 Ala Moana Boulevard, Honolulu, Oahu
- (4) Amendment of Covered Source Permit (CSP) No. 0239-01-C**
Application for Significant Modification No. 0239-06
Hawaiian Electric Company, Inc. (HECO)
Waiau Generating Station
Located At: 475 Kamehameha Highway, Pearl City, Oahu
- (5) Amendment of Covered Source Permit (CSP) No. 0234-01-C**
Application for Significant Modification No. 0234-05
Hawaii Electric Light Company, Inc. (HELCO)
Kanoiehua-Hill Generating Station
Located At: 54 Halekauila Street, Hilo, Hawaii
- (6) Amendment of Covered Source Permit (CSP) No. 0007-01-C**
Application for Significant Modification No. 0007-07 (0007-01-C)
Application for Significant Modification No. 0070-04 (0070-01-C)
Hawaii Electric Light Company, Inc. (HELCO)
Keahole Generating Station
Located At: 73-4249 Pukiawe Street, Kailua Kona, Hawaii
- (7) Amendment of Covered Source Permit (CSP) No. 0235-01-C**
Application for Significant Modification No. 0235-04
Hawaii Electric Light Company, Inc. (HELCO)
Puna Generating Station
Located At: Puna Mill Road, Keaau, Hawaii
- (8) Amendment of Covered Source Permit (CSP) No. 0232-01-C**
Application for Significant Modification No. 0232-06
Maui Electric Company, Ltd. (MECO)
Kahului Generating Station
Located At: 200 Hobron Avenue, Kahului, Maui
- (9) Amendment of Covered Source Permit (CSP) No. 0067-01-C**
Application for Significant Modification No. 0067-14 (0067-01-C)
Application for Significant Modification No. 0067-15 (0067-02-C)
Maui Electric Company, Ltd. (MECO)
Maalaea Generating Station
Located At: Maalaea Generating Station, Maalaea, Maui
- (10) Amendment of Covered Source Permit (CSP) No. 0031-04-C**
Application for Significant Modification No. 0031-08
Maui Electric Company, Ltd. (MECO)
Palaau Generating Station
Located At: 32 Ulili Street, Kaunakakai, Molokai

The **DRAFT PERMITS** are described as follows:

The permit amendments incorporate GHG emission caps in accordance with HAR Chapter 11-60.1, Subchapter 11, to limit GHG emissions from affected facilities. Affected facilities are permitted covered sources with potential carbon dioxide equivalent (CO₂e) emissions (biogenic plus nonbiogenic) equal to or greater than 100,000 short tons per year.

Pursuant to HAR Chapter 11-60.1, Subchapter 11, the amendments incorporate provisions for partnering between thirteen (13) electric plants to combine emissions for flexibility in achieving the GHG reductions. Three (3) affected facilities are independent power producers (IPPs) owned and operated by AES, Hamakua Energy, and KPLP. The remaining ten (10) affected facilities are from the Hawaiian Electric Companies that include HECO, HELCO, and MECO.

The partnering facilities propose a total combined GHG emission baseline for establishing the facility-wide GHG emissions cap of 7,584,991 metric tons (8,361,022 short tons) per year. Partnering facilities used 2010 as the baseline year, except for the KCP cogeneration plant which used 2009 for its baseline year because 2010 was deemed unrepresentative due to an overhaul of its steam turbine generator. Emissions from HECO's Shipman Generating Station which closed at the end of 2015 were included in the baseline emissions. The total combined GHG emissions cap proposed for the partnering facilities for calendar year 2020 and beyond is 6,371,392 metric tons (7,023,257 short tons) of CO₂e emissions per calendar year which is a 16% reduction from the proposed total combined GHG emission baseline level.

For calendar year 2019, cap adjustments are necessary to compensate for the continuing unavailability of renewable energy from Puna Geothermal Venture (PGV) and delays to new renewable energy projects for reasons outside of the control of the partnering facilities. The cap adjustments will temporarily increase the total combined GHG emissions cap proposed for the partnering facilities to 6,539,587 metric tons (7,208,661 short tons) for a 13.78% reduction from the proposed total combined GHG emission baseline level. Alternate operating scenarios are added to the permits for continuing with the cap adjustments by adding one twelfth (1/12) of the 2019 annual adjustments for every month that PGV generation is delayed into and beyond calendar year 2020. The 2019 annual CO₂e adjustments for each individual facility on the island of Hawaii only are 97,524 short tons for Hamakua Energy, LLC, 17,132 short tons for Kanoelehua-Hill Generating Station, 31,213 short tons for Keahole Generating Station, and 39,535 short tons for Puna Generating Station. The total combined CO₂e adjustment for these facilities is 185,404 short tons. For delays in PGV generation into and beyond calendar year 2020, monthly adjustments for each individual facility on the island of Hawaii are 8,127 short tons for Hamakua Energy, LLC, 1,428 short tons for Kanoelehua-Hill Generating Station, 2,601 short tons for Keahole Generating Station, and 3,295 short tons for Puna Generating Station for a total monthly CO₂e adjustment of 15,450 short tons. These alternate operating scenarios apply to each individual cap for partnering facilities on the island of Hawaii and the total combined emissions cap for all partnering facilities until PGV restores net generation of electricity to levels that preceded its shutdown due to the volcanic activity that was determined to be 26,883 MWh. Once net generation of 26,883 MWh per month from the PGV facility is reached, the alternate operating scenarios no longer applies and no further adjustments will be made to the CO₂e emissions caps, thereafter.

For calendar year 2020 and beyond, AES further reduced its individual GHG emissions cap by 16% below its individual GHG emission baseline level. Emissions from the AES cap adjustments were distributed evenly among partnering facilities on the island of Oahu, excluding the AES plant and the HECO Honolulu Generating Station.

The three (3) IPP permits and CSP No. 0548-01-C for HECO's CIP Generating Station will specify individual and total combined GHG emission caps established for the partnering facilities. Any GHG emission cap revision will require each of these facilities (AES, Hamakua Energy, KPLP, and HECO's CIP Generating Station) to submit a significant permit modification for the change.

The permits for the remaining partnering facilities operated by HECO, HELCO, and MECO will not specify individual and total combined GHG emission caps, but instead reference GHG emission caps included in CSP No. 0548-01-C for HECO's CIP Generating Station. Designating CSP No. 0548-01-C as the main permit will reduce the burden of modifying all Hawaiian Electric Companies' permits should an emissions cap be revised. Only CSP No. 0548-01-C would require modification as the emission caps will not be incorporated separately into each facility's permit.

Individual and total combined GHG emission caps were established in each facility's GHG emission reduction plan. Each facility may exceed its individual cap as long as the total combined GHG emissions cap is met. Biogenic carbon dioxide emissions are excluded in determining compliance with the CO₂e emissions caps.

A. Independent Power Producers (IPPs)

- (1) The significant modification of **CSP No. 0087-02-C** will grant conditional approval to incorporate an individual CO₂e emissions cap of 1,534,598 metric tons (1,691,605 short tons) for calendar year 2019 and 1,281,442 metric tons (1,412,548 short tons) for calendar year 2020 and beyond that applies specifically to the AES cogeneration plant. The conditional approval includes temporarily increasing the total combined CO₂e emissions cap proposed in partnering with the other affected facilities to 6,539,587 metric tons (7,208,661 short tons) for calendar year 2019 and an alternate operating scenario that adds one twelfth (1/12) of the 2019 annual adjustments to the 2020 and beyond GHG emissions cap for every month that PGV's restoration is delayed into and beyond calendar year 2020. A total combined CO₂e emissions cap of 6,371,392 metric tons (7,023,257 short tons) is specified for calendar year 2020 and beyond. The alternate operating scenarios will no longer apply once a net generation of 26,883 MWh per month from PGV is reached.
- (2) The significant modification of **CSP No. 0243-01-C** will grant conditional approval to temporarily increase individual CO₂e emissions cap to 227,906 metric tons (251,223 short tons) for calendar year 2019 and an alternate operating scenario that adds one twelfth (1/12) of the 2019 annual adjustments to the 2020 and beyond GHG emission cap for every month that PGV's restoration is delayed into and beyond calendar year 2020. For 2020 and beyond, an individual CO₂e emissions cap of 139,433 metric tons (153,699 short tons) is specified for the Hamakua Energy cogeneration plant. The conditional approval includes temporarily increasing the total combined CO₂e

emission cap proposed in partnering with the other affected facilities to 6,539,587 metric tons (7,208,661 short tons) for calendar year 2019 and alternate operating scenario that adds one twelfth (1/12) of the 2019 annual adjustments to the 2020 and beyond GHG emissions cap for every month that PGV's restoration is delayed into and beyond calendar year 2020. A total combined CO₂e emissions cap of 6,371,392 metric tons (7,023,257 short tons) is specified for calendar year 2020 and beyond. The alternate operating scenarios will no longer apply once a net generation of 26,883 MWh per month from PGV is reached.

- (3) The significant modification of **CSP No. 0214-01-C** will grant conditional approval to incorporate an individual CO₂e emissions cap of 993,198 metric tons (1,094,813 short tons) for calendar year 2019 and 1,056,486 metric tons (1,164,577 short tons) for calendar year 2020 and beyond that applies specifically to the KPLP cogeneration plant. The conditional approval includes temporarily increasing the total combined CO₂e emissions cap proposed in partnering with the other affected facilities to 6,539,587 metric tons (7,208,661 short tons) for calendar year 2019 and an alternate operating scenario that adds one twelfth (1/12) of the 2019 annual adjustments to the 2020 and beyond GHG emissions cap for every month that PGV's restoration is delayed into and beyond calendar year 2020. A total combined CO₂e emission cap of 6,371,392 metric tons (7,023,257 short tons) is specified for calendar year 2020 and beyond. The alternate operating scenarios will no longer apply once a net generation of 26,883 MWh per month from PGV is reached.

B. Hawaiian Electric Companies

- (1) The significant modification of **CSP No. 0548-01-C** will grant conditional approval to incorporate an individual CO₂e emissions cap of 48,752 metric tons (53,740 short tons) for calendar year 2019 and 112,041 metric tons (123,504 short tons) for calendar year 2020 and beyond that applies specifically to the HECO CIP Generating Station. The conditional approval includes temporarily increasing the total combined CO₂e emissions cap proposed in partnering with the other affected facilities to 6,539,587 metric tons (7,208,661 short tons) for calendar year 2019 and an alternate operating scenario that adds one twelfth (1/12) of the 2019 annual adjustments to the 2020 and beyond GHG emissions cap for every month that PGV's restoration is delayed into and beyond calendar year 2020. A total combined CO₂e emission cap of 6,371,392 metric tons (7,023,257 short tons) is specified for calendar year 2020 and beyond. The alternate operating scenarios will no longer apply once a net generation of 26,883 MWh per month from PGV is reached.
- (2) The significant modification of **CSP No. 0238-01-C** will grant conditional approval to incorporate an individual CO₂e emissions cap 0 metric tons (0 short tons) per calendar year that applies specifically to the HECO Honolulu Generating Station. The conditional approval includes temporarily increasing the total combined CO₂e emissions cap proposed in partnering with the other affected facilities to 6,539,587 metric tons (7,208,661 short tons) for calendar year 2019 and an alternate operating scenario that adds one twelfth (1/12) of the 2019 annual adjustments to the 2020 and beyond GHG emissions cap for

every month that PGV's restoration is delayed into and beyond calendar year 2020. A total combined CO₂e emission cap of 6,371,392 metric tons (7,023,257 short tons) is specified for calendar year 2020 and beyond. The alternate operating scenarios will no longer apply once a net generation of 26,883 MWh per month from PGV is reached.

- (3) The significant modification of **CSP No. 0240-01-C** will grant conditional approval to incorporate an individual CO₂e emissions cap 1,935,707 metric tons (2,133,752 short tons) for calendar year 2019 and 1,998,996 metric tons (2,203,516 short tons) for calendar year 2020 and beyond that applies specifically to the HECO Kahe Generating Station. The conditional approval includes temporarily increasing the total combined CO₂e emissions cap proposed in partnering with the other affected facilities to 6,539,587 metric tons (7,208,661 short tons) for calendar year 2019 and an alternate operating scenario that adds one twelfth (1/12) of the 2019 annual adjustments to the 2020 and beyond GHG emissions cap for every month that PGV's restoration is delayed into and beyond calendar year 2020. A total combined CO₂e emission cap of 6,371,392 metric tons (7,023,257 short tons) is specified for calendar year 2020 and beyond. The alternate operating scenarios will no longer apply once a net generation of 26,883 MWh per month from PGV is reached.
- (4) The significant modification of **CSP No. 0239-01-C** will grant conditional approval to incorporate an individual CO₂e emissions cap of 733,265 metric tons (808,286 short tons) for calendar year 2019 and 796,554 metric tons (878,050 short tons) for calendar year 2020 and beyond that applies specifically to the HECO Waiau Generating Station. The conditional approval includes temporarily increasing the total combined CO₂e emissions cap proposed in partnering with the other affected facilities to 6,539,587 metric tons (7,208,661 short tons) for calendar year 2019 and an alternate operating scenario that adds one twelfth (1/12) of the 2019 annual adjustments to the 2020 and beyond GHG emissions cap for every month that PGV's restoration is delayed beyond into and beyond calendar year 2020 to a total combined CO₂e emission cap of 6,371,392 metric tons (7,023,257 short tons) in partnering with all other affected facilities. The alternate operating scenarios will no longer apply once a net generation of 26,883 MWh per month from PGV is reached.
- (5) The significant modification of **CSP No. 0234-01-C** will grant conditional approval to temporarily increase the individual CO₂e emissions cap to 171,991 metric tons (189,588 short tons) for calendar year 2019 and an alternate operating scenario that adds one twelfth (1/12) of the 2019 annual adjustments to the 2020 and beyond GHG emissions cap for every month that PGV's restoration is delayed into and beyond calendar year 2020. For calendar year 2020 and beyond, an individual CO₂e emissions cap of 156,449 metric tons (172,456 short tons) per calendar year is specified for the HELCO Kanoelehua-Hill Generating Station. The conditional approval includes temporarily increasing the total combined CO₂e emissions cap proposed in partnering with the other affected facilities to 6,539,587 metric tons (7,208,661 short tons) for calendar year 2019 and an alternate operating scenario that adds one twelfth (1/12) of the 2019 annual adjustments to the 2020 and beyond GHG emission cap for every month that PGV's restoration is delayed into and beyond calendar

year 2020. A total combined CO₂e emission cap of 6,371,392 metric tons (7,023,257 short tons) is specified for calendar year 2020 and beyond. The alternate operating scenarios will no longer apply once PGV net generation of 26,883 MWh per month is reached.

- (6) The significant modification of **CSP No. 0007-01-C** will grant conditional approval to temporarily increase the individual CO₂e emissions cap to 248,043 metric tons (273,421 short tons) for calendar year 2019 and an alternate operating scenario that adds one twelfth (1/12) of the 2019 annual adjustments to the 2020 and beyond GHG emissions cap for every month that PGV's restoration is delayed into and beyond calendar year 2020. For calendar year 2020 and beyond, an individual CO₂e emissions cap of 219,727 metric tons (242,208 short tons) per calendar year is specified for the HELCO Keahole Generating Station. The conditional approval includes temporarily increasing the total combined CO₂e emissions cap proposed in partnering with the other affected facilities to 6,539,587 metric tons (7,208,661 short tons) for calendar year 2019 and an alternate operating scenario that adds one twelfth (1/12) of the 2019 annual adjustments to the 2020 and beyond GHG emissions cap for every month that PGV's restoration is delayed into and beyond calendar year 2020. A total combined CO₂e emission cap of 6,371,392 metric tons (7,023,257 short tons) is specified for calendar year 2020 and beyond. The alternate operating scenarios will no longer apply once a net generation of 26,883 MWh per month from PGV is reached.
- (7) The significant modification of **CSP No. 0235-01-C** will grant conditional approval to temporarily increase the individual CO₂e emissions cap to 64,666 metric tons (71,282 short tons) for calendar year 2019 and an alternate operating scenario that adds one twelfth (1/12) of the 2019 annual adjustments to the 2020 and beyond GHG emissions cap for every month that PGV's restoration is delayed into and beyond calendar year 2020. For calendar year 2020 and beyond an individual CO₂e emissions cap of 28,800 metric tons (31,747 short tons) per calendar year for the HELCO Puna Generating Station. The conditional approval includes temporarily increasing the total combined CO₂e emissions cap proposed in partnering with the other affected facilities to 6,539,587 metric tons (7,208,661 short tons) for calendar year 2019 and an alternate operating scenario that adds one twelfth (1/12) of the 2019 annual adjustments to the 2020 and beyond GHG emissions cap for every month that PGV's restoration is delayed into and beyond calendar year 2020. A total combined CO₂e emission cap of 6,371,392 metric tons (7,023,257 short tons) is specified for calendar year 2020 and beyond. The alternate operating scenarios will no longer apply once a net generation of 26,883 MWh per month from PGV is reached.
- (8) The significant modification of **CSP No. 0232-01-C** will grant conditional approval to incorporate an individual CO₂e emissions cap of 140,281 metric tons (154,633 short tons) per calendar year that applies specifically to the MECO Kahului Generating Station. The conditional approval includes temporarily increasing the total combined CO₂e emissions cap proposed in partnering with the other affected facilities to 6,539,587 metric tons (7,208,661 short tons) for calendar year 2019 and an alternate operating scenario that

adds one twelfth (1/12) of the 2019 annual adjustments to the 2020 and beyond GHG emissions cap for every month that PGV's restoration is delayed into and beyond calendar year 2020. A total combined CO₂e emission cap of 6,371,392 metric tons (7,023,257 short tons) is specified for calendar year 2020 and beyond. The alternate operating scenarios will no longer apply once a net generation of 26,883 MWh per month from PGV is reached.

- (9) The significant modification of **CSP No. 0067-01-C** will grant conditional approval to incorporate an individual CO₂e emissions cap of 417,182 metric tons (459,864 short tons) per calendar year that applies specifically to the MECO Maalaea Generating Station. The conditional approval includes temporarily increasing the total combined CO₂e emissions cap proposed in partnering with the other affected facilities to 6,539,587 metric tons (7,208,661 short tons) for calendar year 2019 and an alternate operating scenario that adds one twelfth (1/12) of the 2019 annual adjustments to the 2020 and beyond GHG emissions cap for every month that PGV's restoration is delayed into and beyond calendar year 2020. A total combined CO₂e emission cap of 6,371,392 metric tons (7,023,257 short tons) is specified for calendar year 2020 and beyond. The alternate operating scenarios will no longer apply once PGV net generation of 26,883 MWh per month is reached.
- (10) The significant modification of **CSP No. 0031-04-C** will grant conditional approval to incorporate an individual CO₂e emissions cap of 23,999 metric tons (26,454 short tons) per calendar year that applies specifically to the MECO Palaau Generating Station. The conditional approval includes temporarily increasing the total combined CO₂e emissions cap proposed in partnering with the other affected facilities to 6,539,587 metric tons (7,208,661 short tons) for calendar year 2019 and an alternate operating scenario that adds one twelfth (1/12) of the 2019 annual adjustments to the 2020 and beyond GHG emissions cap for every month that PGV's restoration is delayed into and beyond calendar year 2020. A total combined CO₂e emission cap of 6,371,392 metric tons (7,023,257 short tons) is specified for calendar year 2020 and beyond. The alternate operating scenarios will no longer apply once a net generation of 26,883 MWh per month from PGV is reached.

The **ADMINISTRATIVE RECORDS**, consisting of the **APPLICATIONS, GHG EMISSION REDUCTION PLANS**, and non-confidential supporting material from the applicant, the permit review summary, and the **DRAFT PERMITS**, are available for public inspection during regular office hours, Monday through Friday, 7:45 a.m. to 4:15 p.m., at the following locations:

Oahu:

State of Hawaii
Clean Air Branch
2827 Waimano Home Road, #130
Pearl City, HI 96782

Hawaii:

Hilo: Hawaii District Health Office, Department of Health
1582 Kamehameha Avenue, Hilo, Hawaii 96720

Kona: Sanitation Branch, Department of Health
79-1020 Haukapila Street, Room 115, Kona, Hawaii 96750

Maui:

Maui District Health Office, Department of Health
54 High Street, Wailuku, Maui 96793

Kauai:

Kauai District Health Office, Department of Health
3040 Umi Street, Lihue, Kauai 96766

All comments on the draft permits and any request for a public hearing must be in writing, addressed to the Clean Air Branch at the above address on Oahu and must be postmarked or received by **August 14, 2020**.

Any person may request a public hearing by submitting a written request that explains the party's interest and the reasons why a hearing is warranted. The DOH may hold a public hearing if a hearing would aid in DOH's decision. If a public hearing is warranted, a public notice for the hearing will be published at least thirty (30) days in advance of the hearing.

Interested persons may obtain copies of the administrative record or parts thereof by paying **five (5) cents per page copying costs**. Please send written requests to the Oahu office of the Clean Air Branch listed above or call Mr. Dale Hamamoto (CSPs for Hamakua Energy and KPLP facilities) or Mr. Michael Madsen (CSPs for AES, HECO, HELCO, and MECO facilities) at the Clean Air Branch office at (808) 586-4200. Electronic copies of the draft permits, permit reviews, and GHG emission reduction plans may be found online at <http://health.hawaii.gov/cab/public-notices/>.

Comments on the draft permits should address, but need not be limited to, the permit conditions and the facility's compliance with federal and state air pollution laws, including: (1) the National and State Ambient Air Quality Standards; and (2) HRS, Chapter 342B and HAR, Chapter 11-60.1.

DOH will make a final decision on the permits after considering all comments and will send notice of the final decision to each person who has submitted comments or requested such notice.

Bruce S. Anderson, Ph.D.
Director of Health

DRAFT PERMIT

DRAFT

DATE

CERTIFIED MAIL
RETURN RECEIPT REQUESTED
(xxxx xxxx xxxx xxxx xxxx)

20-xxxE CAB
File No. 0243-07

Mr. Kevin Monahan
Asset Manager
Hamakua Energy, LLC
34759 Lencioni Avenue
Bakersfield, California 93308

Dear Mr. Monahan:

**SUBJECT: Amendment of Covered Source Permit (CSP) No. 0243-01-C
Application for Significant Modification No. 0243-07
Hamakua Energy, LLC
Hamakua Energy Plant
65 MW Cogeneration Facility
Located At: 45-300 Lehua Street, Honokaa, Hawaii
Date of Expiration: August 2, 2014 (Expiration Date to be Revised Upon Permit Renewal)**

In accordance with Hawaii Administrative Rules (HAR), Chapter 11-60.1, and pursuant to your application for significant modification dated March 28, 2018, the updated greenhouse gas (GHG) emission reduction plans received on October 29, 2018, May 30, 2019, and April 20, 2020, from Hamakua Energy, LLC, and the additional information received on January 23, 2020, February 14, 2020, April 2, 2020, May 22, 2020, and June 9, 2020, from Hawaiian Electric Company, Inc. submitted on behalf of the partnership for cap adjustments. The Department of Health, Clean Air Branch (herein after referred to as Department), hereby amends CSP No. 0243-01-C issued to Hamakua Energy, LLC, on August 3, 2009, and amended on December 16, 2013, January 31, 2014, November 17, 2017, November 20, 2017, and June 7, 2019.

In accordance with HAR, Chapter 11-60.1, Subchapter 11, the amendment incorporates provisions for partnering the Hamakua Energy cogeneration plant with other affected plants to combine emissions for flexibility in achieving GHG reductions. The amendment includes GHG emission cap adjustments for 2019 and a total combined GHG emission cap for 2020 and beyond that is a sixteen percent (16%) reduction from the combined partnership baseline GHG emissions level. The amendment also includes alternate operating scenarios in the event delays are encountered in restoring the Puna Geothermal Venture (PGV) facility on the island of Hawaii to the net generation that preceded its shutdown in 2018. Individual and total combined GHG emission caps established in each facility's GHG emission reduction plan are incorporated in the amendment with associated provisions pursuant to HAR §11-60.1-204(d)(6)(C). The partnering facilities included in this amendment are:

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Independent Power Producers (IPPs)

- AES Hawaii, LLC (AES), CSP No. 0087-02-C
- Hamakua Energy, LLC (Hamakua Energy), CSP No. 0243-01-C
- Kalaeloa Partners, L.P. (KPLP), CSP No. 0214-01-C

Hawaiian Electric Companies

- Hawaiian Electric Company, Inc. (HECO), CSP No. 0548-0-C
- Hawaiian Electric Company, Inc. (HECO), CSP No. 0238-01-C
- Hawaiian Electric Company, Inc. (HECO), CSP No. 0239-01-C
- Hawaiian Electric Company, Inc. (HECO), CSP No. 0240-01-C
- Hawaii Electric Light Company, Inc. (HELCO), CSP No. 0007-01-C
- Hawaii Electric Light Company, Inc. (HELCO), CSP No. 0234-01-C
- Hawaii Electric Light Company, Inc. (HELCO), CSP No. 0235-01-C
- Maui Electric Company, Ltd. (MECO), CSP No. 0031-04-C
- Maui Electric Company, Ltd. (MECO), CSP No. 0067-01-C
- Maui Electric Company, Ltd. (MECO), CSP No. 0232-01-C

The three (3) IPP permits and CSP No. 0548-01-C (Campbell Industrial Park (CIP) Generating Station) will specify individual and total combined GHG emission caps established for all of the partnering facilities. Any GHG emission cap revision, except for reasonably anticipated alternate operating scenarios due to the PGV facility shutdown, will require each of these facilities (AES, Hamakua Energy, KPLP, HECO CIP) to submit a significant permit modification.

The permits for the remaining partnering facilities operated by HECO, HELCO, and MECO will not specify individual and total combine GHG emission caps, but will reference GHG emission caps included in CSP No. 0548-01-C. Designating CSP No. 0548-01-C as the main HECO permit will reduce the burden of modifying all Hawaiian Electric Companies' permits should an emission cap be revised. Only CSP No. 0548-01-C would require modification as the emission caps will not be incorporated separately into each facility's permit.

CSP No. 0243-01-C issued on August 3, 2009, and amended on December 16, 2013, January 31, 2014, November 17, 2017, November 20, 2017, and June 7, 2019, is amended as follows:

1) Added Attachment and Form:

- a) Attachment II - GHG: Special Conditions – GHG Reduction Requirements
- b) Monitoring Report Form: GHG Emissions

2) Superseded Attachment and Form:

- a) Attachment III: Annual Fee Requirements
- b) Compliance Certification Form

DRAFT

Mr. Kevin Monahan
DATE
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All other permit conditions of CSP No. 0243-01-C issued on August 3, 2009, and amended on December 16, 2013, January 31, 2014, November 17, 2017, and November 20, 2017, shall not be affected and shall remain valid.

If there are any questions regarding these matters, please contact Mr. Dale Hamamoto of the Clean Air Branch at (808) 586-4200.

Sincerely,

_____, P.E., ACTING CHIEF
Environmental Management Division

DH:tkg

Enclosures

c: Allen Hess, General Manager, Hamakua Energy Plant Facility
45-300 Lehua Street, Honokaa, Hawaii 96727

Scott Valentino, President, Pacific Current
P.O. Box 733, Suite 1880, Honolulu, Hawaii 96813

**ATTACHMENT II - GHG: SPECIAL CONDITIONS
GHG REDUCTION REQUIREMENTS
COVERED SOURCE PERMIT NO. 0243-01-C**

Amended Date: DATE

Expiration Date: August 2, 2014
(Expiration Date to be Revised Upon Permit Renewal)

In addition to the standard conditions of the CSP, the following special conditions shall apply to the permitted facility.

Section A. Equipment Description

1. Attachment II - GHG of this permit encompasses the following equipment and associated appurtenances:

<u>Unit No.</u>	<u>Equipment Description</u>
CT1	23 MW General Electric LM 2500 Combustion Turbine Generator
CT2	23 MW General Electric LM 2500 Combustion Turbine Generator
-----	1,250 kW Cummins Black Start Diesel Engine Generator, Engine Model No. KTASO-G9

(Auth.: HAR §11-60.1-3)

2. The equipment is subject to GHG emission reduction requirements of HAR, Chapter 11-60.1, Subchapter 11 and associated permit conditions based on information from the GHG emission reduction plan and permit application for significant modification. The GHG emission reduction plan shall become a part of the CSP application process for renewals and any required modifications pursuant to HAR, Chapter 11-60.1, Subchapter 5. With each subsequent GHG reduction plan submittal, the permittee shall report:
- a. The GHG emission reduction status;
 - b. Factors contributing to the emission changes;
 - c. Any control measure updates; and
 - d. Any new developments or changes that would affect the basis of the facility-wide GHG emissions cap.

(Auth.: HAR §11-60.1-5, §11-60.1-204(g))

Section B. GHG Permit Conditions

1. Permit conditions specified in Attachment II – GHG, including provisions to limit maximum potential GHG emissions, are state-only enforceable requirements which are not federally enforceable under the federal Clean Air Act.

(Auth.: HAR §11-60.1-3, §11-60.1-90, 11-60.1-161; 40 CFR §70.6)¹

2. The permittee shall comply with all applicable provisions of these conditions, including all emission limits, notification, testing, monitoring, and reporting requirements. The major requirements of these provisions are detailed in the special conditions of this attachment.

(Auth.: HAR §11-60.1-3, §11-60.1-90, 11-60.1-161)¹

Section C. GHG Emission Limitations

1. GHG Emission Caps

- a. Each partnering facility shall not emit or cause to be emitted carbon dioxide equivalent (CO₂e) emissions in excess of the following individual caps, except as specified in Attachment II – GHG, Special Condition No. C.1.d.iv:

- i. For calendar year 2019, each partnering facility shall not exceed the following individual GHG emission caps:

Calendar Year 2019			
Generating Station	CSP Permit No.	CO₂e Emission Cap^a	
		Metric Tons per Calendar Year	Short Tons per Calendar Year
AES Hawaii, LLC Cogeneration Plant	0087-02-C	1,534,598	1,691,605
Hamakua Energy, LLC Cogeneration Plant	0243-01-C	227,906	251,223
Kalaeloa Partners, L.P. Cogeneration Plant	0214-01-C	993,198	1,094,813
HECO Campbell Industrial Park Generating Station	0548-01-C	48,752	53,740
HECO Honolulu Generating Station	0238-01-C	0	0
HECO Kahe Generating Station	0240-01-C	1,935,707	2,133,752
HECO Waiau Generating Station	0239-01-C	733,265	808,286
HELCO Kanoelehua-Hill Generating Station	0234-01-C	171,991	189,588
HELCO Keahole Generating Station	0007-01-C	248,043	273,421
HELCO Puna Generating Station	0235-01-C	64,666	71,282
MECO Kahului Generating Station	0232-01-C	140,281	154,633
MECO Maalaea Generating Station	0067-01-C	417,182	459,864
MECO Palaau Generating Station	0031-04-C	23,999	26,454

^aMetric Tons = (0.90718474) x (Short Tons)

- ii. For calendar year 2020 and beyond, each partnering facility shall not exceed the following individual GHG emission caps, except as specified in Attachment II – GHG, Special Condition No. C.3:

Calendar Year 2020 and Beyond			
Generating Station	CSP Permit No.	CO₂e Emission Cap^a	
		Metric Tons per Calendar Year	Short Tons per Calendar Year
AES Hawaii, LLC Cogeneration Plant	0087-02-C	1,281,442	1,412,548
Hamakua Energy, LLC Cogeneration Plant	0243-01-C	139,433	153,699
Kalaeloa Partners, L.P. Cogeneration Plant	0214-01-C	1,056,486	1,164,577
HECO Campbell Industrial Park Generating Station	0548-01-C	112,041	123,504
HECO Honolulu Generating Station	0238-01-C	0	0
HECO Kahe Generating Station	0240-01-C	1,998,996	2,203,516
HECO Waiiau Generating Station	0239-01-C	796,554	878,050
HELCO Kanoelehua-Hill Generating Station	0234-01-C	156,449	172,456
HELCO Keahole Generating Station	0007-01-C	219,727	242,208
HELCO Puna Generating Station	0235-01-C	28,800	31,747
MECO Kahului Generating Station	0232-01-C	140,281	154,633
MECO Maalaea Generating Station	0067-01-C	417,182	459,864
MECO Palaau Generating Station	0031-04-C	23,999	26,454

^aMetric Tons = (0.90718474) x (Short Tons)

- b. All partnering facilities shall not exceed the following combined emission caps:
 - i. For 2019, total combined CO₂e emissions in excess of 7,208,661 short tons (6,539,587 metric tons) per calendar year.
 - ii. For 2020 and beyond, CO₂e emissions in excess of 7,023,257 short tons (6,371,392 metric tons) per calendar year, except as specified in Attachment II – GHG, Special Condition No. C.3.
- c. In the event that partnering is terminated or becomes unavailable:
 - i. The permittee shall not exceed the applicable individual GHG emissions cap specified in Attachment II – GHG, Special Condition No. C.1.a;
 - ii. Attachment IIC – GHG, Special Condition Nos. C.1.b, C.1.d.iv, C.1.d.v, C.3.c, C.3.f, and D.1.f do not apply; and
 - iii. Items 2 and 3 of the **Monitoring Report Form: GHG Emissions** do not apply.

- d. For purposes of the CO₂e emission limits in Attachment II - GHG, Special Condition Nos. C.1.a, C.1.b, and C.1.c of this permit:
- i. The CO₂e emissions shall have the same meaning as that specified in HAR §11-60.1-1;
 - ii. In accordance with HAR §11-60.1-204(d)(6)(B), biogenic carbon dioxide (CO₂) emissions shall not be included when determining compliance with the emission limits;
 - iii. The permittee shall be in compliance with the applicable emission limits by the end of 2019 and each calendar year thereafter;
 - iv. Except as specified in Attachment II - GHG, Special Condition No. C.1.c, the permittee may exceed the emissions cap specified in Attachment II - GHG, Special Condition No. C.1.a, if the GHG emissions limit specified in Attachment II - GHG, Special Condition No. C.1.b is met; and
 - v. Except as specified in Attachment II - GHG, Special Condition No. C.1.c, at no time shall the permittee exceed Attachment II - GHG, Special Condition Nos. C.1.a and C.1.b simultaneously over a calendar year. For incidences when Attachment II - GHG, Special Condition Nos. C.1.a and C.1.b, are exceeded simultaneously, emissions in excess of the total combined cap shall be allocated according to the following equation for compliance purposes:

$$X = XG \frac{(A - C)}{\sum_{A_i > C_i} (A_i - C_i)}$$

Where:

- X = Adjusted portion in metric tons or short tons of GHG emissions that are in excess of total combined cap specified in Attachment II – GHG, Special Condition No. C.1.b. The equation applies to all affected facilities that do not meet the individual and total combined GHG emission caps specified in Attachment II – GHG, Special Condition Nos. C.1.a and C.1.b, respectively.
- XG = Total combined actual GHG emissions from affected facilities minus total combined GHG emissions cap.
- A = Actual GHG emissions from the affected facility.
- C = GHG emissions cap for the affected facility.
- $\sum_{A_i > C_i} (A_i - C_i)$ = The sum of the difference between the actual emissions and cap emissions for all facilities that did not achieve the individual facility-wide GHG emissions cap.

(Auth.: HAR §11-60.1-3, §11-60.1-5, §11-60.1-90, §11-60.1-204)

2. GHG Emission Cap Revisions

- a. The facility-wide GHG emissions cap may be re-evaluated and revised by the Department in accordance with HAR §11-60.1-204(h).

- b. A revision to the facility-wide GHG emissions cap shall be considered a significant modification subject to the application and review requirements of HAR §11-60.1-104. For each GHG emission cap revision, the Department may impose additional emission limits or requirements, or limit the time-frame allowed for the revised GHG emissions cap.

(Auth.: HAR §11-60.1-3, §11-60.1-90, §11-60.1-204)

3. Alternate Operating Scenarios

The alternate operating scenario for the PGV facility shutdown due to volcanic activity on the island of Hawaii in 2018, shall remain in effect until an additional net energy generation of 26,883 MWh per month from the PGV facility is reached in any month of the year. The following shall apply to the individual and total combined alternate operating scenario GHG emission cap adjustments starting January 1, 2020, and for any subsequent year until these alternate operating scenarios no longer apply:

- a. Attachment II – GHG, Special Condition No. C.3 no longer applies when:

$$NG_{PGV-R} \geq NG_{PGV2017}$$

Where:

$NG_{PGV2017} = 26,883$ Net Generating capacity from the PGV facility in calendar year 2017 on an average monthly basis (MWh) preceding its shutdown.
 $NG_{PGV-R} =$ Net Generation from the restored PGV facility (MWh per month)

- b. The alternate scenario individual GHG emission cap adjustment for calendar year 2019 is 97,524 short tons for Hamakua Energy, LLC, 17,132 short tons for Kanoelehua-Hill Generating Station, 31,213 short tons for Keahole Generating Station, and 39,535 short tons for Puna Generating Station. Starting on January 1, 2020, and for any subsequent year, the alternate scenario GHG emissions individual cap adjustment for each of the foregoing island of Hawaii partnering facilities shall be calculated by adding one-twelfth (1/12) of the 2019 annual adjustment for each facility's individual GHG emissions cap specified in Attachment II – GHG, Special Condition No. C.1.a.ii per month for the facilities from January 1 of that year. Monthly adjustments to the GHG emissions individual GHG emission caps shall be determined as specified in Attachment II – GHG, Special Condition No. C.3.d until this alternate operating scenario no longer applies as specified in Attachment II – GHG, Special Condition No. C.3.a. A full one-twelfth (1/12) of the annual cap adjustment shall apply per month until the criteria in Attachment II – GHG, Special Condition No. C.3.a are met and not thereafter.

- c. The PGV alternate scenario total combined cap adjustment for calendar year 2019 is 185,404 short tons. Starting on January 1, 2020, and for any subsequent year, the PGV alternate operating scenario total combined GHG emissions cap adjustment shall be calculated by adding one-twelfth (1/12) of the 2019 annual adjustment of 15,450 short tons to the total combined cap specified in Attachment II – GHG, Special Condition No. C.1.b.ii per month from January 1 of that year. Monthly adjustments to the total combined GHG emissions cap shall be determined as specified in Attachment II – GHG, Special Condition No. C.3.d until this alternate operating scenario no longer applies as specified in Attachment II – GHG, Special Condition No. C.3.a. A full one-twelfth (1/12) of the annual cap adjustment shall apply per month until the criteria in Attachment II – GHG, Special Condition No. C.3.a are met and not thereafter.
- d. Monthly adjustments to the individual and total combined GHG emission caps shall be determined with the following equation:

$$AC = FAC/12$$

Where:

- FAC = Full Adjustment to CO₂e caps (short tons – refer to table below)
- AC = Monthly adjustment to GHG Emissions Caps

Generating Station	Full Adjustment to CO₂e Caps (Short Tons)	2020 CO₂e Cap (Short Tons)	FAC/12 (Short Tons)^b
Hamakua Energy	97,524	153,699	8,127
Kanoelehua-Hill	17,132	172,456	1,428
Keahole	31,213	242,208	2,601
Puna	39,535	31,747	3,295
Combined	185,404	see note ^a	15,450

^aTotal combined CO₂e cap for all partnering facilities is 7,023,257 short tons.

^bMonthly full CO₂e cap adjustment.

- e. Individual GHG emission cap adjustments, affecting the total combined GHG emissions cap, shall only apply to partnering facilities on the island of Hawaii.
- f. The permittee may exceed the adjusted individual GHG emissions cap as determined in Attachment II – GHG, Special Condition No. C.3.b, if the adjusted total combined GHG emission cap as determined in Attachment II – GHG, Special Condition No. C.3.c is met.
- g. Alternate operating scenario records shall be maintained in accordance with Attachment II – GHG, Special Condition No. D.3.
- h. The terms and conditions under each operating scenario shall meet all applicable requirements, including the special conditions of this permit.

(Auth.: HAR §11-60.1-3, §11-60.1-5; §11-60.1-204(h))

Section D. Monitoring and Record Keeping Requirements

1. GHG Emissions

For calculating CO₂e emissions to assess fees, determining compliance with the GHG emission caps, and quality assurance/quality control requirements, the permittee shall:

- a. Monitor CO₂ mass emissions data for the stationary source combustion units listed in Attachment II - GHG, Special Condition No. A.1, in accordance with 40 Code of Federal Regulations (CFR) §98.34;
- b. Estimate missing data in accordance with the applicable procedures in 40 CFR §98.35;
- c. Determine the metric tons of CO₂, methane (CH₄), and nitrous oxide (N₂O) in accordance with calculation methodologies in 40 CFR §98.33;
- d. Calculate the GHG emissions, expressed in metric tons of CO₂e, using Equation A-1 of 40 CFR §98.2;
- e. Convert the metric tons of CO₂e emissions to short tons for monitoring and annual emissions reporting as applicable. For the conversion, one (1) short ton is equal to 0.90718474 metric tons;
- f. Provide total actual CO₂e emissions semi-annually to HECO in Item 1 of **Monitoring Report Form: GHG Emissions**. The monitoring report form, with Item 1 emissions data, shall be signed and dated by a responsible official; and
- g. Report CO₂e emissions to the Department in accordance with Attachment II - GHG Special Condition No. E.4.

(Auth.: HAR §11-60.1-3, §11-60.1-5, §11-60.1-90; §11-60.1-204d(6)(c); 40 CFR §98.2, §98.33, §98.34, §98.35)

2. Records

All records, including support information, shall be maintained for **at least five (5) years** from the date of the monitoring sample, measurement, test, report, or applications. Support information includes all maintenance, inspection, and repair records, and copies of all reports required by this permit. These records shall be true, accurate, and maintained in a permanent form suitable for inspection and be made available to the Department or authorized representative(s) upon request.

(Auth.: HAR §11-60.1-3, §11-60.1-11, §11-60.1-90)

3. Alternate Operating Scenarios

- a. The permittee shall contemporaneously with making a change from one operating scenario to another record in a log, the scenario under which it is operating.

- b. The permittee shall maintain all records corresponding to the implementation of an alternate operating scenario.

(Auth.: HAR §11-60.1-3, §11-60.1-5, §11-60.1-90)

Section E. Notification and Reporting Requirements

1. Standard Condition Reporting

Notification and reporting pertaining to the following events shall be done in accordance with Attachment I, Standard Condition Nos. 17 and 24, respectively:

- a. Emissions of air pollutants in violation of HAR, Chapter 11-60.1 or this permit (excluding technology-based emission exceedances due to emergencies); and
- b. Permanent discontinuance of construction, modification, relocation, or operation of the facility covered by this permit.

(Auth.: HAR §11-60.1-8, §11-60.1-15, §11-60.1-16, §11-60.1-90; SIP §11-60-10, SIP §11-60-16)²

2. Deviations

- a. Except as specified in Attachment II - GHG, Special Condition No. E.2.b, the permittee shall report in writing **within five (5) working days** any deviations from permit requirements, including those attributed to upset conditions, the probable cause of such deviations, and any corrective actions or preventive measures taken. Corrective actions may include a requirement for testing, or more frequent monitoring, or could trigger implementation of a corrective action plan.
- b. The permittee shall report, in writing, deviations from Attachment II – GHG, Special Condition No C.1.d.v and C.1.c.i as applicable, the probable cause of such deviations, and any corrective actions or preventive measures taken. Corrective actions may include a requirement for testing, more frequent monitoring, or could trigger implementation of a corrective action plan. Reports shall be submitted **within sixty (60) days** following the end of each calendar year.

(Auth.: HAR §11-60.1-3, §11-60.1-15, §11-60.1-16, §11-60.1-90)

3. Compliance Certification

- a. During the permit term, the permittee shall submit at least **annually** to the Department and U.S. Environmental Protection Agency (EPA), Region 9, the attached **Compliance Certification Form** pursuant to HAR, Subsection 11-60.1-86. The permittee shall indicate whether or not compliance is being met with each term or condition of this permit. For making this certification for the partnering facility conditions in Attachment II – GHG, the permittee is relying on information provided by other partners that these partners independently certify. The compliance certification shall include, at a minimum, the following information:
 - i. The identification of each term or condition of the permit that is the basis of the certification;
 - ii. The compliance status;
 - iii. Whether compliance was continuous or intermittent;
 - iv. The methods used for determining the compliance status of the source currently and over the reporting period;
 - v. Any additional information indicating the source's compliance status with any applicable enhanced monitoring and compliance certification, including the requirements of Section 114(a)(3) of the Clean Air Act or any applicable monitoring and analysis provisions of Section 504(b) of the Clean Air Act;
 - vi. Brief description of any deviations including identifying as possible exceptions to compliance any periods during which compliance is required and which the excursion or exceedances as defined in 40 CFR Part 64 occurred; and
 - vii. Any additional information as required by the Department, including information to determine compliance.
- b. The compliance certification shall be submitted within **sixty (60) days after** the end of each calendar year and shall be signed and dated by a responsible official.
- c. Upon the written request of the permittee, the deadline for submitting the compliance certification may be extended, if the Department determines that reasonable justification exists for the extension.

(Auth.: HAR §11-60.1-4, §11-60.1-86, §11-60.1-90)

4. Monitoring Reports

- a. The permittee shall complete and submit **semi-annual** monitoring reports to the Department that provide the metric tons and short tons of CO₂e emitted by all partnering facilities, except that biogenic CO₂ shall be excluded from the total CO₂e emissions. All reports shall be submitted **within sixty (60) days after** the end of each semi-annual calendar period (January 1 – June 30 and July 1 – December 31). The following enclosed form, or equivalent form, shall be used for reporting and shall be signed and dated by a responsible official:

Monitoring Report Form: GHG Emissions

- b. For calendar year 2019, the permittee shall report the CO₂e emissions **within sixty (60) days** after the issuance of this permit. The Monitoring Report Form: GHG Emissions, or equivalent form, for the 2019 calendar year shall be used for reporting and shall be signed and dated by a responsible official.
- c. For calendar year 2020, the permittee shall report the CO₂e emissions **within sixty (60) days** after the issuance of this permit or **within sixty (60) days** after the end of the semi-annual calendar period, whichever is later. The Monitoring Report Form: GHG Emissions, or equivalent form, for the 2020 calendar year shall be used for reporting and shall be signed and dated by a responsible official.

(Auth.: HAR §11-60.1-3, §11-60.1-5, §11-60.1-90)

Section F. Agency Notification

Any document (including reports) required to be submitted by this permit shall be done in accordance with Attachment I, Standard Condition No. 28.

(Auth.: HAR §11-60.1-4, §11-60.1-90)

¹The citations to the CFR identified under a particular condition, indicate that the permit condition complies with the specified provision(s) of the CFR. Due to the integration of the preconstruction and operating permit requirements, permit conditions may incorporate more stringent requirements than those set forth in the CFR.

²The citations to the State Implementation Plan (SIP) identified under a particular condition, indicate that the permit condition complies with the specified provision(s) of the SIP.

**MONITORING REPORT FORM
GHG EMISSIONS
COVERED SOURCE PERMIT NO. 0243-01-C
(PAGE 1 OF 2)**

Amended Date: DATE

Expiration Date: August 2, 2014
(Expiration Date to be Revised Upon Permit Renewal)

In accordance with the HAR, Title 11, Chapter 60.1, Air Pollution Control, the permittee shall report to the Department of Health the following information semi-annually.

(Make Copies for Future Use)

For Period: _____ Date: _____

Facility Name: _____

Location: _____

I certify that I have knowledge of the facts herein set forth that the same are true, accurate, and complete to the best of my knowledge and belief, and that all information not identified by me as confidential in nature shall be treated by the Department of Health as public record. In making this certification for the partnering facility conditions in Items 2 and 3 of this form, I am relying on information provided by other partners that these partners independently certify.

Responsible Official (Print): _____

Title: _____

Responsible Official (Signature): _____

1. Report the CO₂e emitted by Hamakua Energy Plant during each reporting period for purposes of the facility's individual GHG emissions cap:

Emission Year Reporting For _____					
Reporting Period	Hamakua Energy Plant Emissions (Metric Tons of CO ₂ e)			Hamakua Energy Plant Emissions (Total CO ₂ e)	
	CO ₂ (Non-Biogenic)	CH ₄	N ₂ O	Metric Tons	Short Tons
January 1 – June 30 (1 st Semi-Annual Period)					
July 1 – December 31 (2 nd Semi-Annual Period)					
Total Emissions →					

Provide the CO₂e emitted by Hamakua Energy Plant in Item 1 above to HECO during each reporting period for purposes of calculating the total combined GHG emissions from the partnering facilities.

**MONITORING REPORT FORM
GHG EMISSIONS
COVERED SOURCE PERMIT NO. 0243-01-C
(CONTINUED, PAGE 2 OF 2)**

Amended Date: DATE

Expiration Date: August 2, 2014
(Expiration Date to be Revised Upon Permit Renewal)

2. Report the total combined CO₂e emitted by all partnering facilities during each reporting period for purposes of the total combined GHG emissions cap for these facilities:

Emission Year Reporting For _____					
Reporting Period	Total Combined Emissions from all partnering facilities (Metric Tons of CO ₂ e)			Total CO ₂ e	
	CO ₂ (Non-Biogenic)	CH ₄	N ₂ O	Metric Tons	Short Tons
January 1 – June 30 (1 st Semi-Annual Period)					
July 1 – December 31 (2 nd Semi-Annual Period)					
Total Emissions →					

3. For incidences when the individual cap for Hamakua Energy Plant and total combined cap for all partnering facilities is exceeded, report the emissions in excess of the total combined cap using the following equation:

$$X = XG \frac{(A-C)}{\sum_{A_i > C_i} (A_i - C_i)} = \underline{\hspace{2cm}}$$

Where:

X = Adjusted portion in metric tons or short tons of GHG emissions that are in excess of total combined cap specified in Attachment II - GHG, Special Condition No. C.1.b. The equation applies to all affected facilities that do not meet the individual and total combined GHG emission caps specified in Attachment II - GHG Special Condition Nos. C.1.a and C.1.b, respectively.

XG = Total combined actual GHG emissions from affected facilities minus total combined GHG emissions cap.

A = Actual GHG emissions from the affected facility.

C = GHG emissions cap for the affected facility.

$\sum_{A_i > C_i} (A_i - C_i)$ = The sum of the difference between the actual emissions and cap emissions for all facilities that did not achieve the individual facility-wide GHG emissions cap.

**ATTACHMENT III: ANNUAL FEE REQUIREMENTS
COVERED SOURCE PERMIT NO. 0243-01-C**

Amended Date: DATE

Expiration Date: August 2, 2014
(Expiration Date to be Revised Upon Permit Renewal)

The following requirements for the submittal of annual fees are established pursuant to HAR, Title 11, Chapter 60.1, Air Pollution Control. Should HAR, Chapter 60.1, be revised such that the following requirements are in conflict with the provisions of HAR, Chapter 60.1, the permittee shall comply with the provisions of HAR, Chapter 60.1.

1. Annual fees shall be paid in full:
 - a. Within **one hundred twenty (120) days** after the end of each calendar year; and
 - b. Within **thirty (30) days** after the permanent discontinuance of the covered source.
2. The annual fees shall be determined and submitted in accordance with HAR, Chapter 11-60.1, Subchapter 6.
3. The annual emissions data for which the annual fees are based shall accompany the submittal of any annual fees and submitted on forms furnished by the Department.
4. The annual fees and the emission data shall be mailed to:

**State of Hawaii
Clean Air Branch
2827 Waimano Home Road, #130
Pearl City, HI 96782**

DRAFT

**COMPLIANCE CERTIFICATION FORM
COVERED SOURCE PERMIT NO. 0243-01-C
(PAGE 1 OF ___)**

Amended Date: DATE

Expiration Date: August 2, 2014

(Expiration Date to be Revised Upon Permit Renewal)

In accordance with the HAR, Title 11, Chapter 60.1, Air Pollution Control, the permittee shall report to the Department of Health the following certification at least annually, or more frequently, as requested by the Department.

(Make Copies of the Compliance Certification Form for Future Use)

For Period: _____ Date: _____

Company/Facility Name: _____

I certify that I have knowledge of the facts herein set forth that the same are true, accurate, and complete to the best of my knowledge and belief, and that all information not identified by me as confidential in nature shall be treated by the Department of Health as public record. I further state that I will assume responsibility for the construction, modification, or operation of the source in accordance with the Hawaii Administrative Rules, Title 11, Chapter 60.1, Air Pollution Control, and any permit issued thereof.

Responsible Official (Print): _____

Title: _____

Responsible Official (Signature): _____

**COMPLIANCE CERTIFICATION FORM
COVERED SOURCE PERMIT NO. 0243-01-C
(CONTINUED, PAGE 2 OF ___)**

Amended Date: DATE

Expiration Date: August 2, 2014
(Expiration Date to be Revised Upon Permit Renewal)

The purpose of this form is to evaluate whether or not the facility was in compliance with the permit terms and conditions during the covered period. If there were any deviations to the permit terms and conditions during the covered period, the deviation(s) shall be certified as *intermittent compliance* for the particular permit term(s) or condition(s). Deviations include failure to monitor, record, report, or collect the minimum data required by the permit to show compliance. In the absence of any deviation, the particular permit term(s) or condition(s) may be certified as *continuous compliance*.

Instructions:

Please certify Sections A, B, and C below for continuous or intermittent compliance. Sections A and B are to be certified as a group of permit conditions. Section C shall be certified individually for each operational and emissions limit condition as listed in the Special Conditions section of the permit (list all applicable equipment for each condition). Any deviations shall also be listed individually and described in Section D. The facility may substitute its own generated form in verbatim for Sections C and D.

A. Attachment I, Standard Conditions

<u>Permit term/condition</u>	<u>Equipment</u>	<u>Compliance</u>
All standard conditions	All Equipment listed in the permit	<input type="checkbox"/> Continuous <input type="checkbox"/> Intermittent

B. Special Conditions - Monitoring, Recordkeeping, Reporting, Testing, and INSIG

<u>Permit term/condition</u>	<u>Equipment</u>	<u>Compliance</u>
All monitoring conditions	All Equipment listed in the permit	<input type="checkbox"/> Continuous <input type="checkbox"/> Intermittent
All recordkeeping conditions	All Equipment listed in the permit	<input type="checkbox"/> Continuous <input type="checkbox"/> Intermittent
All reporting conditions	All Equipment listed in the permit	<input type="checkbox"/> Continuous <input type="checkbox"/> Intermittent
All testing conditions	All Equipment listed in the permit	<input type="checkbox"/> Continuous <input type="checkbox"/> Intermittent
All INSIG conditions	All Equipment listed in the permit	<input type="checkbox"/> Continuous <input type="checkbox"/> Intermittent

**COMPLIANCE CERTIFICATION FORM
COVERED SOURCE PERMIT NO. 0243-01-C
(CONTINUED, PAGE 3 OF ___)**

Amended Date: DATE

Expiration Date: August 2, 2014
(Expiration Date to be Revised Upon Permit Renewal)

C. Special Conditions - Operational and Emissions Limitations

Each permit term/condition shall be identified in chronological order using attachment and section numbers (e.g., Attachment II, B.1, Attachment IIA, Special Condition No. B.1.f, etc.). Each piece of equipment shall be identified using the description stated in Section A of the Special Conditions (e.g., unit no., model no., serial no., etc.). Check all methods (as required by permit) used to determine the compliance status of the respective permit term/condition.

<u>Permit Term / Condition</u>	<u>Equipment</u>	<u>Method</u>	<u>Compliance</u>
		<input type="checkbox"/> monitoring <input type="checkbox"/> recordkeeping <input type="checkbox"/> reporting <input type="checkbox"/> testing <input type="checkbox"/> none of the above	<input type="checkbox"/> Continuous <input type="checkbox"/> Intermittent
		<input type="checkbox"/> monitoring <input type="checkbox"/> recordkeeping <input type="checkbox"/> reporting <input type="checkbox"/> testing <input type="checkbox"/> none of the above	<input type="checkbox"/> Continuous <input type="checkbox"/> Intermittent
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**COMPLIANCE CERTIFICATION FORM
COVERED SOURCE PERMIT NO. 0243-01-C
(CONTINUED, PAGE 4 OF ___)**

Amended Date: DATE

Expiration Date: August 2, 2014
(Expiration Date to be Revised Upon Permit Renewal)

D. Deviations

<u>Permit Term / Condition</u>	<u>Equipment / Brief Summary of Deviation</u>	<u>Deviation Period</u> time (am/pm) & date (mo/day/yr)	<u>Date of Written</u> <u>Deviation Report</u> <u>to DOH</u> (mo/day/yr)
		Beginning: Ending:	
		Beginning: Ending:	
		Beginning: Ending:	
		Beginning: Ending:	
		Beginning: Ending:	
		Beginning: Ending:	
		Beginning: Ending:	

*Identify as possible exceptions to compliance any periods during which compliance is required and in which an excursion or exceedance as defined under 40 CFR Part 64 occurred.

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DRAFT REVIEW SUMMARY

**PERMIT APPLICATION REVIEW
GREENHOUSE GAS (GHG) EMISSIONS REDUCTION PLAN (ERP)
Covered Source Permit (CSP) NO. 0243-01-C
Application for Significant Permit Modification No. 0243-07**

Submitter: Hamakua Energy, LLC

Facility: Hamakua Energy Plant (HEP)
45-300 Lehua Street, Honokaa, Hawaii 96727

Mailing Address: Hamakua Energy, LLC
P.O. Box 40
Honokaa, Hawaii 96727

Responsible Official: Mr. Kevin Monahan
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Phone: (661) 387-7864

Manager: Mr. Allen Hess
General Manager
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EHS Specialist
Phone: (808) 775-9593

Proposed Project

The Standard Industrial Classification (SIC) Code is 4911 - Electric Services

Hamakua Energy, LLC (Hamakua Energy) has applied for a significant modification to CSP No. 0243-01-C for the HEP to incorporate GHG emission caps as defined in Hawaii Administrative Rules (HAR) §11-60.1-202. Site specific GHG emission limits were established based on HEP's GHG emission reduction plan on October 29, 2018, May 30, 2019, and

April 20, 2020 from Hamakua Energy, LLC, and the additional information received on January 23, 2020, February 14, 2020, April 2, 2020, May 22, 2020, and June 9, 2020 from Hawaiian Electric Company, Inc. submitted on behalf of the partnership for cap adjustments. Updates include proposed cap adjustments due to complications arising from the shutdown of a geothermal energy plant and allocation of emissions for reducing the individual GHG emissions cap for the AES Hawaii, LLC cogeneration plant by 16% below its baseline level. Another update are alternate operating scenarios in the event delays are encountered for restoring operation of the Puna Geothermal Venture (PGV) facility on the island of Hawaii after it shutdown in 2018 due to volcanic activity. Affected facilities subject to GHG reductions are existing covered sources with maximum potential carbon dioxide equivalent (CO₂e) emissions (biogenic plus non-biogenic) equal to or greater than 100,000 short tons per year. The GHG reductions are specified in HAR, Subchapter 11 pursuant to Hawaii Act 234, 2007 which required the Department of Health to develop rules for regulating GHGs. Partnering will be used as a measure to comply with the emission caps in accordance with HAR §11-60.1-204(d)(6)(A). In summary, the Hamakua Energy's GHG ERP is proposing to:

1. Establish a total combined cap on carbon dioxide equivalent (CO₂e) emissions emitted by the HEP and partnering facilities as proposed in Tables 1-1 and 1-2;
2. Establish an individual facility-wide cap on CO₂e emissions from the HEP as proposed in Tables 1-1 and 1-2; and
3. Partner as a measure to comply with the emission caps in accordance with HAR §11-60.1-204(d)(6)(A) that will enable the transfer of GHG emissions allowances between partnering facilities, and allow individual facility-wide caps on CO₂e emissions to be exceeded as long as the total combined cap among partnering facilities is met.

Department of Health's (DOH) approval:

Implementation of Hamakua Energy's GHG ERP in accordance with HAR §11-60.1-204 and §11-60.1-205, respectively, requires the DOH's approval for the following proposals:

1. Establish "*facility-wide GHG emissions cap*"¹ and associated provisions pursuant to HAR §11-60.1-204(b) and §11-60.1-204(d)(6)(A); and
2. Establish a control strategy involving partnering with other facilities pursuant to HAR §11-60.1-204(d)(6).

¹Facility-wide GHG emissions cap is defined in HAR §11-60.1-202 as a permit emissions limitation, applicable to a covered source. It may also be defined as an approved combined GHG emissions cap applicable to multiple covered source permits used as a control strategy to leverage emission reductions among partnering facilities as described in HAR §11-60.1-204(d)(6)(A). The entire source's annual non-biogenic greenhouse gas, and biogenic nitrous oxide and methane emissions will be subject to the permit emissions limitation.

Permitted Equipment Subject to GHG Emissions Cap:

The following permitted units are subject to GHG emission reductions specified in Subchapter 11 of the Hawaii Administrative Rules (HAR):

<u>Unit No.</u>	<u>Equipment Description</u>
CT1	23 MW General Electric LM2500 Combustion Turbine Generator (247 MMBtu/hr max heat input rate - refer to Hamakua Energy's response letter dated December 27, 2018)
CT2	23 MW General Electric LM2500 Combustion Turbine Generator (247 MMBtu/hr max heat input rate)
-----	1,250 kW (14.3 MMBtu/hr) Cummins Black Start Diesel Engine Generator

Permitted Equipment Not Subject to GHG Emissions Cap:

<u>Unit No.</u>	<u>Equipment Description</u> ^a
-----	Two (2) unfired HRSGs with Two (2) SCR Units
-----	19 MW (nominal) Steam Turbine Generator
-----	Two (2) 120-foot high exhaust stacks servicing CT1 and CT2
Tank Nos. 1 and 3	Two (2) 1.4 Million Gallon External Floating Roof Petroleum Tanks for Storage and Transfer of Naphtha or gasoline
-----	Multi-cell Cooling Tower

^a Mandatory GHG reporting pursuant to 40 CFR §98.2(a)(3) applies only to "stationary fuel combustion sources" as defined in 40 CFR §98.30 as devices that combust solid, liquid, or gaseous fuel. This excludes sources of fugitive emissions.

Background:

The HEP produces electrical power and process steam. The nominal 65 megawatts (MW) of electricity produced is sold to the Hawai'i Electric Light Company, Inc. (HELCO) to supplement the electrical demands for the island of Hawaii. With exception to downtime for maintenance, the plant is fully dispatchable and operates year-round.

Equipment at the facility consists of two (2) 24.3 (gross capacity) MW General Electric LM2500 combustion turbine generators (CT1 and CT2), two HRSGs, and one nominal 19 MW steam turbine generator. The facility was initially operated in simple cycle mode and currently operates in combined cycle mode. In combined cycle mode, the high temperature exhaust from the combustion turbine generators is directed to the HRSG's for extraction of energy to produce steam which then drives the steam turbine generators to produce 19 MW of additional power.

The combustion turbine generators are fired primarily on naphtha, with low sulfur fuel oil No. 2 (LSFO) or gasoline allowed as alternate fuels. In addition, Hamakua Energy has submitted a separate application No. 0243-08 for a minor modification to authorize the combustion of biodiesel and biodiesel blended with LSFO. The combustion turbine generators use water injection to reduce nitrogen oxide (NOx) emissions. Additional NOx reduction is provided by two (2) selective catalytic reduction (SCR) units, each installed as part of the two (2) HRSG's.

For meeting the GHG emission reductions, Hamakua Energy is proposing to partner the HEP with ten (10) Hawaiian Electric Company (HECO) facilities and two (2) other independent power producers (IPPs) to allow flexibility in dispatching units to generate power.

Permits issued to the Hawaiian Electric Companies will reference GHG emission caps specified in CSP No. 0548-01-C for Campbell Industrial Park Generating Station as the main permit for specifying each individual partnering facility and total combined GHG emissions caps. This will enable the modification of a single permit if the GHG emission caps need to be revised and reduce the burden of modifying all Hawaiian Electric Companies' permits had the caps been incorporated separately into each facility's permit.

The IPPs will be issued a separate permit specifying individual and total combine GHG emission caps established for the partnering facilities. Any GHG emission cap revision will require each IPP to submit a significant permit modification since emission caps will be incorporated separately into each facility's permit.

Air Pollution Controls:

NO_x emissions from the combustion turbines are controlled through the use of water injection and SCR. The NO_x emissions are limited to 15 ppmvd @ 15% O₂.

The HEP uses a continuous emissions monitoring system (CEMS) to measure NO_x and carbon monoxide (CO) emissions. A transmissometer is used to measure visible emission levels.

Applicable Requirements:

Hawaii Administrative Rules (HAR)

Title 11, Chapter 60.1	Air Pollution Control
Subchapter 1	General Requirements
HAR 11-60.1-1	Definitions
Subchapter 2	General Prohibitions
HAR 11-60.1-31	Applicability
HAR 11-60.1-32	Visible Emissions
HAR 11-60.1-33	Fugitive Dust
HAR 11-60.1-38	Sulfur Oxides from Fuel Combustion
HAR 11-60.1-39	Storage of Volatile Organic Compounds
Subchapter 5	Covered Sources
HAR 11-60.1-81	Definitions
HAR 11-60.1-104	Applications for Significant Modification
Subchapter 6	Fees for Covered Sources, Noncovered Sources, and Agricultural Burning
HAR 11-60.1-111	Definitions
HAR 11-60.1-112	General Fee Provisions for Covered Sources
HAR 11-60.1-113	Application Fees for Covered Sources
HAR 11-60.1-114	Annual Fees for Covered Sources
HAR 11-60.1-115	Basis of Annual Fees for Covered Sources
Subchapter 8	Standards of Performance for Stationary Sources (NSPS)
Subchapter 9	Hazardous Air Pollutant Sources
HAR 11-60.1-174	Maximum Achievable Control Technology (MACT) Emission Standards
Subchapter 11	Greenhouse Gas Emissions

HAR Chapter 11-60.1, Subchapter 11, §11-60.1-204 Greenhouse Gas Emission Reduction Plan

1. Applicability of Subchapter 11 pursuant to HAR §11-60.1-204(a).

HAR §11-60.1-204(a) is applicable to the HEP because it is a permitted covered source as defined in HAR Subchapter 11 with the potential to emit GHG emissions (biogenic plus non-biogenic) equal to or greater than 100,000 short tons per year (TPY).

2. Baseline Emission Rate and Cap.

a. DOH's Approval:

Subsequent to public review and comment, the DOH approval is required for the following:

- i. Proposed CO₂e emission caps emitted by the HEP and partnering facilities listed in Tables 1-1 and 1-2 pursuant to HAR §11-60.1-204(d)(6)(A); and
- ii. Temporarily adjust the CO₂e emission caps where renewable energy producers cease operations due to reasonably unforeseen events beyond the control of the permittee, and to protect the health and welfare of the public, pursuant to HAR §11-60.1-204(h).

b. Establishing CO₂e Emission Caps

Pursuant to HAR §11-60.1-204(b) and (c), HEP is proposing to establish an annual facility-wide GHG emissions cap for HEP as shown in Table 1-2 of this review. As provisioned in HAR §11-60.1-204(d)(6)(A), Hamakua Energy is proposing to combine HEP's GHG emissions cap with other GHG emission caps established for partnering facilities to leverage emission reductions. The combined emissions cap was determined by multiplying total combined baseline GHG emissions (less any biogenic carbon dioxide (CO₂)) for partnering facilities by 0.84 (1.0-0.16). Each facility may exceed its individual cap as long as the total combined GHG emissions cap is met. Partnering facilities are using CY 2010 as the baseline year to establish their caps, except KPLP is proposing to use CY 2009 as an alternate baseline year.

During the public comment period held from April 16, 2019 to May 15, 2019 to consider draft permits for the partnering facilities, both the Hawaiian Electric Companies and Hamakua Energy requested a temporary adjustment to the collective partnership GHG emissions cap. The Hawaiian Electric Companies (HECO) stated that the loss of renewable energy from PGV on Hawaii Island and the delay of new renewable energy projects planned for 2019, for reasons outside the direct control of the companies, has eliminated the additional compliance margin anticipated and relied upon in the GHG emission calculations. As indicated by the Hawaiian Electric Companies, the PGV plant was shut down in May 2018 due to the Kilauea eruption. Also, lava destroyed the Puna complex substation, the adjacent warehouse, and covered a few of PGV's geothermal wells, as well as cut off access to the PGV power plant. HECO, ultimately requested a 185,404 ton increase to the original partnership GHG emissions cap due to the loss of PGV for the entire 2019 operating year. This adjustment is documented in HECO's July 26, 2019 greenhouse gas emissions reduction plan.

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According to HECO's February 14, 2020 correspondence, although a substantial amount of renewable energy was added, other renewable energy projects for 2019 and 2020 have been delayed until 2021. Preliminary GHG emissions of the partnership for calendar year 2019 are estimated to be 7,103,530 tons per year which exceeds the overall partnership GHG emissions cap of 7,023,257 tons per year that results in a 16% reduction of GHG emissions from the total combined baseline emissions level.

Upon incorporating the temporary increase requested in HECO's February 14, 2020 correspondence, the DOH returned the revised draft permits to HECO and the partnering IPPs for another review on March 18, 2020. In April 2, 2020 correspondence, HECO and Hamakua Energy requested the DOH to consider a provision in the permits that allows the 2020 PGV allowance to be increased to the 2019 level adjusted for the loss of PGV in the event the PGV plant implementation is delayed until later in 2020; and additionally allow for the 2019 level adjusted for the loss of PGV to be continued into 2021 if implementation is delayed into 2021. HECO, AES Hawaii, LLC, and Kalaeloa Partners, L.P. also requested that the DOH clarify that no penalties could be asserted for that period given that GHG levels for 2019 are already documented and the permit will be approved after year end 2019. In April 20, 2020 correspondence, Hamakua Energy requested that DOH retain the emission cap set for CY 2019 for HEP to remain consistent until PGV is fully functional and is able to deliver energy to HELCO at the same level of quantity, quality and reliability as it did prior to it being taken off line in 2018,

To address concerns after a public hearing on September 26, 2019 and second public comment period from August 14, 2019 to September 27, 2019, HECO stated in a May 22, 2020 email that AES Hawaii, LLC has agreed to reduce its individual GHG emissions cap by 16% from its baseline emissions level. It was also HECO's understanding that PGV will not likely return to its level of pre-volcanic service by the end of 2020.

Recognizing the magnitude of legal uncertainties, an alternate operating scenario was incorporated into permits to address HECO's concerns on the delay in restoring operation of the PGV facility. The modification for CSP 0548-01-C was redrafted and returned to HECO for review on May 29, 2020.

The following provisions in the HAR allow the GHG emissions cap to be adjusted for events that are beyond the control of the owner or operator of an affected facility:

- i. HAR §11-60.1-204(h)(4) allows the facility-wide GHG emissions cap to be re-evaluated and revised if renewable energy producers cease operations or fail to meet contractual obligations with the affected source, and there are no other reasonable alternatives.
- ii. HAR §11-60.1-204(h)(5) allows the facility-wide GHG emissions cap to be re-evaluated and revised when there are unforeseen events beyond the control of the permittee, resulting in long-term or temporary emission changes, whereby maintenance of the GHG emissions cap would be detrimental to the health and welfare of the public.

Based on the recent events, the proposed revision to the total combined emission cap for calendar year 2019 and the alternate operating scenarios to address the delay in restoring operation to the PGV facility are considered to be within the provisions of HAR §11-60.1-204(h).

Pursuant to HAR §11-60.1-204(h)(4) and HAR §11-60.1-204(h)(5), the DOH agreed to temporarily adjust the GHG emission caps for calendar year 2019 due to the PGV shutdown. Calculations to reallocate emissions for facilities on Hawaii Island were provided by HECO and were updated on July 7, 2019 with lower numbers. The total combined GHG cap adjustment of 185,404 for PGV shutdown is based on estimates provided in Mr. Greg Narum’s email dated August 9, 2019. and is distributed among Keahole, Kaneohele-Hill, and Puna generating stations and HEP as shown in Table 0-1 of this review. For the adjustment, HECO determined difference in emissions between electric plants on the Big Island operating with and without PGV. Emissions with PGV in operation were based on 2017 numbers from EPA’s electronic Greenhouse Reporting Tool (e-GGRT). Since the PGV plant shutdown in May 2018, GHG emissions without PGV in operation were based on twelve (12) months of data from Hawaii Island electric plants between July 2018 and the end of June 2019. The following tables provide results from HECO’s evaluation to determine extra yearly GHG emissions from fossil fuel fired electric plants without renewable energy from PGV:

Table 0-1 Big Island Plant GHG Emissions

Big Island Plant	GHG Emissions (tons)			
	2017 e-GGRT	2018 Jul-Dec	2019 Jan-Jun	July 2018- June 2019
Hamakua Energy, LLC	98,962	112,722	126,252	238,974
HELCO Kanoelehua-Hill	193,103	90,662	89,683	180,345
HELCO Keahole	243,346	144,943	115,147	260,090
HELCO Puna	26,400	34,188	33,618	67,806
Total→	561,811	382,515	364,700	747,215

Table 0-2 GHG Emissions Cap Adjustment for PGV Shutdown

GHG Emissions (tons)		
2017 e-GGRT	July 2018- June 2019	Cap Adjustment (July 2018 – June 2019) Minus (2017 e-GGRT)
561,811	747,215	185,404

Table 0-3 Individual GHG Emissions Caps for PGV Shutdown

Big Island Plant	GHG Cap (tons)	Temporary GHG Cap (tons)	
	July 26, 2019 Greenhouse Gas Emission Reduction Plan (Page A-1)	Adjustment	CAP After PGV Shutdown
Hamakua Energy, LLC	153,699	97,524	251,223
HELCO Kanoelehua-Hill	172,456	17,132	189,588
HELCO Keahole	242,208	31,213	273,421
HELCO Puna	31,747	39,535	71,282
Total→		185,404	785,514

The GHG emission cap adjustment adds 185,404 short tons per year of GHG emissions to the original total combine cap referenced in the July 26, 2019 greenhouse gas emission reduction plan with PGV in operation. The adjustment is the extra amount of GHG emissions that would result from fossil fuel combustion to replace renewable energy provided by PGV that is distributed to partnering facilities on the island of Hawaii that include Hamakua Energy, LLC, Kanoelehua-Hill Generating Station, Keahole Generating Station, and Puna Generating Station. Temporarily adjusted CO₂e emission caps for calendar year 2019 are highlighted in red as shown in the following Table 1-1:

Table 1-1 2019 Temporarily Adjusted CO₂e Emission Caps due to PGV Shutdown

Generating Station	CSP Permit No.	CO ₂ e Emission Cap ^{c, d}	
		Metric Tons per Calendar Year ^b	Short Tons per Calendar Year
AES Hawaii, LLC Cogeneration Plant ^a	0087-02-C	1,534,598	1,691,605
Hamakua Energy, LLC Cogeneration Plant	0243-01-C	227,906	251,223
Kalaeloa Partners, L.P. Cogeneration Plant	0214-01-C	993,198	1,094,813
HECO Campbell Industrial Park Generating Station	0548-01-C	48,752	53,740
HECO Honolulu Generating Station	0238-01-C	0	0
HECO Kahe Generating Station	0240-01-C	1,935,707	2,133,752
HECO Waiau Generating Station	0239-01-C	733,265	808,286
HELCO Kanoelehua-Hill Generating Station	0234-01-C	171,991	189,588
HELCO Keahole Generating Station	0007-01-C	248,043	273,421
HELCO Puna Generating Station	0235-01-C	64,666	71,282
HELCO Shipman Generating Station	0236-01-C	0	0
MECO Kahului Generating Station	0232-01-C	140,281	154,633
MECO Maalaea Generating Station	0067-01-C	417,182	459,864
MECO Palaau Generating Station	0031-04-C	23,999	26,454
Combined		6,539,587	7,208,661

^a AES Hawaii, LLC proposal cap is 10,000 short tons of CO₂e emissions above the baseline of 1,681,605 short tons.

^b Metric Tons = (0.90718474) x (Short Tons).

^c Individual caps that were adjusted for facilities on Hawaii Island due to the PGV shutdown are highlighted in red.

^d Totals may not sum due to independent rounding.

The temporary combined emissions cap for 2019 will be made part of the permit for each partnering facility in accordance with HAR §11-60.1-204(d)(6)(C). Pursuant to HAR §11-60.1-202, a “facility-wide GHG emissions cap” means a permit emissions limitation, applicable to a covered source, limiting the entire source’s annual non-biogenic GHG, and biogenic nitrous oxide and methane emissions. In accordance with HAR §11-60.1-202, a facility-wide GHG emissions cap may also be defined in multiple CSPs to identify partnering facilities with an approved combined GHG emissions cap as described in HAR §11-60.1-204(d)(6)(A).

The temporary total combined cap of 7,208,661 short tons for operating year 2019 is a 13.78% reduction from the total combined baseline emissions of 8,361,022 short tons. Although the reduction is less than 16% from the total combined baseline GHG emissions level, there are no provisions in HAR §11-60.1-204(h) that require a GHG control assessment for revising the cap due to reasonably unforeseen events beyond the control of the owner or operator of an affected source.

In response to public comments on draft permits to incorporate GHG cap provisions to limit GHGs, AES Hawaii, LLC negotiated adjustments to its initial individual GHG cap proposal of 1,691,605 short tons. The initial cap proposal by AES Hawaii, LLC was 10,000 short tons above its individual GHG baseline level of 1,681,605 short tons. As indicated in HECO's January 23, 2020 letter regarding the adjustment of site-specific caps, AES Hawaii, LLC agreed to reduce its individual GHG emissions cap by 10,000 short tons for a zero percent reduction from its individual baseline level.

After further negotiations, AES Hawaii, LLC ultimately agreed to a GHG cap adjustment of 16% below its baseline level which is documented in HECO's May 22, 2020 and June 9, 2020 emails. This 16% reduction (269,075 short tons of CO₂e) from the GHG baseline plus 10,000 short tons reduction from the initial GHG cap proposal of 1,691,605 short tons was distributed evenly among four (4) partnering facilities on Oahu that included Kalaeloa Partners, L.P, HECO Campbell Industrial Park Generating Station, HECO Kahe Generating Station, and HECO Waiiau Generating Station. Each individual cap for these four (4) facilities was increased by 69,764 short tons of CO₂e emissions for a total combined CO₂e emission increase of 279,056 short tons. Therefore, the total combined partnership GHG emissions cap is unchanged. This adjustment to distribute emissions to Oahu partnering plants excluded HECO Honolulu Generating Station and the AES Hawaii, LLC cogeneration plant.

For 2020 and beyond, individual caps will remain at the levels originally proposed by the partnering facilities, except that the AES Hawaii, LLC individual CO₂e emissions cap was reduced 16% below its individual GHG baseline and equally redistributed to, Kalaeloa Partners, L.P, HECO Campbell Industrial Park Generating Station, HECO Kahe Generating Station, and HECO Waiiau Generating Station.

Individual caps for the Hawaii Island facilities will return to the caps provided in Table 1-2 once the alternate operating scenario no longer applies and the net generating levels of 26,883 MWh per month from the PGV facility is reached. The 26,883 MWh net generating threshold is an average monthly for calendar year 2017 that preceded PGV's shutdown due to volcanic activity based on data provided in Zachary Adachi's email of PGV dated June 15, 2020. This threshold was reviewed and agreed upon by Patricia McHenry on behalf of Hamakua Energy as documented in her email dated June 16, 2020.

The CO₂e emission baselines and GHG emission caps proposed for the partnering facilities, that achieve a 16% reduction in GHG emissions from the total combined baseline level, are provided in the following Table 1-2 pursuant to HECO's June 9, 2020 email for calendar year 2020 and beyond:

Table 1-2 2020 and Beyond CO₂e Facility Emission Caps and Actual GHG Baseline

Plant	CSP Permit No.	Emissions (short tons)				Emission Reduction (%)
		Baseline CO ₂ e	Baseline Biogenic CO ₂	Baseline CO ₂ e Less Biogenic CO ₂	CO ₂ e Cap (see notes a,b,& c)	
		(a)	(b)	(c)=(a)-(b)	Proposed	
AES	0087-02-C	1,681,605	0	1,681,605	1,412,548	16.0%
Hamakua	0243-01-C	182,975	0	182,975	153,699	16.0%
Kalaeloa	0214-01-C	1,094,813	0	1,094,813	1,164,577	-6.4%
HECO CIP	0548-01-C	19,179	4,233	14,946	123,504	-726.3%
HECO Honolulu ^a	0238-01-C	133,609	0	133,609	0	100%
HECO Kahe	0240-01-C	2,776,073	0	2,776,073	2,203,516	20.6%
HECO Waiiau	0239-01-C	1,074,359	0	1,074,359	878,050	18.3%
HELCO Hill	0234-01-C	222,784	0	222,784	172,456	22.6%
HELCO Keahole	0007-01-C	191,387	0	191,387	242,208	-26.6%
HELCO Puna	0235-01-C	99,691	0	99,691	31,747	68.2%
HELCO Shipman	0236-01-C	10,192	0	10,192	0	100% Plant Closed
MECO Kahului	0232-02-C	230,839	0	230,839	154,633	33.0%
MECO Maalaea	0067-01-C	620,654	1,142	619,512	459,864	25.8%
MECO Palaau	0031-04-C	28,236	0	28,236	26,454	6.3%
Combined		8,366,396	5,375	8,361,021 ^d	7,023,256 ^d	16.0%

^aThe HECO Honolulu Generating Station is currently deactivated (not operating but could restart if necessary).

^b AES Hawaii, LLC individual GHG cap was adjusted to reduce the cap by 279,057 short tons that is highlighted in brown.

^c Adjustments due to AES Hawaii, LLC cap reduction is 69,764 short tons that add up to 279,056 tons for four (4) facilities highlighted in red. Adjustments in the table above were made to individual caps proposed on page A-1 of HECO's greenhouse gas emission reduction plan submitted on July 26, 2019 pursuant to HECO's June 9, 2020 email with documents prepared by the partners. Individual caps were adjusted for facilities in the table above due to the PGV shutdown and the AES Hawaii, LLC individual cap adjustment. The AES Hawaii, LLC cap adjustment is a 10,000 short ton reduction from the previous proposal plus a 16% reduction (269,057 short tons) from the individual baseline level from another proposal. Adjustments were distributed equally among four (4) Oahu facilities excluding AES Hawaii, LLC and the Honolulu Generating Station. The Individual cap adjustment to these facilities was an additional 69,764 short tons of CO₂e emissions for each of the four (4) facilities highlighted in red. Totals may not sum due to independent rounding.

^d Total combined partnering facility proposed GHG baseline and GHG emission cap are 8,361,022 and 7,023,257 short tons, respectively. Totals may not sum due to independent rounding.

The combined emissions cap for 2020 and beyond will be made part of the permit for each partnering facility in accordance with HAR §11-60.1-204(d)(6)(C). Pursuant to HAR §11-60.1-202, a "facility-wide GHG emissions cap" means a permit emissions limitation, applicable to a covered source, limiting the entire source's annual non-biogenic GHG, and biogenic nitrous oxide and methane emissions. In accordance with HAR §11-60.1-202, a facility-wide GHG emissions cap may also be defined in multiple CSPs to identify partnering facilities with an approved combined GHG emissions cap as described in HAR §11-60.1-204(d)(6)(A).

The total combined GHG emissions cap for 2020 and beyond is a 16% reduction from the total combined baseline emissions level established for the partnering facilities.

For information, Table 1-3 below titled “Actual GHG Baseline and Notional 16% CO₂e Facility Emission Caps” shows the total combined baseline and GHG emissions cap if a sixteen percent (16%) reduction had been applied to each partnering facility separately. The total combined emissions cap in the Table 1-3 below achieves the same reduction as that proposed for the partnering facilities that have combined their facility-wide emission caps to leverage emission reductions in meeting the combined GHG emission caps in accordance with HAR Subparagraph 11-60.1-204 (d)(6)(A). The total combined CO₂e cap in Table 1-3 below for the notional cap is 7,023,258 short tons per year which is a 16% reduction from the total combined baseline. The total combined CO₂e emission cap proposed, as shown in the Table 1-3 of this review for 2020 and beyond, is 7,023,257 short tons per year which is a 16% reduction from the total combined baseline. Totals may not sum due to independent rounding.

Table 1-3 Actual GHG Baseline and Notional 16% CO₂e Facility Emission Caps

Plant	CSP Permit No.	Emissions (short tons)				% Reduction
		Baseline CO ₂ e	Baseline Biogenic CO ₂	Baseline CO ₂ e Less Biogenic CO ₂	CO ₂ e Cap	
		(a)	(b)	(c)=(a)-(b)	Notional	
AES	0087-02-C	1,681,605	0	1,681,605	1,412,548	16.0%
Hamakua	0243-01-C	182,975	0	182,975	153,699	16.0%
Kalaeloa	0214-01-C	1,094,813	0	1,094,813	919,643	16.0%
HECO CIP	0548-01-C	19,179	4,233	14,946	12,555	16.0%
HECO Honolulu ^a	0238-01-C	133,609	0	133,609	112,232	16.0%
HECO Kahe	0240-01-C	2,776,073	0	2,776,073	2,331,901	16.0%
HECO Waiiau	0239-01-C	1,074,360	0	1,074,360	902,462	16.0%
HELCO Hill	0234-01-C	222,784	0	222,784	187,139	16.0%
HELCO Keahole	0007-01-C	191,387	0	191,387	160,765	16.0%
HELCO Puna	0235-01-C	99,691	0	99,691	83,740	16.0%
HELCO Shipman	0236-01-C	10,192	0	10,192	8,561	16.0%
MECO Kahului	0232-02-C	230,839	0	230,839	193,905	16.0%
MECO Maalaea	0067-01-C	620,654	1,142	619,512	520,390	16.0%
MECO Palaau	0031-04-C	28,236	0	28,236	23,718	16.0%
Combined		8,366,396	5,375	8,361,022	7,023,258	16.0%

^aThe HECO Honolulu Generating Station is currently deactivated (not operating but could restart if necessary).

For information, the DOH requested HECO to address GHG emission reductions as a result of the ongoing pandemic. According to an April 9, 2020 press release from Hawaiian Electric at: <https://www.hawaiianelectric.com/hawaiian-electric-sees-drop-in-demand-during-pandemic>, there has been a significant reduction in the use of electricity as tourism activities cease, businesses close, and thousands of residents stay home to slow the spread of COVID-19.

In a May 22, 2020 email, Hawaiian Electric anticipates that the resumption of economic activity will increase the use of electricity to levels that could increase the use of electricity to levels that could approach pre-COVID-19 conditions; however, it is not clear to Hawaiian Electric when that will occur.

c. DOH's Methodology for Conducting Assessment.

The DOH used a Tier 1 methodology in 40 Code of Federal Regulations (CFR) Part 98, §98.33 to assess the proposed individual GHG emission cap. The total combined GHG emission cap is assessed in the review for CSP 0548-01-C. Enclosure 2, Figure 2-2 shows the facility's relative GHG emission levels over a time period that extends beyond the five-year period ending 2010 as prescribed by HAR §11-60.1-204(d)(1). The Tier 1 computation method determines mass emissions from the volume of fuel combusted per year using company records, with the default high heat values (HHV) and emission factors from Tables C-1 and C-2 of 40 CFR Part 98. The Tier 1 method is the least accurate method since it utilizes fuel specific default emission factors and HHV. 40 CFR Part 98, §98.33(b)(1)(i), does not restrict the HEP to a specific Tier for its calculation method, however, relative GHG emissions over a longer time span can be evaluated for trends as shown in Figure 2-2 of Enclosure 2 using the Tier 1 method since fuel consumption data is available. The global warming potentials used to compute CO_{2e} emissions are based on 40 CFR Part 98, Subpart A, Table A-1 (79 FR 73779, Dec 11, 2014). Biogenic CO₂ emissions (if any) are factored out of the emission calculations. Pursuant to 40 CFR Part 98, Subpart C, the mass emissions of CO₂, methane (CH₄), and nitrous oxide (N₂O) shall be determined for each type of fuel.

d. Baseline Year.

Hamakua Energy is proposing to use their calendar year 2010 GHG annual emission rate as their baseline in accordance with HAR §11-60.1-204(d)(1).

e. Using Tier 2 Methodology to Calculate CY 2010 Baseline Emissions.

The HEP used the Tier 2 computation method for CYs 2010 through 2017, except the Tier 1 method was used for CY 2016. The Tier 1 computation method results in a GHG annual emission rate that is more than five percent (5%) higher than if computed using the Tier 2 method as determined in Enclosure 2A. The impact, if the HEP continues to use the Tier 1 method for GHG reporting in future years, is expected to conservatively underestimate the annual GHG emission reductions. 40 CFR Part 98, §98.33, does not restrict the HEP to using the Tier 2 method, however, the HEP plans to continue with using the Tier 2 method in future years as stated in Mr. Dave Cumming's December 25, 2018, email.

3. GHG Control Assessment (Refer to the "Non-Applicable Requirements").
4. Proposed Control Strategy.

Hamakua Energy will partner with other facilities listed in Enclosure 1 pursuant to HAR §11-60.1-204(d)(6)(A) as a primary control measure and be limited to a sixteen percent (16%) total combined facility-wide reduction in GHG emissions, except for calendar year 2019 and where the alternate operating scenarios apply, pursuant to HAR §11-60.1-204(h).

A comparison of technically feasible control measures in Table 4 of this review, indicates partnering with other facilities is expected to have the least economic and schedule impact, without compromising partnering facilities to effectively meet a sixteen percent (16%) overall facility-wide emissions reduction goal once PGV has been restored to net generating levels that preceded its shutdown in 2018.

Hamakua Energy's GHG ERP includes the following secondary and tertiary control measures for meeting the required GHG emission cap(s) to increase their margin for reasonably unforeseen events that are beyond the control of the HEP, such as the termination of the partnership or acts of god:

- a. Fuel switching involving biofuels; and
- b. Restrictive operations.

Hamakua Energy considers the use of liquid biofuels at the HEP to be a reasonable alternate control measure for complying with a GHG emissions cap in terms of compatibility with existing infrastructure. Since the HEP is currently capable of receiving, handling, storing, and operating on a variety of distillate fuels, including fuel oil No. 2 (e.g., diesel and Ultralow Sulfur Diesel (ULSD)), the most significant changes may involve a change-out of gasket and flexible tubing to materials that are compatible with biofuels. The combustion turbine generators are capable of operating on biodiesel or blends of biodiesel and LSFO without modification to the units themselves. Accordingly, Hamakua Energy plans to implement the necessary steps to modify the HEP to accommodate biodiesel and has performed the requisite pilot tests, emissions measurements, and acquisition of the technical and operational data needed to support this modification. The HEP has submitted a separate application No. 0243-08 for a minor permit modification to CSP No. 0243-01-C to allow the use of biodiesel and/or blends of biodiesel and LSFO. This control measure becomes viable if the supply of biodiesel becomes available on the island of Hawai'i to reasonably sustain power generation levels. It is also anticipated that the biofuel could be used instead of ULSD for daily startups of the combustion turbine generators.

Restrictive operations would be the least desirable of the top three (3) GHG control measures that may voluntarily be employed if partnering is terminated, adequate supply of biofuel is not available, or other incidences where emergency provisions would not apply or are not be defensible. While it is unlikely, if restrictive operation is employed, the cost to produce electric power from this facility would increase because of imposed penalties for failing to dispatch power as obligated by the power purchase agreement (PPA) with HELCO. This could lead to increasing emissions of GHGs if less efficient facilities are dispatched to make up for the short fall in power generation by the HEP. The extreme ramification of a curtailment in power generation from the HEP is a failure to meet customer demand on the Island of Hawai'i thus resulting in power outages.

Federal Requirements

40 CFR Part 60, Standard of Performance for New Stationary Sources (NSPS):

40 CFR Part 60, Subpart GG, Standards of Performance for Stationary Gas Turbines **is applicable** to the combustion turbine generators because the capacity of each unit is greater than 10 MMBtu/hr and the combustion turbine generators were constructed after October 3, 1977. Pursuant to §60.333(b) standards for sulfur dioxide can be met by burning fuel oil with a sulfur content not to exceed 0.8% by weight.

40 CFR Part 60, Subpart Kb, Standards of Performance for Volatile Organic Liquid Storage Vessels **is applicable** to external floating roof storage Tank Nos. 1 and 3 because:

1. These tanks commenced construction, modification, or reconstruction after July 23, 1984;
2. Each tank exceeds the 151 cubic meters (m³) maximum capacity; and
3. The maximum true vapor pressure of the VOC stored inside these tanks exceeds 3.5 kilopascals (kPa).

Refer to Enclosure 3 for details in determining applicability of Subpart Kb to the facility's storage tanks.

40 CFR Part 63, National Emissions Standards for Hazardous Air Pollutants (NESHAP) for Source Categories (Maximum Achievable Control Technology (MACT)), Subpart ZZZZ – NESHAP for Stationary Reciprocating Internal Combustion Engines (RICE) **is applicable** to the black start diesel engine generator (DEG). For stationary RICE located at an area source of HAP emissions, a stationary RICE is existing if you commenced construction or reconstruction of the stationary RICE before June 12, 2006. The permittee must have complied with the applicable emission limitations and operating limitations no later than May 3, 2013.

Subpart ZZZZ – NESHAP for RICE **is not applicable** to the emergency stationary RICE (or DEG), such as the diesel fire pump engine, at an area source of HAP that complies with §63.6585(f).

The applicable provisions of Subpart ZZZZ will be reviewed and addressed separately with the renewal of CSP No. 0243-01-C.

40 CFR Part 98, Mandatory Greenhouse Gas Reporting **is applicable** to this facility because:

1. The facility does not meet the requirements of either paragraph (a)(1) or (a)(2) of Subpart A, §98.2;
2. The aggregate maximum rated heat input capacity of the stationary fuel combustion units at the facility is 30 MMBtu/hr or greater; and
3. The total CO_{2e} emissions from stationary fuel combustion sources at the HEP are greater than 25,000 metric tons per year.

40 CFR Part 68, Chemical Accident Prevention Provisions **is applicable** to the storage and use of ammonia (anhydrous) at the facility because it exceeds the regulated threshold quantity. Pursuant to section 112(r) of the Clean Air Act, the Chemical Accident Prevention Provisions require facilities that produce, handle, process, distribute, or store certain chemicals to develop a Risk Management Program, prepare a Risk Management Plan (RMP), and submit the RMP to EPA. Compliance with the rule was initially required in 1999, and the rule has been amended on several occasions since then, most recently in 2004.

Table 2

Ammonia (anhydrous)				
Ref	Description		Units	Source or Derivation
(a)	Threshold	10,000	(lbs)	40 CFR §68.130
(b)	Wt per gal (@ 60°F)	5.15	(lbs/gallon)	U.S. Dept of Labor - OSHA Properties of ammonia
(c)	Tank Capacity	12,000	(gallon)	Hamakua Energy's GHG emission reduction plan
(d)	Total Wt =	61,800	(lbs)	(b) x (c)
(e)	Exceeds Threshold	Yes		(d)>(a)

Non-Applicable Requirements:Hawaii Administrative Rules (HAR):

Title 11, Chapter 11-60.1 Air Pollution Control
 Subchapter 3 Open Burning
 Subchapter 4 Noncovered Sources
 Subchapter 7 Prevention of Significant Deterioration Review
 Subchapter 9 Hazardous Air Pollutants Sources
 HAR 11-60.1-180 National Emission Standards for Hazardous Air Pollutants
 Subchapter 11
 HAR 11-60.1-204(d)(2)
 HAR 11-60.1-204(d)(3)
 HAR 11-60.1-204(d)(4)
 HAR 11-60.1-204(d)(5)

GHG Control Assessment.

With exception to the temporary adjustments in emission caps pursuant to HAR §11-60.1-204(h), Hamakua Energy is proposing to combine their facility-wide GHG emissions cap among partnering facilities and meet a combined GHG emissions cap and sixteen percent (16%) GHG emissions reduction. Pursuant to HAR §11-60.1-202, a facility-wide GHG emissions cap may be defined in multiple covered source permits to identify partnering facilities with an approved combined GHG emissions cap as described in HAR §11-60.1-204(d)(6)(A). As specified in HAR §11-60.1-204(d)(2), if the required GHG emissions cap requiring a sixteen percent (16%) emissions reduction from baseline year is deemed unattainable, the permittee shall conduct a GHG control assessment. Since the facility-wide GHG emissions cap (total combined GHG cap for partnering facilities) is sixteen percent (16%) below the total combined baseline GHG emissions level, a GHG control assessment is not required for determining whether the required GHG emissions cap is attainable. A GHG control assessment is also not required for temporary cap adjustments due to events which are beyond the control of the permittee.

A GHG control assessment is not required; however, Hamakua Energy provided the following GHG control assessment in the GHG emission reduction plan:

1. Identify all available control measures and eliminate all technically infeasible options.

Pursuant to HAR §11-60.1-204(d)(3) and §11-60.1-204(d)(4), respectively, all available control measures applicable to HEP are listed in Table 3 and each available control measure evaluated to determine whether it is technically infeasible.

Table 3 Assessment of All Control Measures

GHG Control Option	Feasibility and Benefit
Carbon Capture and Storage (CCS)	Not technically feasible since not currently commercially available for combustion turbine exhaust treatment.
Fuel Switching or Co-Fired Fuels	Fuel switching or co-firing with biodiesel is determined to be technically feasible.
Energy Efficiency Upgrades and Combustion Improvements	HEP is a combined cycle plant that recovers waste heat from CT1 and CT2 to produce steam in the HRSGs. There is limited opportunity for energy efficiency upgrades or operational improvements that would result in meaningful reductions in GHG emissions.
Restrictive Operations or Equipment Retirement	Restrictive operation is technically feasible, however, consideration for efficiency while operating the HEP in combined cycle should dictate the curtailment of other less efficient plants first relative to overall GHG emissions and cost per kilowatt-hour.
Planned Upgrades, Overhaul, or Retirement of Equipment	Hamakua Energy is pursuing the option to fire or co-fire CT1 and CT2 with biodiesel or a blend of biodiesel with LSFO.
Outstanding regulatory mandates, emission standards, and binding agreements	No outstanding regulatory mandates, emissions standards, or binding agreements.
Other GHG reduction initiatives that may affect the facility's GHG emissions	Hamakua Energy is proposing a combined facility-wide GHG emissions cap to leverage emission reductions among partnering facilities as a control strategy. Otherwise, Hamakua Energy has not been able to identify any other GHG reduction initiatives that would apply.

2. List technically feasible control measures and identify the cost effectiveness of each.

Pursuant to HAR §11-60.1-204(d)(5), Hamakua Energy's evaluation of technically feasible control measures are listed and summarized in Table 4. The three (3) technically feasible measures in order of priority are: (1) Partnering with other power producers in Hawai'i, (2) Fuel switching to include biogenic fuels, and (3) Restrictive operations. Hamakua Energy is working with other facilities to develop a GHG partnering agreement, which is the primary control measure for achieving compliance with the GHG emission caps. Secondly, Hamakua Energy is committed on qualifying the HEP to operate on biodiesel and/or a blend of biodiesel and LSFO. Thirdly, if and only if there are no alternatives to meet the GHG permit conditions of its CSP, restrictive operation would be implemented.

Table 4 Effectiveness and Cost of Control Measures

Available Control Measure→	Partnering	Fuel Switching or Co-Fire w/ 16% Biofuel	Restrictive Operation
Fuel Type→	Naphtha	Biodiesel or a Blend with ULSD	Naphtha
Control Effectiveness*	Combined 16%	As high as 100%	16%
Required Implementation Schedule	End of CY 2019	CY 2019	Immediate if no alternatives available
Cost or level of effort required for implementation	\$0	Replace rubber seals and hose & conduct qualification	Higher operating cost and potential penalties
Cost per metric ton of CO _{2e} removed (\$/MT)	\$0	None provided	None provided

* Percent (%) reduction from baseline GHG level

Best Available Control Technology (BACT):

A BACT analysis is required for new or modified sources that have the potential to emit or increase emissions above significant amounts as defined in HAR §11-60.1-1. Since this is not a new source nor are any modifications proposed that have the potential to cause a significant increase in air emissions, a BACT analysis **is not required**.

Prevention of Significant Deterioration (PSD):

The PSD determination from the previous permit application review is still valid and additional PSD review **is not required** because this facility is not a new major stationary source, nor does this application propose any major modifications to a major stationary source as defined in 40 CFR Part 52.21. A major modification is defined as a project at an existing major source that will result in a significant and a significant net emission increase above specified emission thresholds for pollutants subject to regulation.

Major Source / Synthetic Minor Applicability:

The facility's classification as a major source **remains unchanged** from the previous permit application review.

Compliance Assurance Monitoring (CAM), 40 CFR Part 64:

CAM was not previously addressed in the 2009 CSP renewal application review. The purpose of 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 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 one-hundred percent (100%) of the major source level; and (5) not otherwise be exempt from CAM. This source **is not subject to CAM**. Although the combustion turbine generators rely on SCR and a water injection system to achieve compliance with the NO_x emission limit and have potential pre-control emissions greater than the major source level for NO_x, CAM is not applicable because a continuous emission monitoring system (CEMS) is used to determine compliance with the NO_x emissions standard. As such, the combustion turbine generators **are exempt from CAM**.

Air Emissions Reporting Requirements (AERR):

40 CFR Part 51, Subpart A – AERR, is based on the emissions of criteria air pollutants from point sources (as defined in 40 CFR Part 51, Subpart A), which exceed the AERR thresholds as shown in the Table 6-7 titled “Total Facility Emissions and Threshold” from the Project Emissions section. Since the facility-wide emission levels of one or more air pollutant(s) still exceeds the reporting threshold(s), the AERR (previously referred to as “CERR” in the 2009 CSP renewal application review) and DOH in-house Annual Emissions Reporting requirements **remain unchanged** from the previous permit application review and annual emissions reporting for the facility **is still required** for in-house recordkeeping purposes.

Insignificant Activities:

The equipment listed in Table 5 are insignificant activities.

Table 5

Unit Number	Tank Contents	Capacity (Unit)	Justification
7	ULSD storage and transfer	359,000 (gal)	HAR §11-60.1-82(f)(7) [0.11 tpy VOC
-----	Day tank	10,000 (gal)	HAR §11-60.1-82(f)(1)
	Fire pump engine ^a	10.4 (gal/hr)	HAR §11-60.1-82(g)(6)
	One (1) multi-cell cooling tower	-----	HAR §11-60.1-82(f)(7) [0.04 tpy emissions of

^a40 CFR §98.30 excludes emergency generators and equipment as defined in 40 CFR §98.6 from mandatory GHG reporting.

Alternate Operating Scenarios:

The application for a significant modification did not propose any alternate operating scenarios, however, in June 9, 2020 and June 24, 2020 correspondence, HECO requested the DOH to consider provisions in the permits that allows the emissions cap for partnering facilities to be increased for calendar years 2019 and into 2020 and beyond in the event the start-up of PGV

operations is delayed. In response, the DOH has agreed to amend the permits to incorporate the following alternate operating scenarios:

The alternate operating scenario for the PGV facility shutdown due to volcanic activity on the island of Hawaii in 2018, shall remain in effect until an additional net energy generation of 26,883 MWh per month from the PGV facility is reached in any month of the year. The following shall apply to the individual and total combined alternate operating scenario GHG emission cap adjustments starting January 1, 2020 and for any subsequent year until these alternate operating scenarios no longer apply:

- a. One twelfth (1/12) of the 2019 individual GHG emission cap adjustments for Hawaii Island partnering facilities will be added to the individual GHG emission caps of these facilities set forth for 2020 and beyond for each month the PGV facility is not restored to system levels preceding its shutdown. Individual GHG emission cap adjustments for 2019 are 97,524 short tons for Hamakua Energy, LLC, 17,132 short tons for Kanoelehua-Hill Generating Station, 31,213 short tons for Keahole Generating Station, and 39,535 short tons for Puna Generating Station. Monthly GHG emission cap adjustments without PGV operating are 8,127 short tons for Hamakua Energy, LLC, 1,428 short tons for Kanoelehua-Hill Generating Station, 2,603 short tons for Keahole Generating Station, and 3,295 short tons for Puna Generating Station.
- b. One twelfth (1/12) of the total combined cap adjustment for 2019 of 185,404 short tons will be added to the total combined GHG emission cap specified for 2020 and beyond for each month the PGV facility is not restored to generating levels preceding its shutdown. This would adjust the total combined cap by 15,450 short tons per month.

Project Emissions:

The modification to incorporate GHG emissions caps will not cause an increase in maximum potential emissions from the existing permit limits. The emission rates, equipment, and design operating parameters used in determining the maximum potential emissions have not changed.

Table 6-1 compares current emission estimates with estimates from the prior review of CSP renewal application No. 0243-03 and the impact of the change in emissions are discussed as follows:

1. Emission estimates for application No. 0243-07 in Table 6-1 are based on mass emission rates of permitted combustion sources in renewal application No. 0243-06 dated July 11, 2013, unless specified otherwise. A breakdown of emission estimates for application No. 0243-07 are included in Table 6-2. Fugitive emission estimates are not included.
2. Pursuant to EPA's memorandum dated September 6, 1995, emissions from the fire pump engine were determined using a 500 hour per year default assumption to further evaluate prevention of significant deterioration (PSD) and major source applicability determinations (please refer to Table 6-1). Based on this expected worst-case operating assumption, net increases in emissions from the fire pump engine were found to be lower than BACT emission thresholds. Emissions that are below these thresholds do not require PSD review. Also, estimated emissions in the ambient air quality impact report dated March 31, 1998 are

above major source thresholds for NO_x, SO₂, and CO. Since emissions are already above major source thresholds, the fire pump engine will not affect this facility's status as a major source. Additional emissions from the fire pump engine do not cause the facility to become a major source for HAPs.

3. Fugitive PM and VOC emissions from the cooling towers and storage tanks are shown in Tables 6-3 and 6-4 respectively. Fugitive emissions from these sources are not included in the evaluation and therefore the emissions from these sources will have no impact on major source thresholds shown in Table 6-7. See HAR Subchapter 7, Major Source definitions.
4. Assessment of GHG emissions are summarized in Table 6-5. Maximum potential GHG emissions were not included in prior permit application reviews since GHGs were not previously subject to regulation. The combustion turbine generators (CTG) at the HEP will be subject to an individual facility's GHG emissions cap, however, these individual caps may be exceeded provided the combined cap of all partnering facilities are met. Therefore, the GHG emission estimates are based on the facility's *potential annual heat input*, i.e. the maximum rated heat input capacity times the maximum expected hours of operation. Each CTG is rated at 247 MMBtu/hr and potentially is able to operate 8,760 hours annually. The black start DEG has a maximum design fuel consumption rate of 103.6 gal/hr based on a telephone discussion between Mr. Dave Cummings of the HEP and Mr. Dale Hamamoto of the DOH. Using the default high heat value of 0.138 MMBtu/gal from 40 CFR Part 98, Subpart C, Table C-1 for fuel oil No. 2, the maximum rated heat input of the black start DEG is estimated to be 14.3 MMBtu/hr. GHG emissions from the fire water pump diesel engine and fuel storage tanks are not included since 40 CFR Part 98, Subpart A, §98.2(a)(3), states that reporting of GHG emissions must be from *stationary fuel combustion sources* only. 40 CFR Part 98, Subpart C, §98.30 further defines *stationary fuel combustion sources* as devices that combust fuel for producing useful energy but specifically excludes emergency equipment. The CO₂e emissions in Table 6-5 are computed by multiplying the mass-based emissions in Enclosure 5 by each associated global warming potential (GWP) from 40 CFR Part 98, Table A-1.
5. There are no significant changes in emissions of HAPs. Table 6-6 compares the current estimates with previous estimates in CSP review of renewal application No. 0243-03. Emissions of nickel remains as the single highest HAP with a slight reduction in 2019 estimates. Total emissions of HAPs also reduced slightly, which is primarily attributable to eliminating emissions of sulfuric acid mist from the 2019 estimates, despite an increase in xylene isomers. As clarified in Mr. David Cummings' email dated January 23, 2019, any sulfuric acid mist and hydrogen fluoride would react with ammonia resulting in ammonium sulfate, which is included with particulate matter. This explains why both pollutants were not included in the CSP renewal application No. 0243-06. HAP emissions from the HEP will not impact major source thresholds shown in Table 6-7.

Table 6-1 Changes in Annual Emissions

Application →	No. 0243-03		No. 0243-07		
Description →	Two (2) CTGs and a Black Start DEG ^a	Two (2) CTGs and a Black Start DEG	Fire Water Pump Engine	Net Increase	Total
Ref →	(a)	(b)	(c)	(d)	(e)
Source →	Footnote ^b	Table 6-2	Table 6-3	(a)-(e)	(b)+(c)
Pollutant ↓ Units →	(tpy)	(tpy)	(tpy)	(tpy)	(tpy)
NO _x	104.5	103.3	1.6	0.3	104.8
SO ₂	131.4	131.4	6.31E-03	0.0	131.4
CO	245.4	245.3	3.35E-01	0.3	245.7
VOCs	25.1	17.5	1.02E-02	-7.6	17.5
PM	41.3 ^c	41.2	1.14E-01	0.0	41.3
Pb	1.10E-01	1.17E-01	0.00E+00	0.0	1.17E-01
HAP (Single Highest)	2.5 ^d	2.4	4.17E-04	-0.1	2.4
HAP (Total)	14.04 ^d	13.5	1.06E-03	-0.6	13.5

^a Annual estimated emissions are based on two CTG's operating 8,760 hour per year, and on the black start DEG operating 52 hours per year.

^b Permit renewal application review No. 0243-03.

^c Particulate matter based either TSP or PM₁₀.

^d HAP emissions determined in the 2009 review of CSP renewal application No. 0243-03 are from CTG's only; black start DEG emissions were determined to be negligible.

Table 6-2 Emissions from Permitted Combustion Sources

Description →	CTG No. 1 (West)		CTG No. 2 (East)		Black Start DEG		Total Emissions
	8760 hrs/yr		8760 hrs/yr		52 hrs/yr limit		
Source or Derivation →	Note ^a	(a)*8760 2000	Note ^a	(c)*8760 2000	Table 4-2, Enclosure 4		(b)+(d)+(f)
Units →	(lbs/hr)	(tpy)	(lbs/hr)	(tpy)	(lbs/hr)	(tpy)	(tpy)
Pollutant ↓ Ref →	(a)	(b)	(c)	(d)	(e)	(f)	
NO _x	11.7	51.2	11.7	51.2	29.85	0.776	103.3
SO ₂	15	65.7	15	65.7	0.15	0.004	131.4
CO	28	122.6	28	122.6	2.66	0.069	245.3
VOC	2	8.8	2	8.8	0.49	0.013	17.5
PM	4.7	20.6	4.7	20.6	0.20	0.01	41.2
Lead (Pb)	1.34E-02	5.87E-02	1.34E-02	5.87E-02			1.17E-01
HAP (Highest)							2.4
HAP (Total)							13.5

^a Annual emission rates in application No. 0243-07 are from renewal application No. 0243-06.

Table 6-3 Emissions from Permitted Cooling Tower and Diesel Fire Pump Engine

Description→	Cooling Tower		Diesel Fire Pump Engine ^b	
Hours of Operation→	8760 hrs/yr		500 hrs/yr	
Source or Derivation→	Note ^a		Table 4-1, Enclosure 4	
Type of Source→	Permitted (Fugitive)		Insignificant (Combustion)	
Pollutant↓ Units→	(lbs/hr)	(tpy)	(lbs/hr)	(tpy)
NO _x		0.00	6.2	1.6
SO ₂		0.00	2.52E-02	6.31E-03
CO		0.00	1.3	3.35E-01
VOC		0.00	4.07E-02	1.02E-02
PM	1.451	6.147	4.56E-01	1.14E-01
Lead (Pb)		0.000	0	0.000
HAP (Highest)				4.17E-04
HAP (Total)				1.06E-03

^a Refer to Enclosure 7 for detailed calculation of annual emissions from the cooling tower.

^b Fire pump engine will be removed when processing the permit renewal application.

Table 6-4
VOC Emissions from Permitted Floating Roof Tanks and Nonpermitted ULSD Tank

Description→	Floating Roof Tank (East)		Floating Roof Tank (East)		ULSD Tank	
Hours of Operation→	8760 hrs per year		8760 hrs per year		8760 hrs per year	
Fuel Types↓ Units→	(lbs/hr)	(tpy)	(lbs/hr)	(tpy)	(lbs/hr)	(tpy)
Naphtha	0.54	2.37	0.54	2.37		0.00
Gasoline	0.58	2.54	0.58	2.54		0.00
Fuel Oil No. 2	0.009	0.04	0.009	0.04	0.01	0.11
Worst Case		2.54		2.54		0.11

Table 6-5
GHG Emissions

Description →	GHG Mass-Based Emissions ^a	GWP	CO ₂ e Based Emissions	
Source or Derivation →	Enclosure 5	40CFRS98 Table A-1	(a)*(b)	(c)*0.90718474 ^b
Unit of Measure →	(tpy)	None	(tpy)	(metric tons/yr)
GHG Pollutant ↓ Ref→	(a)	(b)	(c)	(d)
Carbon Dioxide (CO ₂)	363,153	1	363,153	329,447
Methane (CH ₄)	15	25	375	340
Nitrous Oxide (N ₂ O)	3	298	894	811
CO ₂ e Emissions =			364,422	330,598

^a Refer to Enclosure 5 for detailed calculations of the GHG mass-based emissions.

^b One (1) short ton is equivalent to 0.90718474 metric tons.

**Table 6-6
Comparison of HAPs Emissions**

Source or Derivation →	Renewal Application No.0243-03	Application No.0243-07 ^a
Pollutant ↓	Units →	
	(tpy)	(tpy)
Acenaphthene		1.03E-06
Acenaphthylene		2.12E-05
Acetaldehyde (1)	1.60	1.55
Acrolein (6)	1.80E-01	1.87E-01
Antimony (172)	4.40E-02	4.44E-02
Anthracene		1.36E-06
Arsenic (173) ^c	9.60E-03	1.06E-02
Benzene (15)	2.00	1.98
Benzo(a)anthracene		7.18E-08
Benzo(b)fluoranthene		1.12E-07
Benzo(k)fluoranthene		3.54E-07
Benzo(g,h,l)perylene		1.36E-07
Benzo(a)pyrene		2.83E-05
Beryllium (174) ^c	6.60E-04	6.67E-04
1,3 Butadiene (23)		2.83E-05
Cadmium (175)	8.30E-03	8.48E-03
Chromium (176)	9.60E-02	9.46E-02
Chrysene		2.56E-07
Cobalt (177)	1.80E-02	1.84E-02
Dibenz(a,h)anthracene		4.23E-07
Fluoranthene		5.52E-06
Fluorene		2.12E-05
Formaldehyde (86)	2.40	2.38
Indeno(1,2,3-cd) pyrene		2.72E-07
Lead (181)		1.17E-01
Manganese (182)	7.00E-01	6.87E-01
Mercury (183)	1.80E-03	1.84E-03
Naphthalene		6.15E-05
Nickel (185)	2.50	2.43
Phenanthrene		2.13E-05
Phosphorous (133)	6.10E-01	6.06E-01
Pyrene		3.46E-06
Selenium (188)	1.10E-02	1.07E-02
Toluene (151)	8.30E-01	8.26E-01
Xylene isomers (168)	0.57	2.18
PAH	3.40E-01	3.39E-01
Fluorides	1.70E-02	
Sulfuric Acid Mist	2.1	
HAP (Single Highest)	2.50	2.43
HAP (Total)	14.04	13.5

^a Emission rates are from CSP Renewal Application No. 0243-06, except as noted.

**Table 6-7
Total Facility Emissions Relative to Control Thresholds (TPY)**

Pollutant	Total Emissions (tpy) ^a	AERR		Major Source		DOH (In-House) Reporting	
		Thresholds (Type B Sources)	Applies	Threshold	Applies	Threshold	Applies
NO _x	104.8	100	Yes	100	Yes	25	Yes
SO ₂	131.4	100	Yes	100	Yes	25	Yes
CO	245.7	1,000	No	100	Yes	250	No
VOC	17.5	100	No	100	No	25	No
PM ₁₀	41.3	100	No		NA	25	Yes
Pb (Actual)	1.17E-01	0.5	No	100	No	5	No
HAPs (Single)	2.4		NA	10	No	5	No
HAP (Total)	13.5		NA	25	No		NA

^a Excludes fugitive emissions

Hamakua Energy is proposing an individual CO₂e emissions cap of 153,699 short tons (139,433 metric tons) per year for the HEP for calendar year 2020 and beyond. While this individual limit may be exceeded, the proposed total combined GHG emissions limit is expected to reduce overall GHG emissions among partnering facilities by sixteen percent (16%) from the total combined baseline level.

Ambient Air Quality Impact Assessment (AAQIA):

An ambient air quality assessment was not required for the significant modification to incorporate the GHG emission caps because there are no increases in emission rates from previously modeled levels.

Significant Permit Conditions:

1. GHG Emission Caps

- a. Each partnering facility shall not emit or cause to be emitted carbon dioxide equivalent (CO₂e) emissions in excess of the following individual caps, except as specified in in Attachment II – GHG, Special Condition No. C.1.d.iv of the permit.
 - i. For calendar year 2019, each partnering facility shall not exceed the following individual GHG emission caps:

Calendar Year 2019

Generating Station	CSP Permit No.	CO ₂ e Emission Cap ^a	
		Metric Tons per Calendar Year	Short Tons per Calendar Year
AES Hawaii, LLC Cogeneration Plant	0087-02-C	1,534,598	1,691,605
Hamakua Energy, LLC Cogeneration Plant	0243-01-C	227,906	251,223
Kalaeloa Partners, L.P. Cogeneration Plant	0214-01-C	993,198	1,094,813
HECO Campbell Industrial Park Generating Station	0548-01-C	48,752	53,740
HECO Honolulu Generating Station	0238-01-C	0	0
HECO Kahe Generating Station	0240-01-C	1,935,707	2,133,752
HECO Waiiau Generating Station	0239-01-C	733,265	808,286
HELCO Kanoelehua-Hill Generating Station	0234-01-C	171,991	189,588
HELCO Keahole Generating Station	0007-01-C	248,043	273,421
HELCO Puna Generating Station	0235-01-C	64,666	71,282
MECO Kahului Generating Station	0232-01-C	140,281	154,633
MECO Maalaea Generating Station	0067-01-C	417,182	459,864
MECO Palaau Generating Station	0031-04-C	23,999	26,454

^aMetric Tons = (0.90718474) x (Short Tons).

- ii. For calendar year 2020 and beyond, each partnering facility shall not exceed the following individual GHG emission caps, except as specified in Attachment II – GHG, Special condition No. C.3:

Calendar Year 2020 and beyond

Generating Station	CSP Permit No.	CO ₂ e Emission Cap ^a	
		Metric Tons per Calendar Year	Short Tons per Calendar Year
AES Hawaii, LLC Cogeneration Plant	0087-02-C	1,281,442	1,412,548
Hamakua Energy, LLC Cogeneration Plant	0243-01-C	139,443	153,699
Kalaeloa Partners, L.P. Cogeneration Plant	0214-01-C	1,056,486	1,164,577
HECO Campbell Industrial Park Generating Station	0548-01-C	112,041	123,504
HECO Honolulu Generating Station	0238-01-C	0	0
HECO Kahe Generating Station	0240-01-C	1,998,996	2,203,516
HECO Waiiau Generating Station	0239-01-C	796,554	878,050
HELCO Kanoelehua-Hill Generating Station	0234-01-C	156,449	172,456
HELCO Keahole Generating Station	0007-01-C	219,727	242,208
HELCO Puna Generating Station	0235-01-C	28,800	31,747
MECO Kahului Generating Station	0232-01-C	140,281	154,633
MECO Maalaea Generating Station	0067-01-C	417,182	459,864
MECO Palaau Generating Station	0031-04-C	23,999	26,454

^aMetric Tons = (0.90718474) x (Short Tons).

- b. All partnering facilities shall not exceed the following combined emission caps:
- i. For 2019, total combined CO₂e emissions in excess of 7,208,661 short tons (6,539,587 metric tons) per calendar year.
 - ii. For 2020 and beyond, CO₂e emissions in excess of 7,023,257 short tons (6,371,392 metric tons) per calendar year, except as specified in Attachment II – GHG, Special Condition No. C.3.

Reason: HAR §11-60.1-204(d)(6)(A), §11-60.1-204(h)(4), and §11-60.1-204(h)(5).

- c. In the event that partnering is terminated or becomes unavailable:
- i. The permittee shall not exceed the individual GHG emission caps specified in Attachment II – GHG, Special Condition Nos. C.1.a;
 - ii. Attachment II – GHG, Special Condition Nos. C.1.b, C.1.d.iv, C.1.d.v, and D.1.f do not apply; and
 - iii. Items 2 and 3 of the **Monitoring Report Form: GHG Emissions** do not apply.

Reason: Requested by Hamakua Energy in Steven Oppenheimer's Email dated March 19, 2018.

- d. For purposes of the CO₂e emission limits in Attachment II – GHG Special Condition Nos. C.1.a, C.1.b, and C.1.c:
- i. The CO₂e emissions shall have the same meaning as that specified in HAR §11-60.1-1;
 - ii. In accordance with HAR §11-60.1-204(d)(6)(B), biogenic carbon dioxide (CO₂) emissions will not be included when determining compliance with the emissions limit;
 - iii. The permittee shall be in compliance with the emissions limits by the end of 2019 and each calendar year thereafter;
 - iv. Except as specified in Attachment II – GHG, Special Condition No. C.1.c, the permittee may exceed the emissions cap specified in Attachment II – GHG Special Condition No. C.1.a, if the GHG emissions limit specified in Attachment II – GHG Special Condition No. C.1.b is met; and
 - v. Except as specified in Attachment II – GHG, Special Condition No. C.1.c, at no time shall the permittee exceed Attachment II – GHG Special Condition Nos. C.1.a and C.1.b simultaneously over a calendar year. For incidences when Attachment II – GHG Special Condition Nos. C.1.a and C.1.b of this permit are exceeded simultaneously, emissions in excess of the total combined cap shall be allocated according to the following equation for compliance purposes:

$$X = XG \frac{(A - C)}{\sum_{A_i > C_i} (A_i - C_i)}$$

Where:

- X = Adjusted portion in metric tons of GHG emissions that are in excess of total combined cap specified in Attachment II – GHG Special Condition No. C.1.b. The equation applies to all affected facilities that do not meet the individual and total combined GHG emission caps specified in Attachment II – GHG Special Condition Nos. C.1.a and C.1.b, respectively.
- XG = Total combined actual GHG emissions from affected facilities minus total combined GHG emissions cap.
- A = Actual GHG emissions from the affected facility.
- C = GHG emissions cap for the affected facility.
- $\sum_{A_i > C_i} (A_i - C_i)$ = The sum of the difference between the actual emissions and cap emissions for all facilities that did not achieve the individual facility-wide GHG emissions cap.

Reason: Required by HAR §11-60.1-3, §11-60.1-5, §11-60.1-90, §11-60.1-204.

2. GHG Emission Cap Revisions

- a. The facility-wide GHG emissions cap may be re-evaluated and revised by the Department in accordance with HAR §11-60.1-204(h).
- b. A revision to the facility-wide GHG emissions cap shall be considered a significant modification subject to the application and review requirements of HAR §11-60.1-104. For each GHG emission cap revision, the Department may impose additional emission limits or requirements, or limit the time-frame allowed for the revised GHG emissions cap.

Reason: HAR §11-60.1-3, §11-60.1-90, §11-60.1-204

3. Alternate Operating Scenarios

The alternate operating scenario for the PGV facility shutdown due to volcanic activity on the island of Hawaii in 2018, shall remain in effect until an additional net energy generation of 26,883 MWh per month from the PGV facility is reached in any month of the year. The following shall apply to the individual and total combined alternate operating scenario GHG emission cap adjustments starting January 1, 2020 and for any subsequent year until these alternate operating scenarios no longer apply:

- a. Attachment II – GHG, Special Condition No. C.3 no longer applies when,

$$NG_{PGV-R} \geq NG_{PGV2017}$$

Where,

- NG_{PGV2017} = 26,883 Net Generating capacity from the PGV facility in calendar year 2017 on an average monthly basis (MW/h) preceding its shutdown.
- NG_{PGV-R} = Net Generation from the restored PGV facility (MW/h per month)

- b. The alternate scenario individual GHG emission cap adjustment for calendar year 2019 is 97,524 short tons for Hamakua Energy, LLC, 17,132 short tons for Kanoelehua-Hill Generating Station, 31,213 short tons for Keahole Generating Station, and 39,535 short tons for Puna Generating Station. Starting on January 1, 2020, and for any subsequent year, the alternate scenario GHG emissions individual cap adjustment for each of the foregoing island of Hawaii partnering facilities shall be calculated by adding one twelfth (1/12) of the 2019 annual adjustment for each facility’s individual GHG emissions cap specified in Attachment II – GHG, Special Condition No. C.1.a.ii per month for the facilities from January 1 of that year. Monthly adjustments to the GHG emissions individual GHG emission caps shall be determined as specified in Attachment II – GHG, Special Condition No. C.3.d until this alternate operating scenario no longer applies as specified in Attachment II – GHG, Special Condition No. C.3.a. A full one-twelfth (1/12) of the annual cap adjustment shall apply to the month during which the 3.a. criteria are met and not thereafter.
- c. The PGV alternate scenario total combined cap adjustment for calendar year 2019 is 185,404 short tons. Starting on January 1, 2020, and for any subsequent year, the PGV alternate operating scenario total combined GHG emissions cap adjustment shall be calculated by adding one twelfth (1/12) of the 2019 annual adjustment of 15,450 short tons to the total combined cap specified in Attachment II – GHG, Special Condition No. C.1.b.ii per month from January 1 of that year. Monthly adjustment to the total combined GHG emissions cap shall be determined as specified in Attachment II – GHG, Special Condition No. C.3.d until this alternate operating scenario no longer applies as specified in Attachment II – GHG, Special Condition No. C.3.a. A full one-twelfth (1/12) of the annual cap adjustment shall apply per month until the criteria in Attachment II – GHG, Special Condition No. C.3.a are met and not thereafter.
- d. Monthly adjustments to the individual and total combined GHG emission caps shall be determined with the following equation:

$$AC = FAC/12$$

Where,

FAC = Full Adjustment to CO₂e caps (short tons – refer to table below)
 AC = Monthly adjustment to GHG Emissions Caps

Generating Station	Full Adjustment to CO₂e Caps (Short Tons)	2020 CO₂e Cap (Short Tons)	FAC/12 (Short Tons)^b
Hamakua Energy	97,524	153,699	8,127
Kanoelehua-Hill	17,132	172,456	1,428
Keahole	31,213	242,208	2,601
Puna	39,535	31,747	3,295
Combined	185,404	see note ^a	15,450

^a Total combined CO₂e cap for all partnering facilities is 7,023,257.

^b Monthly full CO₂e cap adjustment.

- e. Individual GHG emission cap adjustments, affecting the total combined GHG emissions cap, shall only apply to partnering facilities on the island of Hawaii.

- f. The permittee may exceed the adjusted individual GHG emissions cap as determined in Attachment II – GHG, Special Condition No. C.3.b, if the adjusted total combined GHG emission cap as determined in Attachment II – GHG, Special Condition No. C.3.c is met.
- g. Alternate operating scenario records shall be maintained in accordance with Attachment II - GHG, Special Condition No. D.3.
- h. The terms and conditions under each operating scenario shall meet all applicable requirements, including the special conditions of this permit.

Reason: HAR §11-60.1-3, §11-60.1-5, §11-60.1-204(d), and §11-60.1-204(h). The 26,883 MW/h net generation threshold is based on calendar year 2017 average net generation data provided by PGV in Zachary Adachi email dated June 15, 2020.

- 4. For calculating CO₂e emissions to assess fees, determining compliance with the GHG emission caps, and quality assurance/quality control requirements, the permittee shall:
 - a. Monitor CO₂ mass emissions data for the stationary source combustion units listed in Attachment II - GHG, Special Condition No. A.1, in accordance with 40 CFR §98.34;
 - b. Estimate missing data in accordance with the applicable procedures in 40 CFR §98.35;
 - c. Determine the metric tons of CO₂, methane (CH₄), and nitrous oxide (N₂O) in accordance with calculation methodologies in 40 CFR §98.33;
 - d. Calculate the GHG emissions, expressed in metric tons of CO₂e, using Equation A-1 of 40 CFR §98.2;
 - e. Convert the metric tons of CO₂e emissions to short tons for monitoring and annual emissions reporting as applicable. For the conversion, one short ton is equal to 0.90718474 metric tons;
 - f. Provide total actual CO₂e emissions semi-annually to HECO in item 1 of **Monitoring Report Form: GHG Emissions**. The monitoring report form, with item 1 emissions data, shall be signed and dated by a responsible official; and
 - g. Report CO₂e emissions to the Department in accordance with Attachment II - GHG Special Condition No. E.4.

Reason: HAR §11-60.1-3, §11-60.1-5, §11-60.1-90; §11-60.1-204(d)(6), 40 CFR §98.2, §98.33, §98.34, §98.35. Special Conditions f and g are based on Hamakua Energy, LLC letter dated June 24, 2020.

- 5. Semi-annual monitoring report submittals for the GHG emission caps and allocating excess emissions pursuant to Attachment II – GHG, Special Condition No. C.1.c.v are as follows:
 - a. The permittee shall complete and submit **semi-annual** monitoring reports to the Department. All reports shall be submitted **within sixty (60) days after** the end of each semi-annual calendar period (January 1 – June 30 and July 1 – December 31), be signed and dated by a responsible official, except that biogenic CO₂ emissions shall be excluded from the total CO₂e emissions.

- b. For calendar year 2019, the permittee shall report the CO₂e emissions **within sixty (60) days** after the issuance of this permit. The Monitoring Report Form: GHG Emissions, or equivalent form, for the 2019 calendar year shall be used for reporting and shall be signed and dated by a responsible official.
- c. For calendar year 2020, the permittee shall report the CO₂e emissions **within sixty (60) days** after the issuance of this permit or **within sixty (60) days** after the end of the semi-annual calendar period, whichever is later. The Monitoring Report Form: GHG Emissions, or equivalent form, for the 2020 calendar year shall be used for reporting and shall be signed and dated by a responsible official.

Reason: HAR §11-60.1-3, §11-60.1-5, and §11-60.1-90.

Conclusion and Recommendation:

Hamakua Energy applied for a significant modification to CSP No. 0243-01-C for the HEP to incorporate GHG emission caps and significant permit conditions. These permit additions are required for implementing GHG reduction measures proposed in HEP's GHG ERP pursuant to HAR §11-60.1-204

Hamakua Energy is proposing to partner and leverage HEP's efficiency with other facilities to achieve a combined sixteen percent (16%) reduction below the total combined CO₂e baseline emissions. However, unresolved legal uncertainties impinging upon the restoration of PGV operations in addition to temporary closures of court proceedings due to the pandemic, created a need to temporarily adjust both the individual GHG emission caps for partnering facilities on the island of Hawaii and the total combined GHG emission cap for all partnering facilities until PGV is restored to net generating levels that preceded its shutdown in 2018 due to volcanic activity. Conditions have been incorporated in the permit for temporary adjustments to the GHG emission caps for 2019 to commensurate with delays in restoring PGV operations and as alternate operating scenarios to continue with monthly adjustments in the event these delays extend into and beyond 2020. PGV started its operations in 2001 and has been a steady provider of electricity since 2005 as illustrated in Enclosure 2, Figure 2-2. A complete shutdown of PGV operations is deleterious to the health and welfare of the public if alternate providers are not available and therefore temporary adjustments to the GHG emission caps pursuant to HAR §11-60.1-204(h) is warranted. PGV is a renewable energy producer whose operations was shut down due to volcanic activity, which is a reasonably unforeseen event beyond the control of the permittee.

As a secondary control measure, in the event the partnering agreement is terminated or otherwise becomes unavailable, Hamakua Energy is proposing the use of biodiesel or a blend of biodiesel and ULSD to meet the HEP's GHG emissions cap. The availability of biodiesel limits HEP's secondary control measure as a means for mitigating the shortage resulting from the PGV shutdown. As a tertiary control measure, Hamakua Energy is proposing to employ restricted operations if both the primary and secondary control measures are not available, is determined not to be cost effective, or other incidences where emergency provisions would not apply or are not defensible pursuant to HAR §11-60.1-204(h). Restrictive operations, however, are contrary to and not suitable for serving as an emergent alternate net generating source of power.

Hamakua Energy's GHG emissions reduction plan was reviewed and determined to comply with HAR §11-60.1-204. Hamakua Energy's proposed baseline emission rate and emission caps were evaluated using the HEP's past fuel consumption data and determined to be reasonably representative.

The Tier 2 computation method was used to calculate HEP's CY 2010 baseline, which will conservatively impact future assessments by understating emission reductions if the Tier 1 computation method is used for future reporting of GHG emissions. As such, the HEP plans to continue with using Tier 2 for future GHG reporting, thus negating the impact of using different computation methods for determining their facility-wide GHG emissions.

Further review shows the HEP's fuel usage and GHG emission rates have been in a steady decline since CY 2005 and reached forty eight percent (48%) below their 2010 GHG baseline emissions as of the end of CY 2016. However, Hamakua Energy has expressed concerns that unexpected events can easily disrupt this trend, such as the recent volcanic activities in 2018 resulting in the loss of PGV as illustrated in Enclosure 2, Figure 2-2.

As specified in HAR §11-60.1-204(g), once a facility-wide GHG emission cap is established and incorporated in the covered source permit, the GHG ERP shall become part of the permit application process for renewals and any required modifications.

Recommend issuance of the significant modification to the covered source permit subject to thirty-day (30-day) public review and comment period in accordance with HAR §11-60.1-205, a forty-five day (45-day) Environmental Protection Agency review period, and incorporation of the significant permit conditions and alternate operating scenarios.

Review By: Dale Hamamoto
July 8, 2020

ENCLOSURE 1 LIST OF GHG PARTNERING FACILITIES

Generating Station	CSP Permit No.
AES Coal-Fired Cogeneration Plant	0087-02-C
Hamakua Energy, LLC Cogeneration Plant	0243-01-C
Kalaeloa Partners, L.P. Cogeneration Plant	0214-01-C
HECO Campbell Industrial Park Generating Station	0548-01-C
HECO Honolulu Generating Station ^a	0238-01-C
HECO Kahe Generating Station	0240-01-C
HECO Waiiau Generating Station	0239-01-C
HELCO Kanoelehua-Hill Generating Station	0234-01-C
HELCO Keahole Generating Station ^b	0007-01-C
HELCO Puna Generating Station	0235-01-C
MECO Kahului Generating Station	0232-01-C
MECO Maalaea Generating Station ^b	0067-01-C
MECO Palaaui Generating Station	0031-04-C
Partnership Total ^c	

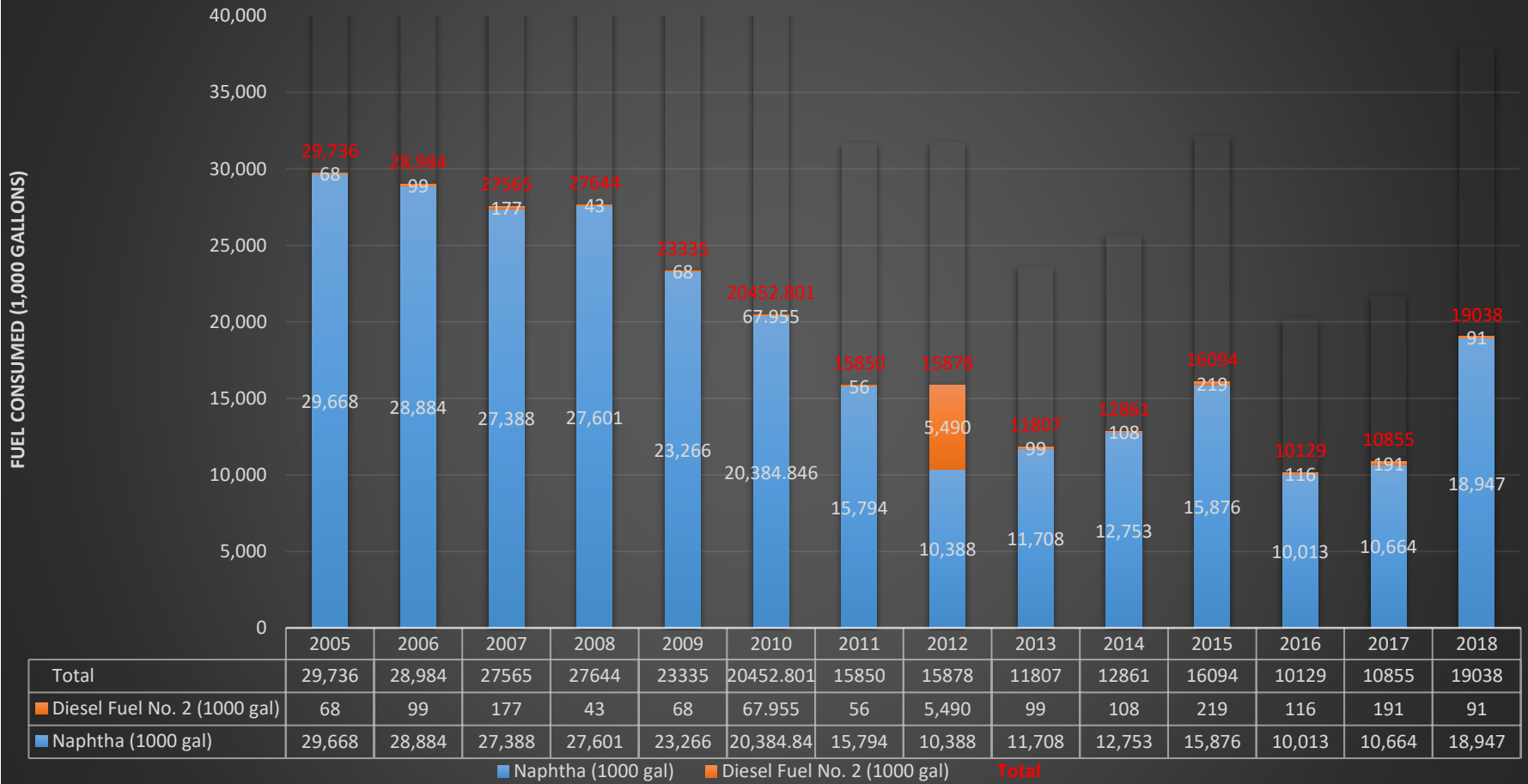
^a The HECO Honolulu Generating Station is currently deactivated (not operating but could restart if necessary).

^b These facilities previously had two operating permits that were combined into a single permit.

^c CSP No. 0236-01-C is not included as a partnering facility since its permit is closed, however, its 2010 baseline emissions are included in calculating the partnership total baseline and emissions cap pursuant with HAR§11-60.1-204(d)(1).

ENCLOSURE 2

Figure 2-1. Hamakua Energy Plant Fuel Usage



ENCLOSURE 2 (Continued)

Table 2-1

COMPILE FUEL USAGE DATA																	
Ref	Source or Derivation	Calendar Year→	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	
(a)	See Data Source	Naphtha (1000 gal)	29,668	28,884	27,388	27,601	23,266	20,384.846	15,794	10,388	11,708	12,753	15,876	10,013	10,664	18,947	
(b)	See Data Source	Diesel Fuel No. 2 (1000 gal)	68	99	177	43	68	67.955	56	5,490	99	108	219	116	191	91	
	(a)+(b)	Total	29,736	28,984	27,565	27,644	23,335	20452.801	15850	15878	11807	12861	16094	10129	10855	19038	
		DATASOURCE→	Annual Emissions Report Forms (AERF)						SLEIS	AERF	SLEIS	SLEIS	SLEIS	SLEIS	SLEIS	SLEIS	SLEIS
COMPILE FACTORS FOR DETERMINING CO ₂ e EMISSIONS																	
(c)	40CFRS98 Table C-1	Heat Value Naphtha (mmBtu/gal)	0.125	0.125	0.125	0.125	0.125	0.125	0.125	0.125	0.125	0.125	0.125	0.125	0.125	0.125	
(d)		Heat Value FO#2 (mmBtu/gal)	0.138	0.138	0.138	0.138	0.138	0.138	0.138	0.138	0.138	0.138	0.138	0.138	0.138	0.138	
(e)	[Emission Factors]	CO ₂ EF Naphtha (Kg/mmBtu)	68.02	68.02	68.02	68.02	68.02	68.02	68.02	68.02	68.02	68.02	69.02	70.02	71.02	72.02	
(f)		CO ₂ EF FO#2 (Kg/mmBtu)	73.96	73.96	73.96	73.96	73.96	73.96	73.96	73.96	73.96	73.96	73.96	73.96	73.96	73.96	
(g)	40CFRS98 Table C-2	CH ₄ EF (Kg/mmBtu)	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	
(h)		[Emission Factors]	N ₂ O EF (Kg/mmBtu)	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	
(i)	40CFRS98 Table A-1 [Global Warming Potential]	GWP CO ₂	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
(j)		GWP CH ₄	25	25	25	25	25	25	25	25	25	25	25	25	25	25	
(k)		GWP N ₂ O	298	298	298	298	298	298	298	298	298	298	298	298	298	298	
CALCULATE FUEL USAGE IN MMBTU																	
(l)	(a)*(c)*10 ³	Naphtha Consumed (MMBtu)	3,708,462	3,610,550	3,423,500	3,450,076	2,908,308	2,548,106	1,974,278	1,298,549	1,463,542	1,594,114	1,984,473	1,251,625	1,332,958	2,368,413	
(m)	(b)*(d)*10 ³	Diesel Fuel No. 2 Consumed (MMBtu)	9,407	13,713	24,441	5,978	9,431	9,378	7,754	757,566	13,681	14,923	30,170	16,031	26,345	12,506	
(n)	(l)+(m)	Total (MMBtu)	3,717,870	3,624,262	3,447,941	3,456,054	2,917,739	2,557,483	1,982,031	2,056,115	1,477,223	1,609,037	2,014,643	1,267,656	1,359,302	2,380,918	
CALCULATE MASS BASED EMISSIONS (TIER 1 METHOD)																	
(o)	(e)*(l) + (f)*(m)	CO ₂ Mass Emissions (Kg)	252,945,374	246,603,777	234,674,113	235,116,293	198,520,604	174,015,730	134,863,838	144,356,857	100,561,980	109,535,357	139,199,673	88,824,469	96,615,108	171,497,990	
(p)	(g)*(n)*(i)	CH ₄ Mass Emissions (Kg)	11,154	10,873	10,344	10,368	8,753	7,672	5,946	6,168	4,432	4,827	6,044	3,803	4,078	7,143	
(q)	(h)*(n)*(k)	N ₂ O Mass Emissions (Kg)	2,231	2,175	2,069	2,074	1,751	1,534	1,189	1,234	886	965	1,209	761	816	1,429	
CALCULATE CO ₂ e EMISSIONS (TIER 1 METHOD)																	
(r)	(l)*(i) + (p)*(j) + (q)*(k)	CO ₂ e Emissions (Kg)	253,888,969	247,523,614	235,549,201	235,993,439	199,261,127	174,664,819	135,366,878	144,878,699	100,936,899	109,943,730	139,710,990	89,146,200	96,960,099	172,102,267	
(s)	(r)/10 ³ (see note a)	CO ₂ e Emissions (MT)	253,889	247,524	235,549	235,993	199,261	174,665	135,367	144,879	100,937	109,944	139,711	89,146	96,960	172,102	
(t)	(s)*1.10231131 ^b	CO ₂ e Emissions (tpy)	279,865	272,848	259,649	260,138	219,648	192,535	149,216	159,701	111,264	121,192	154,005	98,267	106,880	189,710	

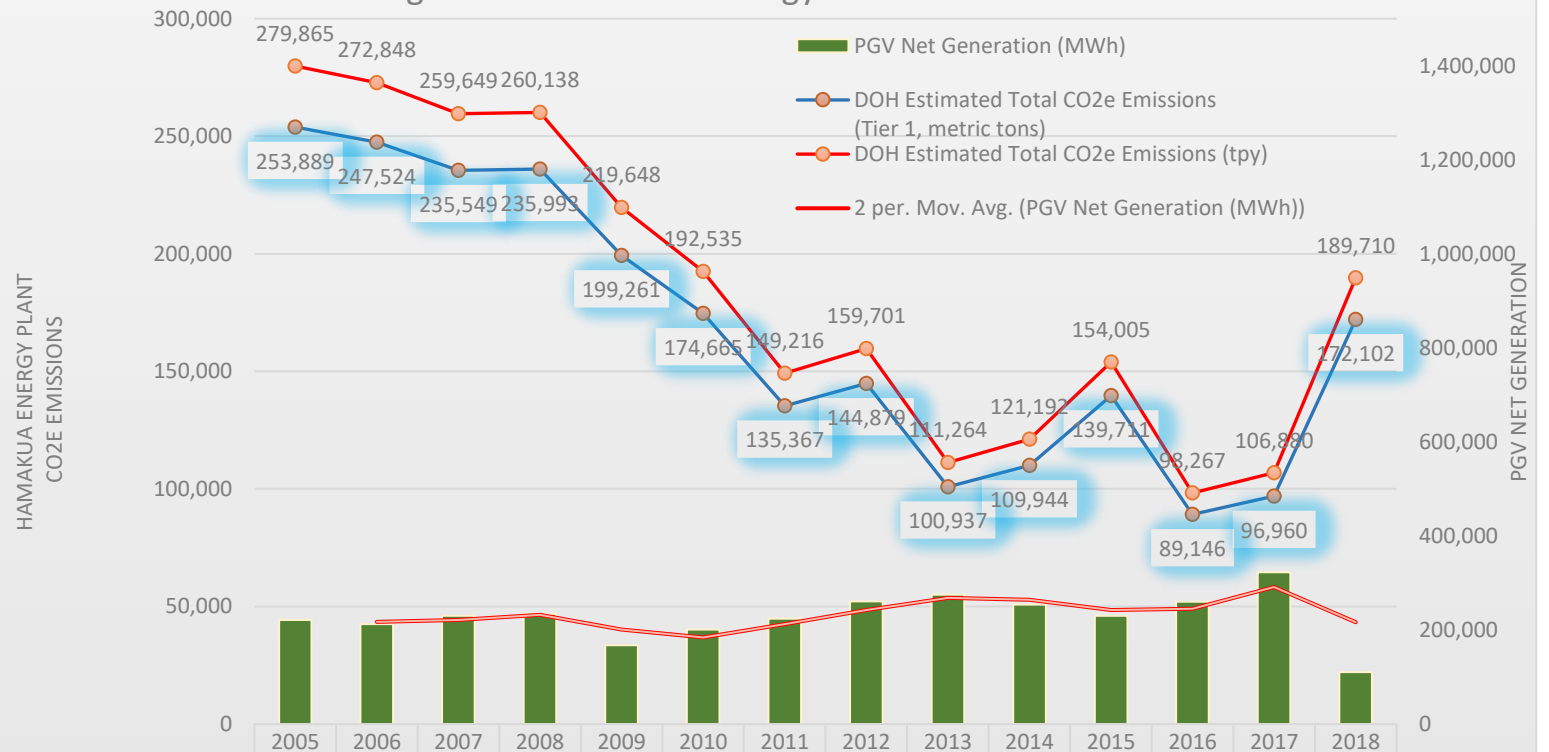
^a One (1) metric-ton=1000 Kg

^b One (1) short-ton = 1.10231131 * metric tons, as derived from 1 metric ton = 0.90718474 * short ton

ENCLOSURE 2 (Continued)

Data Source: DOH estimates based on reported fuel consumption

Figure 2-2. Hamakua Energy Plant CO2e Emissions vs PGV Net Generation



PGV Net Generation (MWh)	221,597	212,276	229,886	234,333	167,591	200,595	223,888	260,997	274,841	253,841	230,340	260,102	322,592	110,089
DOH Estimated Total CO2e Emissions (Tier 1, metric tons)	253,889	247,524	235,549	235,993	199,261	174,665	135,367	144,879	100,937	109,944	139,711	89,146	96,960	172,102
DOH Estimated Total CO2e Emissions (tpy)	279,865	272,848	259,649	260,138	219,648	192,535	149,216	159,701	111,264	121,192	154,005	98,267	106,880	189,710

ENCLOSURE 2 (Continued)

Table 2-2

METHOD	TOTAL COMBINED CO ₂ e FACILITY-WIDE EMISSIONS																	
	Ref	Source or Derivation	Calendar Year→ Description ↓	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	
TIER 1 ^c	(a)	Table 2-1, Ref (s)	DOH Estimated Total CO ₂ e Emissions (Tier 1, metric tons)	253,889	247,524	235,549	235,993	199,261	174,665	135,367	144,879	100,937	109,944	139,711	89,146	96,960	172,102	
	(b)	(a)/0.90718474 ^a	DOH Estimated Total CO ₂ e Emissions (tpy)	279,865	272,848	259,649	260,138	219,648	192,535	149,216	159,701	111,264	121,192	154,005	98,267	106,880	189,710	
			PGV Net Generation (MWh)	221,597	212,276	229,886	234,333	167,591	200,595	223,888	260,997	274,841	253,841	230,340	260,102	322,592	110,089	
			CO ₂ e Emission Reduction from 2010 (tpy)						0	-43,319	-32,834	-81,271	-71,343	-38,530	-94,268	-85,655	-2,825	
			CO ₂ e Emission Reduction from 2010 (%)						0.0%	-22.5%	-17.1%	-42.2%	-37.1%	-20.0%	-49.0%	-44.5%	-1.5%	
	(c)	FLIGHT	Biogenic Emissions			0		0	0	0	0	0	0	0				
	(d)	(b)-(c)	DOH Estimated Non-biogenic Emissions (Tier 1, tpy)							192,535								
HEP PROPOSED TIER 2 METHOD	(e)	Table 1, Main Text	Hamakua Energy Proposed Baseline Emissions (Tier 2, tpy)						182,975									
	(f)	(e)*0.90718474	Hamakua Energy Plant Proposed Baseline Emissions (Tier 2, metric tons)						165,992									
	(g)	FLIGHT	Hamakua Energy Plant Baseline Biogenic Emissions (tpy)						0									
	(h)	Table 1, Main Text	Hamakua Energy Plant Proposed CO ₂ e Emissions Cap (Tier 2, tpy)						153,699									
	(i)	(h)*0.90718474	Hamakua Energy Plant Proposed CO ₂ e Emissions Cap (Tier 2, Metric Tons)						139,433									
	(j)	(e)-(h)	Hamakua Energy Plant Proposed Reduction in CO ₂ e Emissions (tpy)						29,276									
	(k)	Ref (c) of Table 2A-2 in Enclosure 2A	DOH Estimated 2020 Minimum CO ₂ e Baseline Emissions Cap (Tier 2, tpy) ^b						153,142									
	(l)	(i)-(k)	Amount Hamakua Energy Plant Proposed Cap is Lower or (Higher) than DOH estimates (tpy)						(557.4)									
(m)	(l)/(k)	Percent Hamakua Energy Plant Proposed Cap is Lower or Higher(-) than DOH estimates (%)						-0.364%										
COMBINED PARTNERS	(n)	HECO GHG ERP	Proposed Total Combined Baseline Emissions (tpy)						8,361,022									
	(o)	(1.00-0.16)*(N)	Calculated Total Combined Emissions Limit (tpy)						7,023,258									
	(p)	HECO GHG ERP	Proposed Total Combined Emissions Limit (tpy)						7,023,258									
	(q)	(p)*0.90718474	Partnering Facilities Proposed Total Combined Emissions Limit Recalculated to Metric Tons						6,371,392									
FOOTNOTES	^a 1 metric-ton = 0.90718474 * short tons																	
	^b Minimum Facility-Wide GHG Emissions Cap pursuant to HAR §11-60.1-204(c)																	
	^c Tier 1 method is used to illustrate and compare the emissions level of the proposed baseline year relative to emission levels of other calendar years.																	

ENCLOSURE 2A COMPARISON OF TIER 2 TO TIER 1

- Purpose:** This enclosure contains the details for calculating the HEP's CY 2010 baseline GHG emissions using both the Tier 1 and Tier 2 methods. The results from the detailed computations of this enclosure is used to examine the potential impact when using a baseline GHG emissions rate developed from using the Tier 2 method as a benchmark for gaging future GHG emissions developed from using the Tier 1 method.
- Background:** Hamakua Energy is proposing to use CY 2010 as the baseline GHG emissions rate, computed using the Tier 2 method in accordance with 40 CFR §98.33. The HEP may use either the Tier 1, Tier 2, or Tier 3 methods for future reporting, however, the Tier 1 method is the simplest but least accurate method in 40 CFR §98.33. The Tier 1 method utilizes fuel specific default emission factors and HHV, whereas both the Tier 2 and Tier 3 methods requires fuel sampling to determine the annual average HHV and carbon content respectively. From CY 2010 to 2017, the HEP reported to the EPA's Facility Level Information on Greenhouse Gases (GHG) Tool (FLIGHT) GHG emission rates that were computed using the Tier 2 method with exception to CY 2016 where the Tier 1 method was used. The HEP is not required to use the Tier 4 method because the maximum rated heat input capacity of each combustion turbine generator unit is less than 250 MMBtu/hr.
- Calculations:** CY 2010 mass-based emissions are computed using Tier 2 method in Table 2A-1.

ENCLOSURE 2A (Continued)

Table 2A-1

DOH Mass-Based Emission Estimates for CY 2010 Using Tier 2

Pollutant →			Carbon Dioxide (CO ₂) ^a		Methane ^b (CH ₄)		Nitrous Oxide ^b (N ₂ O)	
Fuel Type	Fuel Usage ^c (gal)	HHV ^d	EF (kg/MMBtu)	Mass-Based Emissions (tpy)	EF (kg/MMBtu)	Mass-Based Emissions (tpy)	EF (kg/MMBtu)	Mass-Based Emissions (tpy)
Naphtha	20,384,846	0.118341	68.02	180,877	0.003	8.0	0.0006	1.6
Diesel	67,955	0.136625	73.96	757	0.003	3.07E-02	0.0006	6.14E-03
Subtotal Mass-Based Emissions				181,634		8		2

^a CO₂ mass-based emissions computed with the Tier 2 method, equation C-2a from 40 CFR Subpart C, §98.33(a)(2) modified as follows:

$$CO_2 = 1 \times 10^{-3} \times \text{Fuel} \times \text{HHV} \times \text{EF} \times 1.10231131$$

Where,

- CO₂ = Annual CO₂ mass emissions for a specific fuel type (equation modified to convert emission unit from metric tons to short tons).
- Fuel = Annual volume of fuel combusted (gallons/yr) during the year, from company records as defined in §98.6 (expressed in gallons).
- HHV = See Footnote^d = Annual average high heat value of the fuel (mmBtu per per gallon). The average HHV is calculated to the requirements of paragraph (a)(2) (ii) of §98.33.
- 1 x 10-3 = 0.001 = Conversion factor from kg to metric tons.
- EF = Fuel specific default emission factor for CO₂ from Table C-1 of this subpart (kg CO₂ per mmBtu).
- 1.10231131 = Conversion factor to change emission units from metric tons to short tons.

^b CH₄ and N₂O mass-based emissions are computed from using equation C-9a of 40 CFR SUBPART C, §98.33(c) modified as follows:

$$CH_4 \text{ or } N_2O = 1 \times 10^{-3} \times \text{Fuel} \times \text{HHV} \times \text{EF} \times 1.10231131$$

Where,

- CH₄ or N₂O = Annual CH₄ or N₂O emissions from the combustion of a particular type of fuel (equation modified to convert emissions unit from metric tons to short tons).
- Fuel = Volume of the fuel combusted during the reporting year (gallons).
- HHV = See Footnote^d = High heat value of the fuel, averaged for all valid measurements for the reporting year (mmBtu per gallon).
- EF = Fuel specific default emission factor for CH₄ or N₂O, from Table C-2 of 40 CFR Subpart C of Part 98 (kg CH₄ or N₂O per mmBtu).
- 1 x 10-3 = 0.001 = Conversion factor from kilograms to metric tons.
- 1.10231131 = Conversion factor to change emissions unit from metric tons to short tons.

^c Refer to Enclosure 2, Table 2-1 for CY 2010 fuel usage rate.

ENCLOSURE 2A (Continued)

- ^d The annual average HHV is computed on a weighted average basis using Eq C.2b (expressed below) in 40CFR§98.33 as follows:

$$(HHV)_{annual} = \frac{\sum_{i=1}^n (HHV)_i \times (Fuel)_i}{\sum_{i=1}^n (Fuel)_i} \quad (\text{Eq C.2b})$$

Where,

- $(HHV)_{annual}$ = Weighted annual average high heat value of the fuel (mmBtu per mass or volume).
 $(HHV)_i$ = Measured high heat value of the fuel, for month “i” (which may be the arithmetic average of multiple determinations), or, if applicable, an appropriate substitute data value (mmBtu per mass or volume).
 $(Fuel)_i$ = Mass or volume of the fuel combusted during month “i” from company records (express volume in gallons for liquid fuel).

ENCLOSURE 2A (Continued)

Year: 2010	Diesel Fuel			Naphtha		
Month	HHV (MMBtu/gal)	Is average HHV measured or substituted ?	Fuel Use (gal)	HHV (MMBtu/gal)	Is average HHV measured or substituted ?	Fuel Use (gal)
January	0.135667	m	6,217	0.117929	m	2,394,312
February	0.135667	m	10,412	0.118128	m	1,996,866
March	0.137178	m	8,195	0.118876	m	1,545,645
April	0.136648	m	4,929	0.119160	m	1,466,069
May	0.134832	m	3,100	0.119342	m	1,462,364
June	0.137500	m	5,074	0.118742	m	1,610,917
July	0.137500	m	4,658	0.118441	m	1,565,912
August	0.134392	m	4,241	0.118503	m	1,662,709
September	0.137500	m	4,554	0.117975	m	1,879,563
October	0.137500	m	4,779	0.118481	m	1,720,256
November	0.137500	m	4,138	0.117658	m	1,356,040
December	0.137500	m	6,868	0.117309	m	1,725,063
(HHV) annual	0.136625		67,164	0.118341		20,385,716

Calculations: (continued) CY 2010 CO_{2e} baseline emissions are computed in Table 2A-2 and a comparison made between Tier 1 and Tier 2 methods.

ENCLOSURE 2A (Continued)

**Table 2A-2
DOH CO₂e (GHG) Emission Estimates for CY 2010 Using Tier 2**

Ref	Source or Derivation ↓	Description→	ΣGHG Mass-Based Emissions	Global Warming Potential (GWP)	CO ₂ e Emissions	
		→	Table 2A-1	40CFRS98 Table A-1	(a)*(b)	(c)/1.10231131
		Units→	(tpy)	None	(tpy)	(metric tons/yr)
		GHG↓ Ref→	(a)	(b)	(c)	(d)
(1)	Table 2A-1	CO ₂	181,634	1	181,634	164,776
(2)		CH ₄	8	25	200	182
(3)		N ₂ O	2	298	477	433
(4)	(1)+(2)+(3)	DOH CO ₂ e Emission Estimate (Tier 2) =			182,311	165,390
(5)	0.16*(4)	Sixteen Percent CO ₂ e Emissions Reductions			29,170	
(6)	(4)-(5)	DOH Estimated 2020 CO ₂ e Emissions Cap			153,142	
(7)	Enclosure 2, Table 2-2, Ref (d)	DOH CO ₂ e Emission Estimate (Tier 1) =			192,535	
(8)	(4)-(7)	Lower (Higher) than DOH Tier 2 Estimate (tpy)			(10,224)	
(9)	(8)*100/(4)	Lower (Higher) than DOH Tier 2 Estimate (%)			-5.61%	

Evaluation: Table 2A-2 shows the results of the DOH's detailed computations of the HEP's CO₂e baseline emissions for CY 2010 using the Tier 2 method and compares this value with the DOH's computed baseline CO₂e emissions using the Tier 1 method. Baseline emission rates computed using Tier 1 method results in a baseline emissions rate that is 5.61% higher than emission rates computed using the Tier 2 methods. Therefore, switching to Tier 1 method for future GHG reports would overstate reported GHG emissions thus understating the reduction in GHG emissions when using CY 2010 baseline computed using the Tier 2 method.

ENCLOSURE 3 STORAGE VESSELS

Table 3-1
40 CFR, Part 60, Subpart Kb Storage Vessels

Tank No.	Tank Description	Tank Content	Tank Capacity (gallons)	Tank Capacity ^a (m ³)	Max P _{VA} ^b of fuel (psi)	40CFR Subpart Kb, §60.110b Applicability ^c					
						≥ July 23, 1985	Capacity ≥ 75 m ³	Capacity < 151 m ³	Max P _{VA} ≥ 2.18 ^d psi	Max P _{VA} ≥ 0.508 ^d psi	Subpart Kb Applies
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)
1	External Floating Roof (34,350 bbls)	Naphtha or Gasoline	1,442,700	5461	11.1	Yes	Yes	No	NA	Yes	Yes
3	External Floating Roof (34,350 bbls)	Naphtha or Gasoline	1,442,700	5461	11.1	Yes	Yes	No	NA	Yes	Yes
	Storage & Transfer (8,950 bbls)	ULSD	375,900	1423	0.022	Yes	Yes	No	NA	No	No
	Day Tank	ULSD	10,000	38	0.022	Yes	No	NA	NA	NA	No
	Storage	ammonia (anhydrous)	12,000	45	198	Yes	No	NA	NA	NA	No

Footnotes:

^a AP-42 Appendix A (9/85 Reformatted 1/95), MISCELLANEOUS DATA AND CONVERSION FACTORS, used as reference for the following conversions:

- 1 gallon = 0.0037854 m³
- 1 bbl (petroleum) = 42 gal therefore, 34,350 bbls = 1,442,700 gal
- 1 bbl (petroleum) = 42 gal therefore, 8,950 bbls = 375,900 gal

^b Max P_{VA} = Maximum true vapor pressure as defined in 40 CFR Kb §60.111b and determined from AP42 Section 7.1 (11/06).

1. For the external floating tanks, the permit limit of 11.1 psia or (76.6 kPa) is specified.
2. For tanks that store ULSD, a worst-case vapor pressure of 0.022 PSI at 100°F is specified based on data in Table 7.1-2 of AP 42 Section 7.1.
3. For the tank that store ammonia, a worst-case vapor pressure of 198 PSI at 100°F is specified based on data from the U.S. Department of Labor - OSHA Properties of Ammonia.

ENCLOSURE 3 (Continued)

Footnotes: (continued)

^c 40CFR Subpart Kb, §60.110b Applicability:

(a) Subpart **Kb** applies to each storage vessel with a capacity greater than or equal to 75 cubic meters (m³) that is used to store volatile organic liquids (VOL) for which construction, reconstruction, or modification is commenced after July 23, 1984. The equipment date is December 1995.

(b) Subpart **Kb** does not apply to storage vessels with:

- (1) a capacity greater than or equal to 151 m³ storing a liquid with a maximum true vapor pressure less than 3.5 kilopascals (kPa); or
- (2) a capacity greater than or equal to 75 m³ but less than 151 m³ storing a liquid with a maximum true vapor pressure less than 15.0 kPa.

^d The equivalent maximum true vapor pressures when converting the units from kPa to psi are shown below:

1 kilo Pascal (kPa) = 0.145038 (psi)

	kPa	psi
40CFR Kb, §60.110b(b)(1)	3.5	0.508
40CFR Kb, §60.110b(b)(2)	15	2.18

**ENCLOSURE 4 DEG
DEG EMISSIONS**

**Table 4-1
Fire Water Pump Engine (Fired with LSFO)**

Pollutant	Emission Rate (ER) ^a	Annual Emissions ^c	Annual Emissions
	(lbs/hr)	(lbs/yr)	(tpy)
	(a)	(c)=500*(a)	(d)=(c)/2000
CO	1.19	595	0.298
NO _x	2.10	1050	0.525
PM ^d	0.115	57	0.029
PM ₁₀	0.110	55	0.028
PM _{2.5} ^d	0.103	52	0.026
SO ₂	7.00E-02	35	0.018
Pb	0.00	0	0.000
VOC	5.20E-01	260	0.130
HAP (Highest)	Refer to Table 4-1.1		4.17E-04
HAP (Total)			1.39E-03

ENCLOSURE 4 (Continued)

Table 4-1.1
Speciated Organic Compounds of HAPS
Fire Water Pump Engine (Fired with LSFO)

Organic Compound	Emission Factor ^a (Fuel Input)	Emission Rate ^b	Annual Emissions ^c	Annual Emissions
	(lb/MMBtu)	(lbs/hr)	(lbs/yr)	(tpy)
	(a)	(b)=1.412*(a)	(c)=500*(b)	(d)=(c)/2000
Acenaphthene	1.42E-06	2.01E-06	0.001	5.01E-07
Acenaphthylene	2.92E-05	4.12E-05	0.021	1.03E-05
Acetaldehyde	7.67E-04	1.08E-03	0.542	2.71E-04
Acrolein	9.25E-05	1.31E-04	0.065	3.27E-05
Anthracene	1.87E-06	2.64E-06	0.001	6.60E-07
Benzene	9.33E-04	1.32E-03	0.659	3.29E-04
Benzo(a)anthracene	1.68E-06	2.37E-06	0.001	5.93E-07
Benzo(b)fluoranthene	9.91E-08	1.40E-07	0.000	3.50E-08
Benzo(k)fluoranthene	1.55E-07	2.19E-07	0.000	5.47E-08
Benzo(g,h,i)perylene	4.89E-07	6.91E-07	0.000	1.73E-07
Benzo(a)pyrene	1.88E-07	2.66E-07	0.000	6.64E-08
1,3 Butadiene	3.91E-05	5.52E-05	0.028	1.38E-05
Chrysene	3.53E-07	4.99E-07	0.000	1.25E-07
Dibenz(a,h)anthracene	5.83E-07	8.23E-07	0.000	2.06E-07
Fluoranthene	7.61E-06	1.07E-05	0.005	2.69E-06
Fluorene	2.92E-05	4.12E-05	0.021	1.03E-05
Formaldehyde	1.18E-03	1.67E-03	0.833	4.17E-04
Indeno(1,2,3-cd)pyrene	3.75E-07	5.30E-07	0.000	1.32E-07
Naphthalene	8.48E-05	1.20E-04	0.060	2.99E-05
Phenanthrene	2.94E-05	4.15E-05	0.021	1.04E-05
Pyrene	4.78E-06	6.75E-06	0.003	1.69E-06
Toluene	4.09E-04	5.78E-04	0.289	1.44E-04
Xylenes	2.85E-04	4.03E-04	0.201	1.01E-04
HAP (Single Highest)				4.17E-04
HAP (Total)				1.39E-03

FOOTNOTES TO TABLES 4-1 AND 4-1.1:

- ^a Emission rates for criteria pollutants are from CSP Renewal Application No. 0243-06. Emission factors for HAPs are from AP-42 Section 3.3, Table 3.3-2 (10/96) for diesel fuel.
- ^b Maximum heat input rate is based on the fire water pump diesel engine fuel consumption rate of 10.4 gal/hr and a heating value is 0.1358 MMBtu/gal provided from Mr. Dave Cummings of Hamakua Energy by telephone discussion with Mr. D. Hamamoto of DOH-CAB. The maximum heat input rate is calculated as follows:

$$\text{Max Heat Input Rate (MMBtu/hr)} = 10.4 \text{ (gal/hr)} \times 0.1358 \text{ (MMBtu/gal)} = 1.412$$

- ^c The 500 maximum annual operating hours is the default assumption used in calculating the potential to emit (PTE) for emergency generators.

[Source: EPA's guidance memorandum dated September 6, 1995.]

- ^d It is assumed that 96% and 90% of the total particulate is PM₁₀ and PM_{2.5} respectively, based on AP-42 Appendix B.2, Table B.2-2 (9/90 reformatted 1/95) for gasoline and diesel fired internal combustion engines.

$$\text{PM} = \text{PM}_{10} \div (0.96) = 0.114583 \quad (\text{lbs/MMBtu})$$

$$\text{PM}_{2.5} = \text{PM} \times (0.90) = 0.103125 \quad (\text{lbs/MMBtu})$$

ENCLOSURE 4 (Continued)

Table 4-2
1,250 KW (14.3 MMBtu/hr) Black Start DEG (Fired with LSFO)

Pollutant	Emission Rate (ER) ^a per Stack	Total Emission Rate ^b	Annual Emissions ^c	Annual Emissions
	(lbs/hr)	(lbs/hr)	(lbs/yr)	(tpy)
	(a)	(b)=(a)*2	(c)=52*(b)	(d)=(c)/2000
CO	1.33	2.66	138	0.069
NO _x	14.93	29.86	1553	0.776
PM ^d	0.10	0.21	11	0.005
PM ₁₀	0.10	0.20	10	0.005
PM _{2.5} ^d	0.09	0.19	10	0.005
SO ₂	0.25	0.50	26.00	0.013
Pb	0.00	0.00	0	0.000
VOC	0.25	0.50	26.00	0.013
HAP (Highest)	Refer to Table 4-2.1			4.39E-04
HAP (Total)				1.46E-03

ENCLOSURE 4 (Continued)

Table 4-2.1
Speciated Organic Compounds of HAPs
1,250 KW (14.3 MMBtu/hr) Black Start DEG (Fired with LSFO)

Organic Compound	Emission Factor ^a (Fuel Input)	Emission Rate ^b	Annual Emissions ^c	Annual Emissions
	(lb/MMBtu)	(lbs/hr)	(lbs/yr)	(tpy)
	(a)	(b)=14.3*(a)	(c)=52*(b)	(d)=(c)/2000
Acenaphthene	1.42E-06	2.03E-05	0.001	5.28E-07
Acenaphthylene	2.92E-05	4.18E-04	0.022	1.09E-05
Acetaldehyde	7.67E-04	1.10E-02	0.570	2.85E-04
Acrolein	9.25E-05	1.32E-03	0.069	3.44E-05
Anthracene	1.87E-06	2.67E-05	0.001	6.95E-07
Benzene	9.33E-04	1.33E-02	0.694	3.47E-04
Benzo(a)anthracene	1.68E-06	2.40E-05	0.001	6.25E-07
Benzo(b)fluoranthene	9.91E-08	1.42E-06	0.000	3.68E-08
Benzo(k)fluoranthene	1.55E-07	2.22E-06	0.000	5.76E-08
Benzo(g,h,l)perylene	4.89E-07	6.99E-06	0.000	1.82E-07
Benzo(a)pyrene	1.88E-07	2.69E-06	0.000	6.99E-08
1,3 Butadiene	3.91E-05	5.59E-04	0.029	1.45E-05
Chrysene	3.53E-07	5.05E-06	0.000	1.31E-07
Dibenz(a,h)anthracene	5.83E-07	8.34E-06	0.000	2.17E-07
Fluoranthene	7.61E-06	1.09E-04	0.006	2.83E-06
Fluorene	2.92E-05	4.18E-04	0.022	1.09E-05
Formaldehyde	1.18E-03	1.69E-02	0.877	4.39E-04
Indeno(1,2,3-cd)pyrene	3.75E-07	5.36E-06	0.000	1.39E-07
Naphthalene	8.48E-05	1.21E-03	0.063	3.15E-05
Phenanthrene	2.94E-05	4.20E-04	0.022	1.09E-05
Pyrene	4.78E-06	6.84E-05	0.004	1.78E-06
Toluene	4.09E-04	5.85E-03	0.304	1.52E-04
Xylenes	2.85E-04	4.08E-03	0.212	1.06E-04
HAP (Highest)				4.39E-04
HAP (Total)				1.46E-03

FOOTNOTES TO
TABLES 4-2 AND 4-2.1

- ^a Emission rates for criteria pollutants are from CSP Renewal Application No. 0243-06. Emission factors for HAPs are from AP-42 Section 3.3, Table 3.3-2 (10/96) for diesel fuel.
- ^b Black start DEG has two (2) stacks
- ^c The maximum operating hours of the black start diesel engine generator shall each not exceed fifty-two (52) hours per rolling 12-month period.
- ^d It is assumed that 96% and 90% of the total particulate is PM₁₀ and PM_{2.5} respectively, based on AP-42 Appendix B.2, Table B.2-2 (9/90 reformatted 1/95) for gasoline and diesel fired internal combustion engines.

$$PM = PM_{10} \div (0.96) = 0.104167 \quad (\text{lb/hp-hr})$$

$$PM_{2.5} = PM \times (0.90) = 0.09375 \quad (\text{lb/hp-hr})$$

ENCLOSURE 5 GHG

Table 5-1

Mass-Based Greenhouse Gas Emissions

Source Unit	Fuel	Maximum Design Heat Input per Unit ^a (MMBtu/hr)	Hours of Operation per year	Maximum Heat Input per year (MMBtu/yr)	Carbon Dioxide (CO ₂)		Methane (CH ₄)		Nitrous Oxide (N ₂ O)	
					EF ^c (kg/MMBtu)	Mass-Based Emissions ^d (tpy)	EF ^c (kg/MMBtu)	Mass-Based Emissions ^d (tpy)	EF ^c (kg/MMBtu)	Mass-Based Emissions ^d (tpy)
CT 1	Naphtha	247	8,760	2,163,720	68.02	162,234	0.003	7.16	0.0006	1.43
	FO No. 2	247	8,760	2,163,720	73.96	176,401	0.003	7.16	0.0006	1.43
CT 2	Naphtha	247	8,760	2,163,720	68.02	162,234	0.003	7.16	0.0006	1.43
	FO No. 2	247	8,760	2,163,720	73.96	176,401	0.003	7.16	0.0006	1.43
CT Total Emissions (worst case by fuel type)^b						352,803		14.3		2.9
1275 kW Blackstart DEG	FO No. 2	14.3	8,760	125,268	74.96	10,351	0.003	0.41	0.0006	0.08
Subtotals of Mass-Based GHG Emissions						363,153		15		3

FOOTNOTES TO TABLE 5-1

^a GHG emissions estimate is based on a specified maximum design heat input of 247 MMBtu/hr per CT. A maximum design fuel consumption rate of 103.6 gal/hr is specified in the manufacturer's specification for the 1275kW black start DEG. This equates to a maximum design heat input calculated using a default high heat value of 0.138 MMBtu/gal from 40CFR§98 Table C-1 for Fuel Oil No. 2 as follows:

$$\text{Heat Input of Black Start DEG} = \frac{103.6}{(\text{gal/hr})} \times \frac{0.138}{(\text{MMBtu/gal})} = \frac{14.3}{(\text{MMBtu/hr})}$$

^b Maximum potential emission are based on a worst case operating basis using the fuel type that produces the higher emission rate.

^c As demonstrated in Enclosure 2A, the Tier 1 computation method is used as a conservative estimate since 40 CFR §98.33 allows the HEP Facility to use either Tier 1 or Tier 2. Default emission factors (EF) and HHV are from 40CFR§98 Table C-1 for CO₂ and Table C-2 for CH₄ and N₂O.

ENCLOSURE 5 (Continued)

FOOTNOTES TO
TABLE 5-1 (Continued)

^d Mass-based emissions are calculated by multiplying the [maximum heat input per year] x [applicable emissions factors from 40 CFR §98, Tables C-1 or C-2] x [conversion factor of 1.10231131 (tpy/metric tons)] x [0.001(metric tons/kg)].

$$\begin{matrix} \text{Maximum Heat Input} & \times & \text{EF} & \times & 1.10231131 & \times & 0.001 & = & 1.10\text{E-}03 & \times & \text{Maximum Heat Input} \times \text{EF} \\ \text{(MMBtu/yr)} & & \text{(kg/MMBtu)} & & \text{(tons/metric tons)} & & \text{(metric tons/kg)} & & & & \text{(tpy)} \end{matrix}$$

^e Storage tanks and emergency DEGs are not included because the HEP facility meets the condition of 40 CFR §98.2 paragraph (a)(3) and these units are not stationary fuel combustion sources as defined in 40 CFR §98.30.

ENCLOSURE 6 HAPS
HAPs Emissions for Application No. 0243-07

Description →	CT (East)	CT (West)	CTGs	Fire Pump	Black Start DEG	2019 Totals
Source or Derivation →	Note ^a	Note ^a	$\frac{((a)+(b))*8760}{2000}$	Table 4-1.1, Enclosure 4	Table 4-2.1, Enclosure 4	(c)+(d)+(e)
Ref →	(a)	(b)	(c)	(d)	(e)	(g)
Pollutant ↓ Units →	(lbs/hr)	(lbs/hr)	(tpy)	(tpy)	(tpy)	(tpy)
Acenaphthene			Note ^b	5.01E-07	5.28E-07	1.03E-06
Acenaphthylene			Note ^b	1.03E-05	1.09E-05	2.12E-05
Acetaldehyde (1)	1.77E-01	1.77E-01	1.55	2.71E-04	2.85E-04	1.55
Acrolein (6)	2.13E-02	2.13E-02	1.87E-01	3.27E-05	3.44E-05	1.87E-01
Antimony (172)	5.07E-03	5.07E-03	4.44E-02			4.44E-02
Anthracene			Note ^b	6.60E-07	6.95E-07	1.36E-06
Arsenic (173) ^c	1.13E-03	1.13E-03	9.9E-03	3.29E-04	3.47E-04	1.06E-02
Benzene (15)	2.26E-01	2.26E-01	1.98	5.93E-07	6.25E-07	1.98
Benzo(a)anthracene			Note ^b	3.50E-08	3.68E-08	7.18E-08
Benzo(b)fluoranthene			Note ^b	5.47E-08	5.76E-08	1.12E-07
Benzo(k)fluoranthene			Note ^b	1.73E-07	1.82E-07	3.54E-07
Benzo(g,h,l)perylene			Note ^b	6.64E-08	6.99E-08	1.36E-07
Benzo(a)pyrene			Note ^b	1.38E-05	1.45E-05	2.83E-05
Beryllium (174) ^c	7.61E-05	7.61E-05	6.7E-04			6.67E-04
1,3 Butadiene (23)				1.38E-05	1.45E-05	2.83E-05
Cadmium (175)	9.68E-04	9.68E-04	8.48E-03			8.48E-03
Chromium (176)	1.08E-02	1.08E-02	9.46E-02			9.46E-02
Chrysene			Note ^b	1.25E-07	1.31E-07	2.56E-07
Cobalt (177)	2.10E-03	2.10E-03	1.84E-02			1.84E-02
Dibenz(a,h)anthracene			Note ^b	2.06E-07	2.17E-07	4.23E-07
Fluoranthene			Note ^b	2.69E-06	2.83E-06	5.52E-06
Fluorene			Note ^b	1.03E-05	1.09E-05	2.12E-05
Formaldehyde (86)	2.72E-01	2.72E-01	2.38	4.17E-04	4.39E-04	2.38
Indeno(1,2,3-cd)pyrene			Note ^b	1.32E-07	1.39E-07	2.72E-07
Lead (181)	1.34E-02	1.34E-02	1.17E-01			1.17E-01

ENCLOSURE 6 (Continued)

Description →	CT (East)	CT (West)	CTGs	Fire Pump	Black Start DEG	2019 Totals
Source or Derivation →	Note ^a	Note ^a	<u>((a)+(b))*8760</u> 2000	Table 4-1.1, Enclosure 4	Table 4-2.1, Enclosure 4	(c)+(d)+(e)
Ref →	(a)	(b)	(c)	(d)	(e)	(g)
Pollutant ↓ Units →	(lbs/hr)	(lbs/hr)	(tpy)	(tpy)	(tpy)	(tpy)
Manganese (182)	7.84E-02	7.84E-02	6.87E-01			6.87E-01
Mercury (183)	2.10E-04	2.10E-04	1.84E-03			1.84E-03
Naphthalene			Note ^b	2.99E-05	3.15E-05	6.15E-05
Nickel (185)	2.77E-01	2.77E-01	2.43			2.43
Phenanthrene			Note ^b	1.04E-05	1.09E-05	2.13E-05
Phosphorous (133)	6.92E-02	6.92E-02	6.06E-01			6.06E-01
Pyrene			Note ^b	1.69E-06	1.78E-06	3.46E-06
Selenium (188)	1.22E-03	1.22E-03	1.07E-02			1.07E-02
Toluene (151)	9.43E-02	9.43E-02	8.26E-01	1.44E-04	1.52E-04	8.26E-01
Xylene isomers (168)	2.49E-01	2.49E-01	2.18	1.01E-04	1.06E-04	2.18
PAH	3.87E-02	3.87E-02	3.39E-01			3.39E-01
Fluorides	0	0	0			0
Sulfuric Acid Mist	0	0	0			0
HAP (Single Highest)			2.4	4.17E-04	4.39E-04	2.4
HAP (Total)			13.5	1.39E-03	1.46E-03	13.5

^a Emission rates are from CSP Renewal Application No. 0243-06, except as noted.

^b Grouped as polycyclic aromatic hydrocarbons (PAH).

ENCLOSURE 7 COOLING TOWERS

PM₁₀ emissions for the cooling tower are computed based on past recommendations from Mr. Ron Myers at the EPA, Research Triangle Park as follows:

PM₁₀ emissions =	DE X TDS X CW	(lbs/hr-cell)	
Where,	DE ^a =	Drift Eliminator Factor =	0.002% Efficiency
	TDS ^b =	Total Dissolved Solids =	0.0021 Weight fraction
	CW ^c =	Circulating Water Vol =	11,516,100 (lbs/hr-cell)
PM ₁₀ (lbs/hr-cell) =	0.002%	X	0.0021 X 11,516,100 = 0.4836762
Total PM ₁₀ (lbs/hr) ^d =	0.4836762	X	3 = 1.451
Total PM ₁₀ (tpy) =	1.451	X	8760 ÷ 2000 = 6.147

Footnotes:

^a DE is restricted from exceeding a 0.002% total drift loss.

^b Total concentration of dissolved solids is restricted from exceeding 2,100 mg/l where 1 mg/L = 1 ppm and its maximum equivalent weight fraction computed as follows:

Maximum weight fraction of TDS =	2,100	(ppmwt)	X	1.00E-06	=	0.0021
----------------------------------	-------	---------	---	----------	---	--------

^c The design circulating flow rate is restricted from exceeding 23,000 gallons per minute and its maximum flow rate by weight per hour per cell is computed as follows:

CW _{Vol} =	23,000	(gpm)	X	60	(min/hr)	=	1,380,000
CW _{WT} =	1,380,000	(gal/hr-cell)	X	8.345	(lbs/gal)	=	11,516,100

^d Three (3) cells confirmed with Mr. Dave Cummings by telecon on 2/15/19.

APPLICATION AND SUPPORTING INFORMATION

Re: Hawaiian Electric GHG ERP Draft Revision of Permit**Hamamoto, Dale**

Tue 6/9/2020 9:26 AM

To: Peterson, Sharon**Cc:** Madsen, Michael A; Takamoto, Clayton ; Tandi, Myrna; Kimura, Karin ; Smith, Lee

Hi Sharon,

With regards to your question, "Will the Partners have another opportunity to review the draft permit with DOH's revisions before it goes out for public comment?".

The answer to your question is yes. We are reviewing Hawaiian Electric comments and we plan to incorporate the final agreed upon changes into the draft permit modifications for all partnering facilities. Once completed, I'll be sending all the permits out for a final review.

In hindsight, I believe we need to clearly define the net generating capacity of the Puna Geothermal Venture facility that preceded its shutdown. I'll be doing further research and validation on this today.

Please let me know if you have further questions and/or comments.

Respectfully,

Dale

From: Peterson, Sharon**Sent:** Tuesday, June 9, 2020 8:59 AM**To:** Hamamoto, Dale**Cc:** Madsen, Michael A; Takamoto, Clayton; Tandi, Myrna; Kimura, Karin; Smith, Lee**Subject:** [EXTERNAL] RE: Hawaiian Electric GHG ERP Draft Revision of Permit

Hi Dale,

Hawaiian Electric circulated the draft CSP 0548-01-C you provided on May 29, 2020 to the Hawaiian Electric GHG ERP partners (Partners) for review and comment. Please see the attached documents with comments prepared by the Partners. The attached PDF includes proposed revisions to the *Calendar Year 2019* (renamed by the partners as ERP Partnership 2019 CSP Limits) and *Calendar Year 2020 and Beyond* (renamed by the partners as ERP Partnership Baseline CO2e Emissions) tables that are located in Attachment II – GHG, Section C.1. (GHG Emissions Caps) of the draft CSP. The attached Word document includes proposed revisions to Attachment II – GHG, Section C.3. (Alternate Operating Scenarios) of the draft CSP.

Will the Partners have another opportunity to review the draft permit with DOH's revisions before it goes out for public comment? Due to the number of redlines we would like a day to review for accuracy after the permit is revised.

Please let me know if you have any questions.

Thanks,

SHARON PETERSON

Principal Environmental Scientist, Air Quality & Noise

O: 808.543.4521 | M: 808.430.6885

Hawaiian Electric

PO Box 2750, Honolulu, HI 96840



From: Hamamoto, Dale **Sent:** Monday, June 08, 2020 8:45 AM
To: Peterson, Sharon
Cc: Madsen, Michael A; Takamoto, Clayton ; Tandi, Myrna
Subject: Re: Hawaiian Electric GHG ERP Draft Revision of Permit

Sharon,

OK Great!

Thanks,

Dale

From: Peterson, Sharon
Sent: Monday, June 8, 2020 8:43 AM
To: Hamamoto, Dale
Cc: Madsen, Michael A; Takamoto, Clayton; Tandi, Myrna
Subject: [EXTERNAL] RE: Hawaiian Electric GHG ERP Draft Revision of Permit

Hi Dale,

We are waiting for final review of the comments and revised charts from the partners. We should have the comments for you tomorrow, 6/9.

Thanks,
Sharon

From: Hamamoto, Dale
Sent: Monday, June 08, 2020 8:20 AM
To: Peterson, Sharon
Cc: Madsen, Michael A; Takamoto, Clayton; Tandi, Myrna
Subject: Re: Hawaiian Electric GHG ERP Draft Revision of Permit

Sharon,

Please let us know how much additional time you will need.

Dale

From: Peterson, Sharon
Sent: Monday, June 8, 2020 8:14 AM

To: Hamamoto, Dale
Cc: Madsen, Michael A; [Takamoto, Clayton](#); [Tandi, Myrna](#)
Subject: [EXTERNAL] RE: Hawaiian Electric GHG ERP Draft Revision of Permit

Hi Dale,

The draft permit was circulated to the partners for their review and comment and we are still working on the comments. I'll provide you with updates as I hear about the progress, but I think we are pretty close to having a response ready for you. I'm sorry, I thought you were aware of our need for additional time. Going forward I will communicate this with you directly.

Thanks,
Sharon

From: Hamamoto, Dale
Sent: Monday, June 08, 2020 7:35 AM
To: Peterson, Sharon
Cc: Madsen, Michael A; [Takamoto, Clayton](#); [Tandi, Myrna](#)
Subject: Re: Hawaiian Electric GHG ERP Draft Revision of Permit

Hi Sharon,

Please update us on the status of Hawaiian Electric's review of DOH's re-draft to CSP 0548-01-C?

Dale

From: Peterson, Sharon
Sent: Friday, May 29, 2020 3:26 PM
To: Hamamoto, Dale
Cc: Madsen, Michael A; [Takamoto, Clayton](#); [Tandi, Myrna](#)
Subject: [EXTERNAL] RE: Hawaiian Electric GHG ERP Draft Revision of Permit

Hi Dale,

We've received the draft permit. We will review and get back to you with any comments by June 5, 2020.

Have a great weekend!

Thanks,
Sharon

From: Hamamoto, Dale
Sent: Friday, May 29, 2020 3:17 PM
To: Peterson, Sharon
Cc: Madsen, Michael A; [Takamoto, Clayton](#); [Tandi, Myrna](#)
Subject: Hawaiian Electric GHG ERP Draft Revision of Permit

[This email is coming from an EXTERNAL source. Please use caution when opening attachments or links in suspicious email.]

Good Afternoon Sharon.

Hope your day has been pleasant.

In response to Hawaiian Electric's email response on May 22, 2020 and prior correspondence, the Department of Health Clean Air Branch (DOH) is sending a another draft of CSP No. 0548-01-C for Hawaiian Electric's review and comment. Significant changes include the addition of alternate operating scenarios to allow for the approval of changes to the emission caps due to the shutdown and resurrection of Puna Geothermal Venture (PGV) facility and the reallocation of emission caps to the numbers that was submitted in your email response on May 22, 2020.

To expedite the process, the DOH is using the draft permit for Hawaiian Electric's Campbell Industrial Park as a template for the remaining partnering permits. The DOH requests for Hawaiian Electric's comments by April 5, 2020.

If you have any questions regarding this request, please feel free to contact me.

Very Respectfully,

Dale Hamamoto
Environmental Engineer
State of Hawaii, Department of Health
Clean Air Branch
Phone: (808) 586-4200

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ERP Partnership Baseline CO₂e Emissions

Company	Covered Source	CO ₂ e Emissions ^(1,2)		CSP Limits With AES Reductions ⁽⁴⁾		
		(metric tpy)	(tpy)	CO ₂ e Reduction (%)	CO ₂ e Reduction (tpy)	CO ₂ e Limit (tpy)
Hawaiian Electric (HE)	Kahe	2,518,411	2,776,073	20.6%	572,556	2,203,516
	Waiau	974,642	1,074,359	18.3%	196,309	878,050
	Honolulu	121,208	133,609	100.0%	133,609	0
	CIPGS ⁽³⁾	13,559	14,946	-726.3%	-108,558	123,504
HE Subtotal		3,627,821	3,998,988	19.9%	793,917	3,205,071
Maui Electric (ME)	Kahului	209,414	230,839	33.0%	76,206	154,633
	Maalaea	562,012	619,512	25.8%	159,648	459,864
	Palaau	25,615	28,236	6.3%	1,782	26,454
ME Subtotal		797,041	878,587	27.0%	237,636	640,951
Hawai'i Electric Light (HL)	Kanoelehua-Hill	202,106	222,784	22.6%	50,328	172,456
	Keahole	173,623	191,387	-26.6%	-50,821	242,208
	Puna	90,438	99,691	68.2%	67,944	31,747
	Shipman	9,246	10,192	100.0%	10,192	0
HL Subtotal		475,413	524,053	14.8%	77,642	446,411
Hawaiian Electric Companies		4,900,275	5,401,629	20.5%	1,109,195	4,292,433
AES Hawai'i		1,525,526	1,681,605	16.0%	269,057	1,412,548
Hamakua Energy Power		165,992	182,975	16.0%	29,276	153,699
Kalaeloa Partners, LP		993,198	1,094,813	-6.4%	-69,764	1,164,577
Partnership Total		7,584,991	8,361,022	16.00%	1,337,764	7,023,257⁽⁵⁾

Notes:

- (1) Excludes biogenic CO₂ emissions per HAR §11-60.1-204(d)(6)(B).
- (2) Selections of facility emissions baselines are described in the individual GHG Emission Reduction Plans for the Hawaiian Electric Companies, AES Hawai'i, Kalaeloa Partners, LP (KPLP), and Hamakua Energy Power (HEP).
- (3) CIPGS (Campbell Industrial Park Generating Station) is designated as the Main CSP for the Hawaiian Electric Companies' Emissions Reduction Plan.
- (4) Includes AES' voluntary reduction of 10,000 tons and 16% GHG emissions distributed to Oahu partners except AES and Honolulu.
- (5) Does not include additional requested PGV allowances per HAR 11-60.1-204(h)(5).

ERP Partnership 2019 CSP Limits

Company	Covered Source	PGV 100% Operation	With PGV allowance	
		CO ₂ e Emissions ^(1,2) (tpy)	CO ₂ e Limit Adjustment (tpy)	CO ₂ e Limit ⁽⁴⁾ (tpy)
Hawaiian Electric (HE)	Kahe	2,133,752	0	2,133,752
	Waiau	808,286	0	808,286
	Honolulu	0	0	0
	CIPGS ⁽³⁾	53,740	0	53,740
HE Subtotal		2,995,778	0	2,995,778
Maui Electric (ME)	Kahului	154,633	0	154,633
	Maalaea	459,864	0	459,864
	Palaau	26,454	0	26,454
ME Subtotal		640,951	0	640,951
Hawai'i Electric Light (HL)	Kanoelehua-Hill	172,456	17,132	189,588
	Keahole	242,208	31,213	273,421
	Puna	31,747	39,535	71,282
	Shipman	0	0	0
HL Subtotal		446,411	87,880	534,291
Hawaiian Electric Companies		4,083,140	87,880	4,171,020
AES Hawai'i		1,691,605	0	1,691,605
Hamakua Energy Power		153,699	97,524	251,223 ⁽⁶⁾
Kalaeloa Partners, LP		1,094,813	0	1,094,813
Partnership Total		7,023,257	185,404	7,208,661 ⁽⁵⁾

Notes:

(1) Excludes biogenic CO₂ emissions per HAR §11-60.1-204(d)(6)(B).

(2) Selections of facility emissions baselines are described in the individual GHG Emission Reduction Plans for the Hawaiian AES Hawai'i, Kalaeloa Partners, LP (KPLP), and Hamakua Energy Power (HEP).

(3) CIPGS (Campbell Industrial Park Generating Station) is designated as the Main CSP for the Hawaiian Electric Companies' Emissions Reduction Plan.

(4) Does not include AES' 2020 voluntary reductions of 10,000 tons and 16% GHG emissions. PGV allowance is distributed to Hawai'i Island partners, except Shipman.

(5) Includes requested PGV allowance of 185,404 tons. The GHG Partners reserve the right to request an additional allowance for delays in renewable energy projects that are beyond their reasonable control.

(6) Hamakua's position is that the emission cap must remain at this cap amount beyond 2019 until such time as PGV is able to generate and transmit power to Hawai'i Electric Light's grid at pre-eruption amount.



JUL 29 2019
JUL 26 2019

ANTHONY KOYAMATSU
Director
Environmental Division

Hawaiian Electric
Campbell Industrial Park

July 26, 2019

CERTIFIED MAIL NO. 7016 2710 0000 8739 2030
RETURN RECEIPT REQUESTED

Ms. Marianne Rossio, P.E.
Manager, Clean Air Branch
State of Hawaii Department of Health
2827 Waimano Home Road
Hale Ola Building, Room 130
Pearl City, Hawaii 96782

Dear Ms. Rossio:

**Subject: Updated Greenhouse Gas Emissions Reduction Plan
Second Revision to Significant Modification Applications
Covered Source Permit Nos. 0548-01-C, 0240-01-C, 0238-01-C, 0239-01-C,
0234-01-C, 0007-01-C, 0235-01-C, 0232-01-C, 0067-01-C, and 0031-04-C
Attachment II-GHG
Hawaiian Electric Company, Inc.
Hawai'i Electric Light Company, Inc.
Maui Electric Company, Ltd.**

Hawaiian Electric Company, Inc. (Hawaiian Electric), Hawai'i Electric Light Company, Inc. (Hawai'i Electric Light), and Maui Electric Company, Ltd. (Maui Electric), collectively referred to as "Companies", hereby submits an updated Greenhouse Gas Emissions Reduction Plan (GHG ERP) and the second revision to the significant modification applications dated March 28, 2018. These revisions reflect responses received from Department of Health to comments the Companies submitted on May 15, 2019 concerning the proposed CSPs.

The Companies request that DOH modify the partnership aggregate and Hawai'i Island site-specific emissions caps for calendar year 2019, as detailed in Attachment II – GHG, Special Condition C.1.b of the CIP CSP (Permit No. 0548-01-C), and cross-referenced in each of the GHG CSPs, to reflect the loss of renewable energy from Puna Geothermal Venture (PGV), which had previously been included in the calculations in the Companies' GHG ERP.

Table 1 attached shows the proposed cap adjustment as presented in Table A-2 of the enclosed GHG ERP. The derivation of the cap addition is explained in the enclosed GHG ERP Attachment F.

Revisions were also made to item I.E of Form S-6 for all the GHG ERP partnering facilities to update the reference to the corresponding GHG ERP. Enclosed is Form S-6 for each above reference facilities which are direct replacements for the Form S-6 in the applications previously submitted to the Department of Health. No other changes are proposed with this submittal.

Ms. Marianne Rossio, P.E.
Updated GHG ERP and Second Revision to CSP Significant Modification
July 26, 2019
Page 2 of 2

If you have any questions regarding this submittal, please contact Myrna Tandl at 543-4535 or myrna.tandl@hawaiianelectric.com.

Sincerely,



- Attachment: (1) Table 1: Proposed 2019 GHG Limits for PGV Outage
- Enclosures: (1) Updated Greenhouse Gas Emissions Reduction Plan dated July 26, 2019
(2) Revised Form S-6 for Kahe, Waiau, Honolulu, CIP, Kahului, Maalaea, Palaaau, Kanoelehua-Hill, Keahole, and Puna Generating Stations
- Ec (w/Encl.): Michael Madsen, Department of Health, michael.madsen@doh.hawaii.gov
- Cc (w/Encl.): **RETURN RECEIPT REQUESTED**
Mr. Gerardo Rios [Certified Mail No.7016 2710 0000 8739 2047]
Chief, Permits Office, Air Division
U.S. EPA Region 9
75 Hawthorne Street
Mail Code: AIR-3
San Francisco, CA 94105



Table 1
Proposed 2019 GHG Limits for PGV Outage

Company	Covered Source	PGV 100% Operation	Calendar Year 2019 GHG Limits	
		CO ₂ e Emissions Limit (tpy)	GHG Limit Adjustment (tpy)	CO ₂ e Emissions Limit (tpy)
HE	Kahe	2,133,752	0	2,133,752
	Waiau	808,286	0	808,286
	Honolulu	0	0	0
	CIPGS	53,740	0	53,740
HE Subtotal		2,995,778	0	2,995,778
ME	Kahului	154,633	0	154,633
	Maalaea	459,864	0	459,864
	Palaau	26,454	0	26,454
ME Subtotal		640,951	0	640,951
HE	Kanoielehua-Hill	172,456	17,132	189,588
	Keahole	242,208	31,213	273,421
	Puna	31,747	39,535	71,282
	Shipman	0	0	0
HL Subtotal		446,411	87,880	534,291
Hawaiian Electric Companies		4,083,140	87,880	4,171,020
AES Hawai'i		1,691,605	0	1,691,605
Hamakua Energy Power		153,699	97,524	251,223
Kalaeloa Partners, LP		1,094,813	0	1,094,813
Partnership Total		7,023,257	185,404	7,208,661

JUL 29 2019



**Hawaiian Electric
Maui Electric
Hawai'i Electric Light**

Certification

*This certification applies to the July 26, 2019 update of the **Greenhouse Gas Emissions Reduction Plan for the Hawaiian Electric Companies** that is being submitted to the Department of Health in accordance with HAR 11-60.1 Subchapter 11.*

I certify that I have knowledge of the facts set forth therein, that the same are true, accurate, and complete to the best of my knowledge and belief, and that all information not identified by me as confidential in nature shall be treated by the Department of Health as public record.

Name: Robert C. Isler
Title: Vice President, Power Supply, Hawaiian Electric Company

Signature:  Date: 7/24/19



Hawaiian Electric
Maui Electric
Hawai'i Electric Light

JUL 29 2019
F. [unclear]
JUL 26 2019

Greenhouse Gas Emissions Reduction Plan for the Hawaiian Electric Companies

**Submitted to Hawai'i Department of Health
in accordance with HAR 11-60.1 Subchapter 11**

July 26, 2019 Update



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Record of Revisions

Revision No.	Date	Revisions
0	06/30/2015	Original submission to DOH
1	09/08/2017	Designate Campbell Industrial Park Generating Station (CIPGS) CSP No. 0548-01-C as the Main Permit for Partnership; update facility-specific GHG caps in Table A-1 based on latest forecasts; miscellaneous text updates.
2	02/28/2018	Add AES Hawai'i, Kalaeloa Partners LP (KPLP), and Hamakua Energy Power (HEP) as partners; revise GHG Partnership section; add Monitoring explanation.
3	10/15/2018	Change KPLP baseline and cap in Table A-1 to Tier 3 basis per agreement with DOH. Updates to Table 1 and text to address DOH comments rec'd 9/21/2018.
4	05/15/2019	Changes for consistency with CSP comments. Adjust 2019 Hawai'i Electric Light, HEP, and aggregate GHG caps for loss of PGV. Table A-2 added.
5	07/26/2019	Adjust 2019 Hawai'i Electric Light, HEP, and aggregate GHG caps for loss of PGV in accordance with response to comments received from DOH. Attachment F added.



Introduction

Hawaiian Electric Company, Inc. (Hawaiian Electric) and its subsidiaries, Hawai'i Electric Light Company, Inc. (Hawai'i Electric Light) and Maui Electric Company, Ltd. (Maui Electric), (collectively, "Hawaiian Electric Companies" or "Companies") support Hawai'i's goal established in Act 234 of lowering GHG emissions in the state to 1990 levels.

In accordance with Hawai'i Administrative Rules (HAR) under §11-60.1 Subchapter 11, which were adopted to implement Act 234, facilities that have the potential to emit more than 100,000 tons per year of CO₂e (carbon dioxide equivalent) emissions are designated as "Affected Sources." Affected Sources are required to reduce their GHG emissions at least 16% from their 2010 baseline levels by 2020 and thereafter unless the owner or operator can substantiate that a 16% reduction is unattainable and Hawai'i Department of Health (DOH) approves a lesser reduction.¹ The Act 234 regulations also allow Affected Sources to partner with one another to combine their facility-wide GHG emissions caps to leverage emission reductions among partnering facilities to meet the combined GHG emissions caps.²

The Hawaiian Electric Companies operated eleven generating facilities in 2010 that each had the potential to emit more than 100,000 tons per year of CO₂e and, thus, qualify as Affected Sources. Act 234 regulations require an Affected Source to prepare a GHG Emissions Reduction Plan (ERP) that is used by DOH to set the Affected Source's CO₂e emissions cap. The ERP also demonstrates how that cap will be met by 2020. The Hawaiian Electric Companies have prepared this ERP to satisfy that requirement.

The Hawaiian Electric Companies acquire power from Independent Power Producers (IPPs) and from renewable energy sources (e.g., rooftop solar panels, wind farms, utility scale solar installations) that are used to meet customer demand. In the event an IPP has unplanned outages or there is reduced energy output from renewable sources (e.g., due to cloudy or rainy weather, lack of wind, etc.), the Hawaiian Electric Companies must make up for the shortfall by increasing generation from other generating sources. Historically, the shortfall has been made up by the Companies' Affected Sources, thereby increasing their GHG emissions. In the future, the commissioning of new, rapid-response generators such as the Schofield Generating Station in 2018 as well as battery energy storage systems (BESS) charged by renewable energy sources will allow shifting some of that load to facilities that have lower GHG emissions.

¹ HAR 11-60.1-204(c)

² HAR 11-60.1-204(d)(6)(A)



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GHG Reduction Partnership

This section explains the partnership approach used by the Hawaiian Electric Companies and its Partners in preparing their GHG ERPs.

The power generation facilities operating on each of Hawai'i's islands are highly interdependent. If one or more of them cannot produce their scheduled power output, the other facilities on the island must generate more power than planned to make up for the shortfall. A scheduled or unscheduled outage that takes a major generating unit offline for an extended period can significantly shift GHG emissions from one facility to another. Assigning firm GHG emissions caps to individual facilities does not provide sufficient flexibility to accommodate those types of system upsets that are a natural part of system operation.

For these reasons, the Hawaiian Electric Companies and three major Independent Power Producers (IPPs) have elected to use the partnering provisions in Act 234 Regulations³ to create a Partnership involving all eleven of the Hawaiian Electric Companies' Affected Sources, the Hamakua Energy Power (HEP) facility, the AES Hawai'i facility, and the Kalaeloa Partners LP (KPLP) facility (collectively "Partnership Facilities" or "Partnership"). The Partnership has an overall GHG emissions cap that it commits to attain. Individual partnering facilities have site-specific GHG emissions reduction goals that are used to apportion penalties that may be assessed in the event the overall GHG emissions cap is exceeded. The DOH will include the site-specific goals as GHG emissions caps, along with implementing conditions, in each site's Covered Source Permit (CSP). Owing to the operating flexibility that partnering in this manner affords, the Partnership Facilities can commit to an aggregate 16% reduction of GHG emissions from their respective baselines for their facilities. The site-specific and overall GHG emissions reduction targets for the Partnership Facilities are listed in Tables A-1 and A-2 of Attachment A. The two tables present alternative operating scenarios with and without Puna Geothermal Venture (PGV) operating, as explained further in the next section. The Power Supply Improvement Plan (PSIP) for the Hawaiian Electric Companies that was approved by the Hawai'i Public Utilities Commission (PUC) on July 14, 2017⁴ is the blueprint for how that reduction will be accomplished.

The Hawaiian Electric Companies, HEP, AES Hawai'i, and KPLP are submitting separate ERPs for their facilities. The ERPs share the same GHG emissions reduction goals provided in Table A-1 and A-2, but the individual plans explain the GHG baselines, monitoring, and other plan requirements specific to each partner.

³ HAR 11-60.1-204(d)(6)(A).

⁴ *Hawaiian Electric Companies' PSIP Update Report*, PUC Docket 2014-0183. December 23, 2016.



2019 GHG Cap Adjustments for PGV Outage

PGV was forced to stop generating energy in early 2018 by volcanic activity, removing a substantial amount of renewable energy from the system and significantly increasing GHG emissions from the Hawai'i Electric Light and HEP units that have to offset that lost capacity. In 2017 PGV accounted for 33% of total energy generation on Hawai'i Island and is the largest single renewable energy generator in the State. PGV plans to return to operation but the timing is uncertain because of the significant infrastructure damage that occurred. PGV is not expected to return to operation until at least 2020. Loss of PGV qualifies as a reason for DOH to revise the GHG cap under HAR §11-60.1-204(4): "Renewable energy producers cease operations or fail to meet contractual obligations with the affected source, and there are no reasonable alternatives." There are no renewable alternatives to make up for 38 Megawatts (MW) of firm PGV capacity.

PGV's energy generation is equivalent to 185,404 tons of GHG emissions from the Hawai'i Electric Light and HEP fossil fuel units that must operate more to replace it, as detailed in Attachment F. That was calculated by comparing actual emissions in 2017, the last full year PGV operated, with the 12 months from July 2018 to June 2019 when PGV was offline. Table A-2 in Attachment A assigns those emissions to other generating units in proportion to their July 2018 to June 2019 operation. The Hawaiian Electric Companies propose that the caps in Table A-2 only apply for calendar year 2019 while more renewable energy is integrated into the system. For all succeeding years the caps in Table A-1 will apply.

It should be noted that the Companies have experienced delays beyond their direct control involving several new renewable energy projects anticipated in the PSIP that were counted on to lower GHG emissions. The Companies are not seeking an adjustment for these delays, but they have the effect of increasing GHG emissions more than 100,000 tons above what was expected in the earlier ERPs submitted to DOH.

Even with this cap adjustment the Partnering Facilities commit to doing what they can to hold emissions below the Table A-1 limits in 2019. That may include altering unit dispatch priorities to reduce GHG emissions to the extent practicable although large reductions cannot be expected by that means. Since changing dispatch order may be contrary to minimizing customer costs, some level of PUC approval may be required.



Emission Reduction Plan Required Elements

Hawai'i Administrative Rule (HAR) §11-60.1-204(d) states the GHG Emissions Reduction Plan required of Affected Sources shall at a minimum include the following elements:

- (1) **Facility-wide Baseline Annual Emission Rate (tpy CO₂e).** *Calendar year 2010 annual emissions shall be used as the baseline emissions to calculate the required facility-wide GHG emissions cap, unless another baseline year or period is approved by the director. Baseline emissions shall be determined in accordance with section 11-60.1-115, separated between biogenic and non-biogenic emissions, and exclude all emissions of noncompliance with an applicable requirement or permit limit. The owner or operator shall include the data and calculations used to determine the baseline emissions. If calendar year 2010 is deemed unrepresentative of normal operations, then the owner or operator may propose an alternate baseline annual emission rate...⁵*

Attachment A, Table A-1 lists the baseline GHG emissions for the Partnership Facilities. The Hawaiian Electric Companies' facilities all use 2010 calendar year emissions as their baselines. GHG emissions were calculated using the procedures specified in EPA's Mandatory GHG Reporting Rule (40 CFR Part 98, Subpart C). The Kahe, Waiiau, and Honolulu facilities used Tier 3 level calculations specified in §98.33 and the other facilities used Tier 2 level calculations. All baselines shown in Table A-1 for the Hawaiian Electric Companies' facilities are as reported via EPA's e-GGRT system for 2010 except for Campbell Industrial Park Generating Station (CIPGS) and Shipman. For calendar year 2010 CIPGS and Shipman GHG emissions were lower than the 25,000 metric ton reporting threshold under Part 98 so GHG emissions reporting was not required.

- (2) **2020 Facility-wide GHG Emissions Caps.** *Determine the facility-wide GHG emissions cap in accordance with subsection (c), using calendar year 2010 or the proposed GHG baseline emission rate determined by paragraph (1) above. If the required emissions cap requiring a sixteen percent (16%) emission reduction from baseline year emissions is deemed unattainable, the owner or operator shall provide [a justification and proposal for an alternative cap]...*

In determining whether or not the required GHG emissions cap is attainable, the owner or operator of an affected source shall first conduct the GHG control assessment described in paragraphs (3) to (5). Available EPA

⁵ HAR 60.1-204(d)(1)



*guidelines for GHG Best Available Control Technology analysis and GHG control measures by source type shall be used as applicable for this assessment.*⁶

Attachment A, Tables A-1 and A-2 list the overall and facility-specific GHG emissions caps the Partnership Facilities commit to achieving by 2020 to comply with the Rule with all their Affected Sources grouped into one Partnership. The overall GHG emissions cap in Table A-1 reflects a 16% reduction in GHG from their GHG emissions baselines.

Table A-1 shows that the overall GHG emissions reduction target for the Hawaiian Electric Companies is 24.4%, which exceeds the overall 16% GHG emissions reduction for the Partnering Facilities because IPPs will continue to be preferentially dispatched for contractual reasons and because they are the lowest-cost power producers. Most of the generation displaced by renewable energy will come from reduced operation of Hawaiian Electric's Affected Sources.

One of the important benefits of the Partnership for customers is that it allows the GHG emissions reduction goal of Act 234 to be met while maintaining the lowest energy cost to customers.

Monitoring and Reporting to Demonstrate GHG Emissions Reductions

The Hawaiian Electric Companies' facilities will use the same procedures used to establish their GHG baseline emissions, as described in paragraph (1), to calculate their annual GHG emissions and demonstrate the Partnership's compliance with the GHG emissions reduction requirement. GHG emissions for each facility will be reported annually on EPA's e-GGRT system and semi-annually to the DOH.

The Hawaiian Electric Companies' facilities use the GHG emissions calculation procedures specified in 40 CFR Part 98, Subpart C. They are not required to use Continuous Emissions Monitoring Systems (CEMS) for GHG emissions monitoring and do not have all the necessary instrumentation to be able to do so.

- (3) **Available Control Measures.** *Identify all available control measures with potential application for each source type, and all on-the-book control measures the facility is committed or will be required to implement affecting GHG emissions. At a minimum, the following shall be considered as applicable:*
- (A) *Available technologies for direct GHG capture and control;*
 - (B) *Fuel switching or co-fired fuels;*
 - (C) *Energy efficiency upgrades;*

⁶ HAR 60.1-204(d)(2)



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- (D) *Combustion or operational improvements;*
- (E) *Restrictive operations;*
- (F) *Planned upgrades, overhaul, or retirement of equipment;*
- (G) *Outstanding regulatory mandates, emission standards, and binding agreements; and*
- (H) *Other GHG reduction initiatives that may affect the facility's GHG emissions. Unless the owner or operator of the source has direct ownership or legal control over a GHG reduction initiative, that initiative cannot be relied upon as a proposed control strategy. Identification of GHG reduction initiatives, whether or not the owner or operator has ownership or legal control, will serve to highlight their potential importance for reducing GHG emissions in the state. The owner or operator of an affected source will only benefit from a GHG initiative if the initiative reduces or helps to reduce and maintain the source's GHG emissions below its permitted facility-wide GHG emissions cap.⁷*

Table 1 lists the potential GHG emissions control options cited above and their feasibility for the Hawaiian Electric Companies. ERP Attachments referenced in Table 1 further describe the GHG emissions control options and discuss their feasibility and costs.

⁷ HAR 11-60.1-204(d)(3)



TABLE 1 - EVALUATION OF GHG EMISSIONS CONTROL OPTIONS

GHG Control Option	Feasibility and Benefit
(A) Carbon Capture and Storage (CCS)	Not Economically Viable - See Attachment B for details.
(B) Fuel switching or co-firing fuels (Natural Gas)	Not Feasible – The Hawaiian Electric Companies explored importing liquefied natural gas. However, the PUC rejected that option as part of its decision to deny the merger of the Hawaiian Electric Companies with NextEra. See Attachment C for details about the potential GHG emissions benefits.
(C) Fuel switching or co-firing fuels (Biofuels)	Not Feasible to do on a large scale – The Hawaiian Electric Companies are currently permitted and are burning limited quantities of biodiesel. Attachment D contains a discussion of the availability and cost of biodiesel.
(D) Energy efficiency upgrades and combustion improvements	Attachment E summarizes the Hawaiian Electric Companies' evaluation of energy efficiency improvements available to their power generating units. No economically viable improvements were identified that would contribute significantly towards reducing GHG emissions.
(E) Restrictive operations	If one of the generating facilities in the Hawaiian Electric Companies' electrical grids restricts operation to limit its GHG emissions, other facilities must operate more to meet customer demand so the result is that emissions are redistributed rather than reduced or eliminated. The Partnership concept provides flexibility for lower GHG emitting facilities to operate more to lower overall GHG emissions and Hawaiian Electric intends to do this as much as possible within system and economic constraints. However, the GHG emissions reductions available through this route are limited because the more efficient units (e.g., combined cycle combustion turbines) already operate preferentially because they tend to be lower cost generators.



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As new renewable energy projects come online, the operation of existing fossil-fueled units can be reduced or ceased. The Hawaiian Electric Companies have deactivated or retired the following fossil-fuel units since the 2010 baseline year:

- (F) Planned upgrades, overhaul, or retirement of equipment
- Shipman S3 and S4. Permanently decommissioned and CSP closed December 31, 2015.
 - Honolulu H8 and H9. Deactivated January 2014.

Hawaii'i set a 100 percent Renewable Portfolio Standard (RPS) for electrical generation by 2045. The Hawaiian Electric Companies' December 2016 Power Supply Improvement Plan (PSIP) describes how the Companies intend to accomplish that goal.

- (G) Outstanding regulatory mandates, emission standards, and binding agreements

EPA proposed the Affordable Clean Energy (ACE) Rule on August 31, 2018. It is not clear yet whether it will apply to the Hawaiian Electric Companies' oil-fired generating units. The emphasis of ACE Rule is to improve the efficiency of existing generators through measures to be adopted by the states.

The Hawaiian Electric Companies' main strategy for lowering GHG emissions is to continue replacing fossil-fueled generation with utility-scale and distributed (e.g., rooftop solar) renewable energy sources.

- Other GHG emissions reduction initiatives:

Renewable Energy (RE) Projects:

- (H) Wind, Solar, and Battery Energy Storage Systems (BESS)
- Deployment of new flexible, rapid response generation to enable more integration of renewable energy sources.
- Hawaiian Electric - 206.2 MW of new utility scale RE + 70MW BESS
Maui Electric - 8.74 MW of new RE + 9MW BESS
Hawaii'i Electric Light - 3 MW of new RE.

The December 2016 PSIP includes additional utility scale RE coming online between 2017 and 2019:

The December 2016 PSIP also describes new firm generation projects that provide the rapid response capability needed to work with the varying output from renewables. One of these is the Schofield Generating Station that came online in 2018.



- (4) **Technically Feasible Measures.** *For any new control measure identified for the facility, eliminate all technically infeasible options based on physical, chemical, or engineering principles that would preclude the successful operation of the control with the applicable emission unit or source. Document the basis of elimination, and generate the list of technically feasible control options for further evaluation. All committed and required on-the-book measures shall remain on the list.⁸*

As noted above, Table 1 lists the potential GHG emissions control options and their feasibility. Attachments referenced in Table 1 further describe the GHG emissions control options and discuss their feasibility and costs.

- (5) **Control Effectiveness and Cost Evaluation.** *List the technically feasible control options and identify the following for each control measure as applicable. All cost data shall be provided in present dollars.*
- (A) *Control effectiveness (percent pollutant removed);*
 - (B) *Expected emission rate (tons per year CO₂e, pounds CO₂e/kilowatt-hour);*
 - (C) *Expected emission reduction (tons per year CO₂e);*
 - (D) *Energy impacts (BTU, kilowatt-hour);*
 - (E) *Environmental impacts (other media and the emissions of other regulated air pollutants);*
 - (F) *Any secondary emissions or impacts resulting from the production or acquisition of the control measure; and*
 - (G) *Economic impact (cost effectiveness: annualized control cost, dollar/megawatt-hr, dollar/ton CO₂e removed, and incremental cost effectiveness between the control and status quo).*

For committed or required on-the-books control measures and any other GHG control initiatives, identify at a minimum, items (A) through (C) above. Considering the energy, environmental, and economic impact, determine the GHG control or suite of controls found to be feasible in achieving the maximum degree of GHG reductions for the facility. Determine whether the required GHG emissions cap, pursuant to subsection (c) will be met. If an alternate cap must be proposed for approval, declare the proposed percentage GHG reduction and the alternate GHG reduction cap. Provide the justification and associated support information (e.g., references,

⁸ HAR 11-60.1-204(d)(4)



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assumptions, vendor quotes, sample calculations, etc.) to substantiate the control analysis and alternate GHG emissions cap.⁹

As noted above, Table 1 lists the potential GHG emissions control options and their feasibility. Attachments referenced in Table 1 further describe the GHG emissions control options and discuss their feasibility and costs.

- (6) **Proposed Control Strategy.** *Present the listing of control measures to be used for implementation in meeting the required or proposed alternate 2020 facility-wide GHG emissions cap. Include discussion of the control effectiveness, control implementation schedule, and the overall expected GHG CO₂e emission reductions (tpy) for the entire facility. Owners or operators shall also consider the following:*
- (A) *Affected sources may propose to combine their facility-wide GHG emissions caps to leverage emission reductions among partnering facilities in meeting the combined GHG emissions caps. If approved by the director, each partnering facility will be responsible for complying with its own adjusted GHG facility-wide emissions cap.*
 - (B) *Except for fee assessments and determining applicability to this section, biogenic CO₂ emissions will not be included when determining compliance with the facility-wide emissions cap until further guidance can be provided by EPA, or the director, through rulemaking.*
 - (C) *The approved facility-wide GHG emissions cap and the associated monitoring, recordkeeping, and reporting provisions will be made a part of the covered source permit, enforceable by the director.¹⁰*

The Hawaiian Electric Companies will collectively reduce their GHG emissions 16% from the 2010 baseline year, generally in accordance with the power generation forecasts described in their PSIP that was submitted in December 2016 and accepted by the PUC on July 14, 2017.¹¹ Although the PSIPs are not enforceable under Chapter 342B, HRS, Air Pollution Control, they do carry the weight of oversight by the PUC and public expectations.

The Hawaiian Electric Companies' GHG emissions reductions will result directly from increased state-wide reliance on renewable energy sources as detailed in the PSIP. The Hawaiian Electric Companies have consistently met, and exceeded, the Renewable Portfolio Standards (RPS) agreed to as part of the Hawai'i Clean Energy Initiative (HCEI). For instance, in 2015 23.2% of the Companies' overall power

⁹ HAR 11-60.1-204(d)(5)

¹⁰ HAR 11-60.1-204(d)(6)

¹¹ Public Utilities Commission of the State of Hawai'i Decision and Order No. 34696. July 14, 2017.



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generation was from renewable sources,¹² well ahead of the RPS goal of 15% by 2015.¹³ In 2017, 26.8% of the Companies' power generation was from renewable sources. The RPS goals have increased due to House Bill 623, signed into law by Governor David Ige on June 5, 2015, which establishes a new RPS goal of 100% renewables by 2045. In 2017, the GHG emissions from the combined Hawaiian Electric Companies were 20.0% lower than the 2010 baseline year. Continued progress towards the RPS and PSIP goals will assist GHG emissions from power generation to decline further.

As explained in Table 1 and the supporting attachments, the Hawaiian Electric Companies' evaluation of potential GHG emissions control measures identified no additional measures that are technically feasible and cost effective. Accordingly, the Companies do not propose to implement any GHG emissions controls.

As described earlier, the Hawaiian Electric Companies' eleven affected facilities are partnering with three IPPs to meet the GHG emissions reduction target. Table A-1 lists the overall GHG annual emissions limit for the Partnership Facilities along with site-specific GHG emissions limits for each of the Partnering Facilities.

The Hawaiian Electric Companies have designated Campbell Industrial Park Generating Station (CIPGS) as the Main Permit for their affected facilities. The CIPGS CSP will list the Total Partnership GHG emissions cap and the site-specific emissions caps for the Hawaiian Electric Companies' other facilities. The CSPs for the Hawaiian Electric Companies' other facilities will reference the CIPGS CSP for GHG emissions limits.

¹² 2017-2018 Corporate Sustainability Report. Hawaiian Electric Companies. Page 4.

¹³ HRS §269-92(2). It should be noted that the RPS allows affiliated electrical utilities to aggregate their renewable portfolios. HRS §269-93. Accordingly, all GHG emissions reductions referenced in this section represent the aggregate renewable portfolios for Hawaiian Electric, Hawai'i Electric Light, and Maui Electric.

Table A-1: ERP Partnership Baseline CO₂e Emissions and Proposed CSP Limits (1)

Company	Covered Source	Baseline		CSP Limits			CO ₂ e Limit (tpy)
		CO ₂ e Emissions (metric tpy)	(tpy)	CO ₂ e Reduction (%)	CO ₂ e Reduction (tpy)		
Hawaiian Electric (HE)	Kahe	2,518,411	2,776,073	23.1%	642,321		2,133,752
	Waiau	974,642	1,074,359	24.8%	266,074		808,286
	Honolulu	121,208	133,609	100.0%	133,609		0
	CIPGS	13,559	14,946	-259.6%	-38,794		53,740
HESubtotal		3,627,821	3,998,988	25.1%	1,003,210		2,995,778
Maui Electric (ME)	Kahului	209,414	230,839	33.0%	76,206		154,633
	Maalaea	562,012	619,512	25.8%	159,649		459,864
	Palaau	25,615	28,236	6.3%	1,782		26,454
ME Subtotal		797,041	878,587	27.0%	237,636		640,951
Hawai'i Electric Light (HEL)	Kanoelehua-Hill	202,106	222,784	22.6%	50,328		172,456
	Keahole	173,623	191,387	-26.6%	-50,821		242,208
	Puna	90,438	99,691	68.2%	67,944		31,747
	Shipman	9,246	10,192	100.0%	10,192		0
HEL Subtotal		475,413	524,053	14.8%	77,642		446,411
Hawaiian Electric Companies		4,900,275	5,401,629	24.4%	1,318,488		4,083,141
AES Hawai'i		1,525,526	1,681,605	-0.6%	-10,000		1,691,605
Hamakua Energy Power		165,992	182,975	16.0%	29,276		153,699
Kalaeloa Partners, LP		993,198	1,094,813	0.0%	0		1,094,813
Partnership Total		7,584,991	8,361,022	16.00%	1,337,764		7,023,258

Notes:

- (1) Table A-2 applies for calendar year 2019 only due to loss of PGV renewable energy.
- (2) Selections of facility emissions baselines are described in the individual GHG Emission Reduction Plans for the Hawaiian Electric Companies, AES Hawai'i, Kalaeloa Partners, LP (KPLP), and Hamakua Energy Power (HEP).
- (3) CIPGS (Campbell Industrial Park Generating Station) is designated as the Main CSP for the Hawaiian Electric Companies' Emissions Reduction Plan.

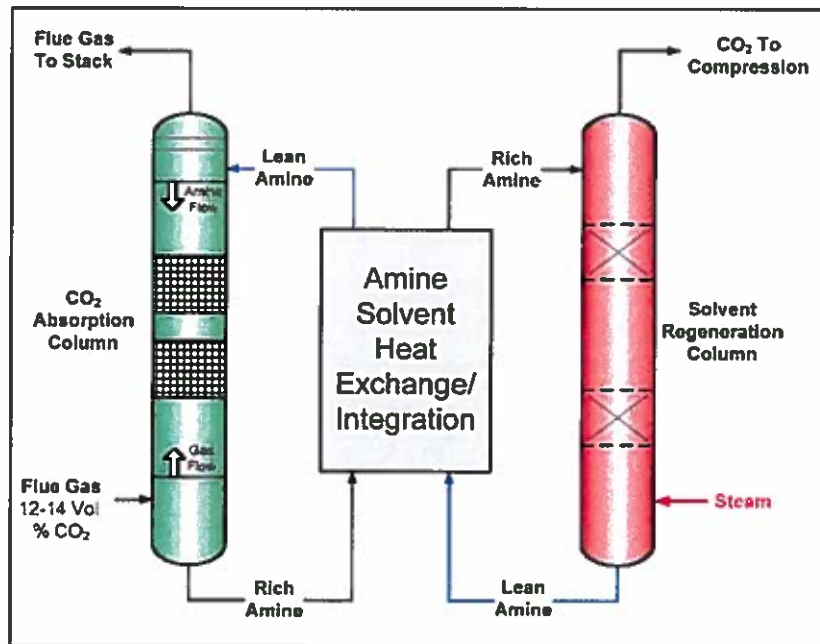
Table A-2: Substitute 2019 GHG Limits for PGV Outage

Company	Covered Source	PGV 100% Operation		Calendar Year 2019 GHG Limits	
		CO2e Emissions Limit (tpy)	GHG Limit Adjustment (tpy)	CO2e Emissions Limit (tpy)	CO2e Emissions Limit
HECO	Kahe	2,133,752	0	2,133,752	
	Waiau	808,286	0	808,286	
	Honolulu	0	0	0	
	CIPGS	53,740	0	53,740	
HE Subtotal		2,995,778	0	2,995,778	
MECO	Kahului	154,633	0	154,633	
	Maalaea	459,864	0	459,864	
	Palaa	26,454	0	26,454	
	ME Subtotal		640,951	0	640,951
HELCO	Kanolehua-Hill	172,456	17,132	189,588	
	Keahole	242,208	31,213	273,421	
	Puna	31,747	39,535	71,282	
	Shipman	0	0	0	
HEL Subtotal		446,411	87,880	534,291	
Hawaiian Electric Companies		4,083,140	87,880	4,171,020	
AES Hawai'i		1,691,605	0	1,691,605	
Hamakua Energy Power		153,699	97,524	251,223	
Kalaeloa Partners, LP		1,094,813	0	1,094,813	
Partnership Total		7,023,257	185,404	7,208,661	

Carbon Capture and Storage

Carbon Capture and Storage (CCS) is composed of two major functions; CO₂ capture and CO₂ storage. A number of methods may potentially be used for separating the CO₂ from the exhaust gas stream, including adsorption, physical absorption, chemical absorption, cryogenic separation, and membrane separation (Wang et al., 2011). Many of these methods are either still in development or not suitable for treating power plant flue gas due to the characteristics of the exhaust stream (Wang, 2011; IPCC, 2005). Of the potentially applicable post-combustion CO₂ capture options, the use of an amine solvent such as monoethanolamine (MEA) it is the most mature and well-documented technology (Kvamsdal et al., 2011). Figure B-1 illustrates the amine-based post-combustion capture process.

FIGURE B-1 SCHEMATIC DIAGRAM OF AMINE-BASED CO₂ CAPTURE PROCESS



Source: Interagency Task Force on Carbon Capture and Storage, 2010

EPA generally considers post-combustion CO₂ capture with an amine solvent to be technically feasible for natural gas fired combined cycle combustion turbines and coal fired power plants. However, this technology has not been demonstrated on simple cycle combustion turbines and reciprocating engines. Part of the reason is that the flue gas temperature from simple cycle turbines and reciprocating engines is much higher than from combined cycle turbines and boilers so the gases have to be cooled prior to scrubbing going to the CO₂ absorption column. While still feasible, that adds cost and makes it less economically practical. A more fundamental difficulty with using amine absorption for combustion turbines of either type as well as reciprocating engines is that the CO₂ concentration in the flue gas is

Attachment B – Carbon Capture and Storage

lower than 6 percent. That concentration is much lower than other types of power plants, such as coal fired power plants, where the CO₂ concentration may be as high as 12-15 percent by volume in the post combustion flue gas stream. As a result, the amine system equipment has to be more than twice as large for the same amount of CO₂ captured. That greatly increases the treatment cost. Although significant challenges exist, CCS cost estimates are provided in Tables B-1 and B-2. The data in the tables do not reflect the higher cost associated with treating low-CO₂ concentration flue gases from combustion turbines and reciprocating engines.

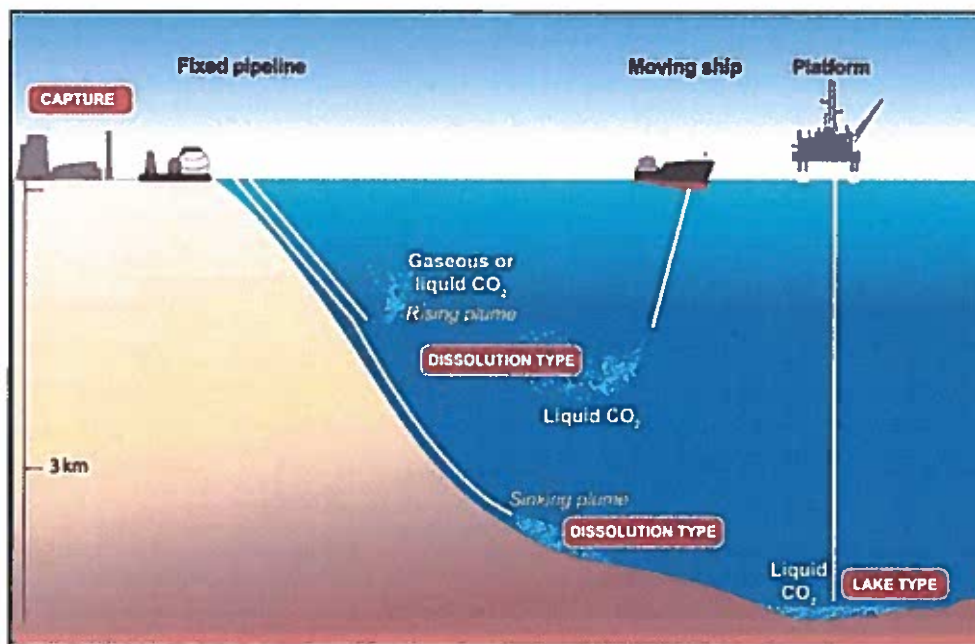
Hawai'i's remote location imposes many additional challenges implementing CO₂ storage that are not present for continental U.S. sources. Hawaiian Electric is not aware of any proven CO₂ geological storage sites on Hawai'i. Therefore, ocean storage, i.e., direct CO₂ release into the ocean water column or onto the deep seafloor, appears to be the most readily available CO₂ storage option.

As shown in Figure B-2, CO₂ ocean storage potentially could be implemented in two ways:

- By injecting and dissolving CO₂ into the water column (typically below 1,000 meters) via a fixed pipeline or a moving ship, or
- By depositing CO₂ via a fixed pipeline or an offshore platform onto the sea floor at depths below 3,000 m, where CO₂ is denser than water and is expected to form a "lake" that would delay dissolution of CO₂ into the surrounding environment.

Ocean storage and its ecological impacts are still in the research phase and the legal status of intentional ocean storage is unknown (Herzog, 2010; IPCC, 2005; Purdy, 2006).

FIGURE B-2 OVERVIEW OF OCEAN STORAGE CONCEPTS



Source: IPCC, 2005

Attachment B – Carbon Capture and Storage

The first step to costing CCS is calculating CO₂ emission rates. CO₂ emissions from power generation are a function of fuel type and the heat rate of the generating unit. Due to the large number of generating units and the various current and future fuel types, the costing is based on typical generating unit configurations.

Table B-1 lists the estimated total annual cost on a \$/million Btu (MBtu) basis to add CCS based on fuel type. The estimate includes the amine absorber system cost, the onshore CO₂ storage cost, and the ocean injection cost. The total annual estimated cost ranges from \$5.64 to \$7.99 per MBtu of heat input.

As noted earlier, due to the absence of suitable subterranean formations, geological storage does not appear to be a viable option in Hawai'i. Even if available, using geological storage instead of ocean storage would not lower the cost. The listed estimated total ocean CO₂ storage cost of \$13.80 per ton (\$2.00 + \$4.81 + \$6.99 = \$13.80) is actually lower than the estimated total cost for geological storage (\$8.53 to \$19.51 per ton)¹⁴.

Table B-2 lists the estimated total annual cost for CCS on a \$/kW basis for various fuel and generating unit types. These costs range from 7¢ to 10¢ per kWh based on maximum operation. These costs would be higher based on actual operating levels. That means that power cost to customers would have to increase 25% or more from 2016 rates, depending on location, to pay for CCS.

¹⁴ Table 9 of the National Energy Technology Laboratory report "Quality Guidelines for Energy System Studies: Estimating Carbon Dioxide Transport and Storage Costs" (DOE/NETL-2013/1614), dated March 14, 2013.

Attachment B – Carbon Capture and Storage

TABLE B-1 ESTIMATED TOTAL ANNUAL CCS COST (\$/MBTU)

Carbon Capture and Storage (CCS) Component	Cost (\$/ton CO ₂ Captured)	CO ₂ Emissions ¹ (lb/MMBtu)	% Captured ²	CO ₂ Emissions Captured (lb/MMBtu)	Total Annual Cost (\$/MMBtu)
No. 6 Fuel Oil					
CO ₂ Capture and Compression ³	93.44				\$6.96
Onshore CO ₂ Storage ⁴	2.00	165.6	90%	149	\$0.15
Ship transport to injection ship ⁴	4.81				\$0.36
Injection ship, pipe and nozzle ⁴	6.99				\$0.52
Total Cost (Biodiesel)	107.24				\$7.99
No. 2 Fuel Oil					
CO ₂ Capture and Compression ³	93.44				\$6.87
Onshore CO ₂ Storage ⁴	2.00	163.1	90%	147	\$0.15
Ship transport to injection ship ⁴	4.81				\$0.35
Injection ship, pipe and nozzle ⁴	6.99				\$0.51
Total Cost (Diesel)	107.24				\$7.88
Natural Gas					
CO ₂ Capture and Compression ³	93.44				\$4.91
Onshore CO ₂ Storage ⁴	2.00	117.0	90%	105	\$0.11
Ship transport to injection ship ⁴	4.81				\$0.25
Injection ship, pipe and nozzle ⁴	6.99				\$0.37
Total Cost (Natural Gas)	107.24				\$5.64

Notes:

1. Emission factors from the Mandatory Greenhouse Gas Reporting rule (40 CFR Part 98 Subpart C, Table C-1).
2. Typical value for amine absorber systems (Interagency Task Force on Carbon Capture and Storage, 2010; NETL, 2013).
3. The CO₂ capture and compression cost is based on information presented in Figure III-1 of the Report of the Interagency Task Force on CCS, dated August 2010. The listed dollar per ton of CO₂ captured is the cost of applying post-combustion CCS to an existing natural gas fired combined cycle power plant. The listed cost (\$103 per metric ton or \$93.44 per ton) is based on continuous operation (8,760 hrs per unit per year at base load for each fuel type).
4. Costs are from Table 6.6 of the IPCC Special Report on Carbon Dioxide Capture and Storage, dated 2005.

Attachment B – Carbon Capture and Storage

TABLE B-2 ESTIMATED TOTAL ANNUAL CCS COST (\$/KWH)

Unit Type	Typical Heat Rate (Btu/kWh)	Fuel Type	Total Annual Cost (\$/MMBtu)	CO ₂ Removal Cost (\$/kWh)
Boiler	12,000	No. 6 Fuel Oil	\$7.99	0.10
		No. 2 Fuel Oil	\$7.88	0.09
		Natural Gas	\$5.64	0.07
Simple Cycle Combustion Turbine	9,500	No. 2 Fuel Oil	\$7.88	0.09
		Natural Gas	\$5.64	0.07
Combined Cycle Combustion Turbine	7,500	No. 2 Fuel Oil	\$7.88	0.09
		Natural Gas	\$5.64	0.07
Reciprocating Engine	8,000	No. 2 Fuel Oil	\$7.88	0.09
		Natural Gas	\$5.64	0.07

Note - Costs are based on continuous operation at base load. Costs based on actual operating levels would be higher.

References

- Herzog, H.J., 2010. Scaling up carbon dioxide capture and storage: From megatons to gigatons, *Energy Econ.* doi:10.1016/j.eneco.2010.11.004
- Interagency Task Force on Carbon Capture and Storage, 2010. "Report of the Interagency Task Force on Carbon Capture and Storage," dated August 2010.
- Intergovernmental Panel on Climate Change, 2005. IPCC Special Report on Carbon Dioxide Capture and Storage. Prepared by Working Group III of the Intergovernmental Panel on Climate Change. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.
- Kvamsdal, H., Chikukwa, A., Hillestad, M., Zakeri, A., & Einbu, A., 2011. A comparison of different parameter correlation models and the validation of an MEA-based absorber model. *Energy Procedia*, 4, 1526-1533.
- Purdy, Ray, 2006. The Legal Implications of Carbon Capture and Storage Under the Sea. *Sustainable Development Law and Policy*, Fall 2006, 22-26
- Wang, M., Lawal, A., Stephenson, P., Sidders, J., & Ramshaw, C., 2011. Post-combustion CO₂ capture with chemical absorption: A state-of-the-art review. *Chemical Engineering Research and Design*, 89, 1609-1624.

Natural Gas Conversion GHG Emissions Reduction

The Hawaiian Electric Companies pursued importation of liquefied natural gas (LNG) to lower fuel costs and air emissions, including GHG. However, after the PUC denied the merger of the Hawaiian Electric Companies with NextEra¹⁵ the Companies withdrew their application for approval of LNG Supply Agreements.

Substitution of natural gas fuel can significantly reduce GHG emissions from power generation. To the extent that LNG replaces no. 2 (diesel) fuel oil and no. 6 fuel oil, GHG emissions are 28 to 30 percent lower per million Btu (MMBtu) of fuel heat input as shown by the emissions factors in Table C-1. Net GHG emissions are reduced by a lesser amount, probably in the 25-28% range, because more heat input is typically required from gas than oil for the same amount of power generated. It is unlikely that LNG would make up 100% of the Companies' fuel consumption so the overall GHG reduction would be correspondingly lower.

TABLE C-1 NATURAL GAS CONVERSION CO₂ EMISSIONS REDUCTION CALCULATION

Fuel	GHG Pollutant ¹	Emission Factor ² (kg/MMBtu)	Global Warming Potential ³	Total GHG Emissions as CO ₂ e (lb/MMBtu)
No. 6 Fuel Oil	CO ₂	75.10	1	165.6
	N ₂ O	6.0E-04	298	0.3942
	CH ₄	3.0E-03	25	0.1653
Total CO₂e =				166.2
No. 2 Fuel Oil	CO ₂	73.96	1	163.1
	N ₂ O	6.0E-04	298	0.3942
	CH ₄	3.0E-03	25	0.1653
Total CO₂e =				163.7
Natural Gas	CO ₂	53.06	1	117.0
	N ₂ O	1.0E-04	298	0.0657
	CH ₄	1.0E-03	25	0.0551
Total CO₂e =				117.1
No. 6 Fuel Oil to Natural Gas Reduction = 29.5%				
No. 2 Fuel Oil to Natural Gas Reduction = 28.4%				

Notes:

1. Greenhouse Gas (GHG) pollutants from the Mandatory Greenhouse Gas Reporting rule (40 CFR §98.32).
2. Emission factors from the Mandatory Greenhouse Gas Reporting rule (40 CFR Part 98 Subpart C, Tables C-1 and C-2).
3. Global Warming Potentials from the Mandatory Greenhouse Gas Reporting rule (40 CFR Part 98 Subpart A, Table A-1).

¹⁵ Public Utilities Commission of the State of Hawai'i Decision and Order No. 33795. July 15, 2016.

Biofuel Conversion GHG Emissions Reduction

1. Availability

Biodiesel has been used as fuel for power generation on a limited scale but there is not enough supply to replace a significant portion of the fuel consumed by the Hawaiian Electric Companies. According to the U.S. Energy Information Administration (EIA) Biodiesel Production Report for July 2018, biodiesel (as B100) production capacity in Hawai'i was only about 6 million gallons per year (MGY). Campbell Industrial Park (CIPGS) alone burned 7.7 million gallons in 2017. U.S. production capacity was 2370 MGY but only 209 MGY of that was on the west coast where delivery to Hawai'i would be practical. By comparison, the Hawaiian Electric Companies used 370 million gallons of residual and distillate fuels in 2013.

In order for biodiesel to become sufficiently available to provide fuel for the State's electricity needs, dedicated energy crops would be required. But it is uncertain whether those crops would be adequate for the competing fuel needs throughout the State. Furthermore, biodiesel production is constrained by limited land availability and unpredictable financial incentives. A 2010 study on the potential for biofuel production in Hawai'i concluded that biodiesel produced from waste fats, oils, and greases would account for only one half of one percent of current diesel fuel usage (B&V, 2010). The same study estimated the theoretical biodiesel potential from waste oil as 2 to 2.5 million gallons per year (MGY).

Hawaiian Electric recently obtained a contract with Pacific Biodiesel to purchase approximately 3 MGY of biodiesel, primarily for CIPGS. At this time, Pacific Biodiesel is the only producer of biodiesel located in the State of Hawai'i. Another company, Imperium Renewables Hawai'i, announced plans to develop and build a biodiesel plant in Kapolei (O'ahu) several years ago but the project was unsuccessful due to financial reasons. Subsequently, the PUC rejected Hawaiian Electric's proposal to import biodiesel from Imperium's production plant in Washington State because of high costs. To the extent possible, Hawaiian Electric and the PUC would prefer to use locally-produced biofuels. But there simply is not enough biodiesel supply available to significantly lower Hawaiian Electric's greenhouse gas emissions without drastically increasing the cost.

2. Cost

Table D-1 summarizes Hawaiian Electric's April 2015 fuel price forecasts. Historically, biodiesel has not been economically competitive compared to petroleum diesel without some type of governmental incentive. Our forecast shows that through 2019, the price of biodiesel will be approximately double that of our current fuel mix.

In addition to fuel cost, capital cost would be necessary to provide the infrastructure for receiving and storing biodiesel. Indirect costs such as permitting, performance testing, and engineering would likely add to the overall cost of switching to biodiesel. From an energy standpoint, biodiesel is similar to traditional diesel but contains about 7-10% less energy per gallon. Thus, the cost of biodiesel compared to diesel is higher but the energy content is lower.

Attachment D – Biofuel Conversion GHG Emissions Reduction

Biodiesel prices are expected to continue to rise. Although current generation biodiesel production facilities are more efficient and benefit from economies of scale, feedstock costs have remained high (B&V, 2010). Generally, waste oils are the least expensive but are not always available in large quantities. Furthermore, the U.S. biodiesel industry is highly dependent on financial incentives such as the Federal blender tax credit. The unpredictability of the biofuel market does not align with Hawaiian Electric's priority to provide reliable and low cost electricity. Further, we believe that it is questionable whether the PUC will approve large-scale conversions to biodiesel because of the potential cost impact on the Companies' customers.

TABLE D-1 BIODIESEL FUEL COST COMPARISON

Hawaiian Electric's 2018 Fuel Price Forecast				
	\$/million Btu			
Year	No. 2 Diesel	LSFO	ULSD	Biodiesel
2018	15.82	13.08	16.88	31.84
2019	14.96	12.17	16.02	31.76
2020	15.86	12.99	16.96	32.93
2021	16.20	13.26	17.32	33.71

References

- EIA (U.S. Energy Information Administration), 2015. "Monthly Biodiesel Production Report," dated March 2015.
- B&V (Black and Veatch Corp.), 2010. "The Potential for Biofuels Production in Hawai'i," dated January 2010.
- Hawaiian Electric, 2018 Fuel Price Forecast. Received from C. Reyes 7/6/2018.

Attachment E – Potential Energy Efficiency Improvements

Potential Energy Efficiency Improvements

Improving the efficiency when fuel energy is converted to usable power output reduces the amount of fuel that has to be combusted to satisfy power demand, in turn decreasing the emissions of greenhouse gases and other air pollutants that are created in the combustion process. Additionally, improved energy efficiency reduces the cost of power generation because of the lower fuel requirement.

Energy efficiency of power generating units can be improved through changes to technology (equipment), processes, and practices. But most of the cost-effective improvements available to power generators have already been made to reduce fuel cost since fuel is such a large part of the total cost of power generation. That is especially true for Electrical Generating Units (EGU) like Hawaiian Electric's that burn oil, which is a relatively high cost fuel. Energy efficiency improvement is one of the four Building Blocks that EPA relied on to develop its proposed *Carbon Pollution Emission Guidelines for Existing Stationary Sources: Electric Utility Generating Units*.¹⁶ In the preamble to the proposed rule EPA stated that they decided not to include efficiency improvement by oil-fired EGUs as an element of their Best System for Emissions Reduction (BSER) evaluation for GHG emissions because the potential GHG reductions are small compared to the reductions available from other types of power generation.¹⁷

Nevertheless, potential energy efficiency improvements for the Hawaiian Electric Companies' boilers, combustion turbines, and diesel electric generator sets are discussed in this section.

Boilers

The major portion of the Hawaiian Electric Companies' power generation comes from boilers that power steam turbine electric generators. The Hawaiian Electric Companies operate their boilers as efficiently as practicable. An important incentive for doing so is that the PUC establishes efficiency standards that must be met for the Company to fully recover the cost of the fuel used in power generation. Hawaiian Electric assures that its boilers operate at optimal energy efficiency a number of ways. One is by daily tracking and reporting of Heat Rate (HR) for each unit. Heat Rate, a measure of overall power generation efficiency that is commonly used in the power generation industry, is the ratio of the total fuel energy input divided by the net amount of power exported to customers, usually reported as Btu of fuel energy consumed per Kilowatt-hour of power exported (Btu/KWh). The lower the Heat Rate, the more efficiently the unit is operating. Heat Rate trends are a sensitive indicator of efficiency changes somewhere in the system. The Hawaiian Electric Companies also have aggressive Heat Rate improvement programs that follow the guidelines developed by the Electric Power Research

¹⁶ 79 Fed. Reg. 34830, June 18, 2014.

¹⁷ *Ibid.* p. 34877.

Attachment E – Potential Energy Efficiency Improvements

Institute (EPRI).¹⁸ Those guidelines are based on the best practices used in the industry for improving and maintaining energy efficiency.

Maui Electric's four boilers and Hawai'i Electric Light's two boilers underwent energy assessments and tune-ups in 2014 that were required by 40 CFR Part 63 Subpart JJJJJ, NESHAP for Industrial, Commercial, and Institutional Boilers Area Sources. The assessments, performed by a certified independent combustion engineer, concluded that the overall condition of the boilers is good and that good efficiency practices are followed. All the Maui Electric and Hawai'i Electric Light boilers are tested annually to confirm their efficiency and tune-ups are required under Subpart JJJJJ once every five years.

Hawaiian Electric's boilers compare favorably for energy efficiency with other oil-fired EGUs in the U.S. The Energy Information Administration (EIA) collects and publishes Heat Rate data for several categories of EGUs. For the 2009 to 2013 period, EIA reported that the average HR for petroleum-fired EGUs was 10.9 MBtu/MWh.¹⁹ By comparison, Hawaiian Electric's fourteen boilers on O'ahu averaged lower than 10.6 MBtu/MWh Heat Rate in the first 6 months of 2015. That is very good performance given the Hawaiian Electric boilers' operating rates.

Traditional style power plants were designed to operate near full capacity, often termed base-loaded, where they are most efficient. Operating them at lower and varying loads reduces their efficiency. Hawaiian Electric's boilers operate below full capacity. During 2012 through 2014, for instance, their average operating load was less than 60% of online capacity. There are two reasons for the lower load. One is that, unlike utilities on the mainland, Hawaiian Electric operates an isolated system. It cannot draw power from neighboring utilities in the event of system upsets so it must be entirely self-sufficient. To protect against power outages, Hawaiian Electric keeps enough unused generation capacity online as spinning reserve to absorb unexpected loss of the largest generation facility that is operating at any time.

Another factor that keeps operating load lower than ideal is imposed by the increasing amount of renewable energy that has been integrated into Hawaiian Electric's system. The output for renewable energy sources such as solar and wind is variable and intermittent because clouds reduce solar panel output and variable wind speeds reduce windmill output. Consequently, Hawaiian Electric's boilers must vary their operation in order to match overall system output with demand. The result of those constraints on operating load is that Hawaiian Electric's boilers typically operate below their peak efficiencies. Despite these constraints, as noted above, their HRs are competitive with those of mainland utilities, which generally do not have the same constraints.

¹⁸ *Heat Rate Improvement Guidelines*. EPRI, Palo Alto, CA: 2012. Publication 1023913.

¹⁹ *Electric Power Annual*. U.S. EIA. March 23, 2015 release, Table 8.1.

Attachment E – Potential Energy Efficiency Improvements

Combustion Turbines

Combustion Turbines (CT) represent the Hawaiian Electric Companies' second-largest source of power generation. The Company operates three CTs on O'ahu, four on Maui, and five on Hawai'i Island.

The energy efficiency of CTs is highest when they operate in combined cycle mode rather than simple cycle. In simple cycle, the hot gases from the turbine are exhausted to the atmosphere, whereas in combined cycle hot exhaust gases pass through a heat recovery steam generator, where steam passes through a turbine to generate additional power.

All four of Maui's and two of Hawai'i Island's CTs are capable of operating in combined cycle mode. No other significant energy efficiency improvements have been identified.

The remaining three CTs on Hawai'i Island and three on O'ahu are simple cycle units. Although their energy efficiency could be improved by converting them to combined cycle, the Companies evaluated doing so and concluded that it would not be feasible given the function that the simple cycle CTs serve on the current system. These units operate less than 10 percent of the time and instead are used to provide fast response power in case of shortages on the system. Unlike boilers, which take a long time to start up, simple-cycle CTs can be started up quickly when needed. In contrast, it takes significantly longer to bring a combined-cycle CT fully online. Operating the current simple-cycle CTs in combined-cycle mode would defeat much of the reason they are used. Hawaiian Electric has not identified any energy efficiency improvements for its CTs that fit within the current design of its system. That does not rule out system design changes that could accommodate combined cycle combustion turbines; however, such changes could not be implemented before 2020, the compliance date for Act 234 units.

Diesel Electric Generators

Diesel electric generators (DEGs) have generally lower power output capability than boilers or combustion turbines and are mainly used to serve lower loads, typically in remote locations. DEGs also have the advantage that they can be brought online and ramped up quickly.

The Hawaiian Electric Companies operate DEGs that range in size from 1 MW to 12.5 MW each.

Hawaiian Electric received the following information from Valley Power Systems Northwest. Valley Power has supplied diesel generation equipment to the Hawaiian Electric Companies and is familiar with their DEGs.²⁰ Diesel electric generators are generally very efficient in converting fuel energy into electric power. There are few options available for improving their energy efficiency. One option is to install a turbocharger if a unit is not already equipped with one. However, all the DEGs covered by the Companies GHG Partnership already are equipped with

²⁰ Verbal communication between Dave Peterson of Valley Power Systems Northwest and Greg Narum of Hawaiian Electric, March 20, 2015.

Attachment E – Potential Energy Efficiency Improvements

turbochargers. Another option is to upgrade from 2-pass to 4-pass after-coolers, which can improve efficiency 1-3%. However, this may not be practical for Hawaiian Electric Companies' units because of their age and design. The benefit in terms of GHG emissions reduction would be small in any case, amounting to about 120 metric tons per year of CO₂e for a 2% efficiency improvement of a 1 MW generator.

An approach that would more substantially reduce GHG emissions would be to replace the existing diesel engine generators with newer, more efficient models. Hawaiian Electric estimates that heat rates could be improved 10% to 20%, depending on the unit, by replacing the Companies' larger DEGs with new units similar to those constructed at the Schofield Generating Station.²¹ According to data Hawaiian Electric submitted to the Public Utilities Commission, the 2015 installed cost for new DEG capacity up to 100MW is \$2970/KWh.²² Assuming a 15% heat rate improvement averaged over all the units, the fuel cost savings would be about \$280 per year per KW of capacity based on estimated 2015 fuel costs²³ and 8500 hours per year of operation. Therefore, it would require about 10 years for the energy savings to pay back the investment cost. That cost can only be justified if the existing unit is nearing the end of its useful life.

Summary of Potential Energy Efficiency Improvements

The Hawaiian Electric Companies operate their power generating units at energy efficiencies that are equivalent to or better than mainland averages for oil-fired generators despite constraints imposed by their isolated location. The Company has researched additional opportunities for improving efficiency beyond steps already taken but has not identified any that are operationally and economically justified given current system designs and needs.

²¹ Email from Robert Isler of Hawaiian Electric Generation Planning Department. June 22, 2015.

²² *Hawaiian Electric Power Supply Improvement Plan*. Table F-11. Docket 2011-0206. August 2014.

²³ *Ibid*, Table F-5.

Attachment F – Puna Geothermal Venture Equivalent GHG Emissions

The equivalent GHG emissions reduction from PGV’s energy generation was calculated by comparing the combined actual emissions from Hawai’i Electric Light and HEP in 2017, the last full year PGV operated, with the 12 months from July 2018 to June 2019 when PGV was offline. The difference, 185,404 tons, was distributed among the generating facilities in proportion to their July 2018 to June 2019 operation. The result is tabulated in Table A-2.

The derivation of PGV’s equivalent GHG emissions is summarized below.

Source	GHG Emissions, tons	
	PGV Online	PGV Offline
	2017	July 2018-June 2019
HELCO		
Keahole	193,103	260,090
Kaneolehua-Hill	243,346	180,345
Puna	26,400	67,806
HEP	98,962	238,974
HELCO-HEP Total	561,811	747,215
GHG Adjustment for PGV		185,404

8

JUL 29 2019

FCST/PAK
JUL 26 2019

**Revised Form S-6
Campbell Industrial Park Generating Station
CSP No. 0548-01-C
July 2019**

S-6: Application for a Significant Modification to a Covered Source

In providing the required information, reference the corresponding letters and numbers listed below.

Provide a minimum of **two (2)** sets (1 original and 1 copy) of all application materials to the Hawaii Department of Health. Also, mail **one (1)** set directly to EPA at the following address:

Chief (Attention: AIR-3)
Permits Office, Air Division
U.S. Environmental Protection Agency
Region 9
75 Hawthorne Street
San Francisco, CA 94105

I. In accordance with Hawaii Administrative Rules (HAR) §11-60.1-104, the following information is required:

A. Equipment Specifications:

1. Maximum design capacity. CIP1 is a Siemens Westinghouse Power Corporation SGT6-3000E (135 MW nominal) combustion turbine.
2. Fuel type. CIP1 is currently permitted to burn naphtha, fuel oil No. 2, biodiesel (B100 and B99), and blends of fuel oil No. 2 and biodiesel (B100 and B99) with a maximum sulfur content of 0.05% by weight.
3. Fuel use. CIP1 has a maximum hourly fuel consumption rate of 1,482.6 MMBtu/hr.
4. Production capacity. Does not apply.
5. Production rates. Does not apply.
6. Raw materials. Does not apply.
7. Provide any manufacturer's literature. This application does not change CIP1's manufacturer's specifications.

B. Provide detailed descriptions of all processes and products defined by Standard Industrial Classification Code (SICC). Also, provide any reasonably anticipated alternative operating scenarios, associated processes, and products, by SICC.

Electrical power generation (SIC code 4911) is the only product or process.

No additional changes to operating scenarios are proposed with this application.

1. Identify and describe in detail all air pollution control equipment and compliance monitoring devices or activities planned by the owner or operator, and to the extent of available information, an estimate of emissions before and after controls. Provide all calculations and assumptions.

NO_x emissions are controlled by water injection. SO₂ emissions are controlled by limiting the biodiesel fuel sulfur content to 50 ppm. Emissions of PM, PM₁₀, PM_{2.5}, CO, and VOC are controlled by combustion design and good combustion practices. Emissions of any hazardous air pollutants are controlled by the use of No. 2 diesel or biodiesel and combustion system design.

2. List all **new insignificant** activities in accordance with §11-60.1-82.

No additional changes/additions to insignificant activities are proposed with this application.

- C. Maximum Operating Schedule (to the extent needed to determine or regulate emissions):
1. Total hours per day, per week, and/or per month. Depending on future dispatch requirements, the plant may cycle off-line daily, or operate at reduced loads. While these expected operating levels are less than continuous, there may be times when a unit must be run continuously for extended periods of time. Thus, this application does not include any daily, weekly, or monthly operating limits.
 2. Total hours per year. Up to 8,760 hours per year.
 3. If operation is seasonal or irregular, describe. Refer to I.C.1 above.
- D. Cite and describe all applicable requirements as defined in HAR §11-60.1-81, including the following:
1. Description of or reference to any applicable test methods for determining compliance with each applicable requirement. See Form C-2.
 2. Explanation of all proposed exemptions from any applicable requirements. See Forms C-1 and C-2.
- E. Identify and describe current operational limitations or work practices the source plans to implement that affect emissions of any regulated or hazardous air pollutant. Provide all calculations and assumptions.
- See item I.B.1. above for current work practices that affect emissions of any regulated or hazardous air pollutant.
- Hawaiian Electric requests incorporation of the Greenhouse Gas emissions limitations into the Covered Source Permit CSP No. 0548-01-C, consistent with the Greenhouse Gas Emissions Reduction Plan (GHG ERP) submitted to the DOH on February 28, 2018, the subsequent updates submitted to the DOH on October 17, 2018 and May 15, 2019, and the latest update dated July 26, 2019, enclosed with this application.
- F. Provide a detailed schedule for construction or modification of the proposed source, including any major milestones, if applicable. Not applicable.
- G. Provide detailed information to define permit terms and conditions for any proposed **emissions trading** within the facility in accordance with HAR §11-60.1-96. No emissions trading is proposed.
- H. For **significant** modifications which increase the emissions of any air pollutant or result in the emission of any air pollutant not previously emitted, an assessment of the ambient air quality impact of the covered source or significant modification, with the inclusion of any available background air quality data. The assessment shall include all supporting data, calculations and assumptions, and a comparison with the National Ambient Air Quality Standards and State Ambient Air Quality Standards. Do not apply. The proposed modification will not increase the emissions of any air pollutant or result in the emission of any air pollutant not previously emitted.
- I. For **new** covered sources or **significant** modifications subject to the requirements of subchapter 7 of HAR Chapter 11-60.1, all analyses, assessments, monitoring, and other application requirements of subchapter 7. Do not apply. The proposed modification is not subject to Subchapter 7 of HAR Chapter 11-60.1.
- J. Provide the following for Compliance purposes:

1. A compliance plan, Form C-1.
 2. A compliance certification, Form C-2.
- II. Submit an application fee according to the Application Fees Schedule in the Instructions for Applying for an Air Pollution Control Permit.**
- III. Provide other information as follows:**
- A. As required by any applicable requirement or as requested and deemed necessary by the director to make a decision on the application.
 - B. As may be necessary to implement and enforce other applicable requirements of the Clean Air Act or of HAR Chapter 11-60.1 or to determine the applicability of such requirements.
- IV. The Director reserves the right to request the following information:**
- A. A risk assessment of the air quality related impacts caused by the covered source or significant modification to the surrounding environment.
 - B. Results of source emissions testing, ambient air quality monitoring, or both.
 - C. Information on other available control technologies.
- V. An application shall be determined to be complete only when all of the following have been complied with:**
- A. All information required or requested in numbers I, III, and IV has been submitted.
 - B. All documents requiring certification have been certified pursuant to HAR §11-60.1-4.
 - C. All applicable fees have been submitted.
 - D. The director has certified that the application is complete.
- VI. The Director shall not continue to act upon or consider an incomplete application.**
- A. The applicant shall be notified in writing whether the application is complete:
 1. For the requirements of subchapter 7, thirty days after receipt of the application.
 2. For the requirements of HAR subchapter 5, sixty days after receipt of the application. For purposes of this paragraph, the date of receipt of an application for a new covered source or significant modification subject to the requirements of subchapter 7 shall be the date the application is determined to be complete for the requirements of subchapter 7.
 3. Unless the Director requests additional information or notifies the applicant of incompleteness within sixty days after receipt of an application pursuant to VI.A.2 above, the application shall be deemed complete for the requirements of subchapter 5.
 - B. During the processing of an application that has been determined or deemed complete, if additional information is necessary to evaluate or take final action on the application, the Director may request such information in writing and set a reasonable deadline for a response.
- VII. After receipt of a complete application, the Director, in writing, shall approve, conditionally approve, or deny an application within eighteen months, except as provided in HAR §11-60.1-88 and (A) and (B) below.**
- A. Upon program approval, within nine months for an application containing an early reduction demonstration pursuant to section 112(i)(5) of the Clean Air Act.
 - B. Within twelve months for a new covered source or significant modification subject to the requirements of subchapter 7.

- VIII. **The Director shall provide reasonable procedures and resources to complete the review of the majority of the applications for a significant modification within nine months after receipt of a complete application. An application for significant modification shall be approved only if the Director determines that the significant modification will be in compliance with all applicable requirements.**
- IX. **The Director shall provide for public notice, including the method by which a public hearing can be requested, and an opportunity for public comment on the draft significant modification to the covered source in accordance with HAR §11-60.1-99.**
- X. **The Director shall provide a statement that sets forth the legal and factual bases for the draft permit conditions (including references to the applicable statutory or regulatory provisions) to EPA and any other person requesting it.**
- XI. **Each application for a significant modification, and the proposed Covered Source Permit reflecting the significant modification shall be subject to EPA oversight in accordance with HAR §11-60.1-95.**

**Revised Form S-6
Kahe Generating Station
CSP No. 0240-01-C
July 2019**

S-6: Application for a Significant Modification to a Covered Source

In providing the required information, reference the corresponding letters and numbers listed below.

Provide a minimum of **two (2)** sets (1 original and 1 copy) of all application materials to the Hawaii Department of Health. Also, mail **one (1)** set directly to EPA at the following address:

Chief (Attention: AIR-3)
Permits Office, Air Division
U.S. Environmental Protection Agency
Region 9
75 Hawthorne Street
San Francisco, CA 94105

I. **In accordance with Hawaii Administrative Rules (HAR) §11-60.1-104, the following information is required:**

A. Equipment Specifications:

1. Maximum design capacity. Refer to the table below.
2. Fuel type.
 - Fuel oil No. 6 with maximum sulfur content of 0.5% by weight for Units K-1 through K6.
 - Fuel oil No. 2 with maximum sulfur content 0.5% by weight for Units A and B.
 - A maximum of 115,000 gal/yr of specification (spec) used oil for Units K-1 through K-4.
 - Propane as igniter fuel for K-1 and K-2.
 - Fuel oil No. 2 with maximum sulfur content of 0.5% by weight as igniter fuel for K-3 through K-6.
 - Fuel oil No. 2 (diesel) with maximum 0.5% by weight sulfur as an alternate fuel for Boilers K-1 through K-6 as approved by the DOH on June 7, 2013.
 - Natural gas as alternate fuel for boilers K-1 through K-6 as approved by DOH on January 5, 2015.
3. Fuel use. Refer to the table below.

Unit ID	Maximum Design Fuel Use per Unit		
	Nominal Capacity	Heat Input (MMBtu/hr)	Ignition Fuel
K-1	92 MW	903	Propane
K-2	90 MW	900	Propane
K-3	92 MW	892	Diesel
K-4	93 MW	918	Diesel
K-5	142 MW	1,468	Diesel
K-6	142 MW	1,516	Diesel
A	2.5 MW	30.5	Diesel
B	2.5 MW	30.5	Diesel

4. Production capacity. Does not apply.
5. Production rates. Does not apply.
6. Raw materials. Does not apply.
7. Provide any manufacturer's literature. This application does not change any of Kahe equipment's manufacturer's specifications.

- B. Provide detailed descriptions of all processes and products defined by Standard Industrial Classification Code (SICC). Also, provide any reasonably anticipated alternative operating scenarios, associated processes, and products, by SICC.

Electrical power generation (SIC code 4911) is the only product or process.

No additional changes to operating scenarios are proposed with this application.

1. Identify and describe in detail all air pollution control equipment and compliance monitoring devices or activities planned by the owner or operator, and to the extent of available information, an estimate of emissions before and after controls. Provide all calculations and assumptions.

Sulfur emissions are controlled by limiting the fuel sulfur content to 0.5 percent by weight. Emissions of NO_x, PM, PM₁₀, CO, and VOC are controlled by combustion design and good combustion practices. Emissions of other HAP's are controlled by the use of No. 2 and No. 6 fuel oil and combustion system design. Unit 6 is equipped with low NO_x burners to control NO_x emissions.

2. List all *new insignificant* activities in accordance with §11-60.1-82.

No additional changes/additions to insignificant activities are proposed with this application.

- C. Maximum Operating Schedule (to the extent needed to determine or regulate emissions):

1. Total hours per day, per week, and/or per month. Depending on future power dispatch requirements, specific boilers may cycle off-line daily, or operate at reduced loads. However, there may be times when a unit must be run continuously for extended periods of time. Thus, this application does not include any annual operating limits for Units K-1 through K-5. Unit K-6 is limited to a daily average fuel consumption of 8,610 gal/hr. Units A and B are limited to a combined annual operating hour limit of 300 hours.
2. Total hours per year. Up to 8,760 hours per year.
3. If operation is seasonal or irregular, describe. Refer to I.C.1 above.

- D. Cite and describe all applicable requirements as defined in HAR §11-60.1-81, including the following:

1. Description of or reference to any applicable test methods for determining compliance with each applicable requirement. See Form C-2.
2. Explanation of all proposed exemptions from any applicable requirements. See Forms C-1 and C-2.

- E. Identify and describe current operational limitations or work practices the source plans to implement that affect emissions of any regulated or hazardous air pollutant. Provide all calculations and assumptions.

See item I.B.1. above for current work practices that affect emissions of any regulated or hazardous air pollutant.

Hawaiian Electric requests incorporation of the Greenhouse Gas emissions limitations into the Covered Source Permit CSP No. 0240-01-C, consistent with the Greenhouse Gas Emissions Reduction Plan (GHG ERP) submitted to the DOH on February 28, 2018, the subsequent updates submitted to the DOH on October 17, 2018 and May 15, 2019, and the latest update dated July 26, 2019, enclosed with this application.

- F. Provide a detailed schedule for construction or modification of the proposed source, including any major milestones, if applicable. Not Applicable.
- G. Provide detailed information to define permit terms and conditions for any proposed **emissions trading** within the facility in accordance with HAR §11-60.1-96. No emissions trading is proposed.
- H. For **significant** modifications which increase the emissions of any air pollutant or result in the emission of any air pollutant not previously emitted, an assessment of the ambient air quality impact of the covered source or significant modification, with the inclusion of any available background air quality data. The assessment shall include all supporting data, calculations and assumptions, and a comparison with the National Ambient Air Quality Standards and State Ambient Air Quality Standards. Do not apply. The proposed modification will not increase the emissions of any air pollutant or result in the emission of any air pollutant not previously emitted.
- I. For **new** covered sources or **significant** modifications subject to the requirements of subchapter 7 of HAR Chapter 11-60.1, all analyses, assessments, monitoring, and other application requirements of subchapter 7. Do not apply. The proposed modification is not subject to Subchapter 7 of HAR Chapter 11-60.1.
- J. Provide the following for Compliance purposes:
1. A compliance plan, Form C-1.
 2. A compliance certification, Form C-2.
- II. **Submit an application fee according to the Application Fees Schedule in the Instructions for Applying for an Air Pollution Control Permit.**
- III. **Provide other information as follows:**
- A. As required by any applicable requirement or as requested and deemed necessary by the director to make a decision on the application.
 - B. As may be necessary to implement and enforce other applicable requirements of the Clean Air Act or of HAR Chapter 11-60.1 or to determine the applicability of such requirements.
- IV. **The Director reserves the right to request the following information:**
- A. A risk assessment of the air quality related impacts caused by the covered source or significant modification to the surrounding environment.
 - B. Results of source emissions testing, ambient air quality monitoring, or both.
 - C. Information on other available control technologies.
- V. **An application shall be determined to be complete only when all of the following have been complied with:**
- A. All information required or requested in numbers I, III, and IV has been submitted.
 - B. All documents requiring certification have been certified pursuant to HAR §11-60.1-4.
 - C. All applicable fees have been submitted.
 - D. The director has certified that the application is complete.
- VI. **The Director shall not continue to act upon or consider an incomplete application.**

- A. The applicant shall be notified in writing whether the application is complete:
 - 1. For the requirements of subchapter 7, thirty days after receipt of the application.
 - 2. For the requirements of HAR subchapter 5, sixty days after receipt of the application. For purposes of this paragraph, the date of receipt of an application for a new covered source or significant modification subject to the requirements of subchapter 7 shall be the date the application is determined to be complete for the requirements of subchapter 7.
 - 3. Unless the Director requests additional information or notifies the applicant of incompleteness within sixty days after receipt of an application pursuant to VI.A.2 above, the application shall be deemed complete for the requirements of subchapter 5.
 - B. During the processing of an application that has been determined or deemed complete, if additional information is necessary to evaluate or take final action on the application, the Director may request such information in writing and set a reasonable deadline for a response.
- VII. **After receipt of a complete application, the Director, in writing, shall approve, conditionally approve, or deny an application within eighteen months, except as provided in HAR §11-60.1-88 and (A) and (B) below.**
- A. Upon program approval, within nine months for an application containing an early reduction demonstration pursuant to section 112(i)(5) of the Clean Air Act.
 - B. Within twelve months for a new covered source or significant modification subject to the requirements of subchapter 7.
- VIII. **The Director shall provide reasonable procedures and resources to complete the review of the majority of the applications for a significant modification within nine months after receipt of a complete application. An application for significant modification shall be approved only if the Director determines that the significant modification will be in compliance with all applicable requirements.**
- IX. **The Director shall provide for public notice, including the method by which a public hearing can be requested, and an opportunity for public comment on the draft significant modification to the covered source in accordance with HAR §11-60.1-99.**
- X. **The Director shall provide a statement that sets forth the legal and factual bases for the draft permit conditions (including references to the applicable statutory or regulatory provisions) to EPA and any other person requesting it.**
- XI. **Each application for a significant modification, and the proposed Covered Source Permit reflecting the significant modification shall be subject to EPA oversight in accordance with HAR §11-60.1-95.**

**Revised Form S-6
Waiau Generating Station
CSP No. 0239-01-C
July 2019**

S-6: Application for a Significant Modification to a Covered Source

In providing the required information, reference the corresponding letters and numbers listed below.

Provide a minimum of **two (2)** sets (1 original and 1 copy) of all application materials to the Hawaii Department of Health. Also, mail **one (1)** set directly to EPA at the following address:

Chief (Attention: AIR-3)
Permits Office, Air Division
U.S. Environmental Protection Agency
Region 9
75 Hawthorne Street
San Francisco, CA 94105

I. In accordance with Hawaii Administrative Rules (HAR) §11-60.1-104, the following information is required:

A. Equipment Specifications:

1. Maximum design capacity. Refer to the table below.
2. Fuel type. _____
 - Fuel oil No. 6 with a maximum sulfur content of 0.5% by weight for Units 3 through 8.
 - Natural gas with maximum sulfur content of 175 grains per 100 SCF for Units 5 through 8.
 - Specification used oil for Units 3 through 8 (no more than 50,000 gallons per any rolling 12-month period).
 - Fuel oil No. 2 with a maximum sulfur content of 0.5% by weight for Units 9 and 10.
3. Fuel use. Refer to the table below.

Maximum Capacity and Fuel Use Per Unit

Unit ID	Manufacturer	Model Number	Serial Number	Capacity (Nominal)	Fuel Rate (MMBtu/hr)	Ignition Fuel
3	Babcock and Wilcox		RB-43	49 MW	576	Propane
4	Babcock and Wilcox		RB-92	49 MW	585	Propane
5	Babcock and Wilcox		RB-324	57 MW	633	Propane
6	Babcock and Wilcox		RB-328	58 MW	637	Propane
7	Combustion Engineering		20694	92 MW	923	Diesel
8	Combustion Engineering		20177	92 MW	922	Diesel
9	General Electric	MS7000	217725	50	682	Diesel
10	General Electric	MS7000	217724	52	691	Diesel

4. Production capacity. Does not apply.
5. Production rates. Does not apply.
6. Raw materials. Does not apply.
7. Provide any manufacturer's literature. This application does not change any of Waiau equipment's manufacturer's specifications.

B. Provide detailed descriptions of all processes and products defined by Standard Industrial Classification Code (SICC). Also, provide any reasonably anticipated alternative operating scenarios, associated processes, and products, by SICC.

Electrical power generation (SIC code 4911) is the only product or process.

Several types of alternative operating scenarios apply to the generating station as described

below:

a. Unit operation during startup, shutdown, maintenance and testing of the combustion turbine generators and boilers. Boiler startup operations may range up to 7 hours and occur almost daily.

b. Alternate fuels. Hawaiian Electric may use alternate fuels and fuel additives with prior approval from the Department of Health.

c. Soot blowing is a necessary maintenance operation and may result in a temporary increase in opacity.

d. Use of a temporary replacement unit in the event of a failure or major overhaul of an installed unit. In the event that the projected down time of the unit increases the likelihood of an interruption in electrical service, the down unit may be replaced with an equivalent unit. Emissions from the replacement unit will comply with the original unit's permitted emission limits.

e. Operate the combustion turbines, W9 and W10, below minimum load to address system disturbances and frequency issues. This request was submitted in a minor modification application dated May 6, 2015.

No additional changes to operating scenarios are proposed with this application.

1. Identify and describe in detail all air pollution control equipment and compliance monitoring devices or activities planned by the owner or operator, and to the extent of available information, an estimate of emissions before and after controls. Provide all calculations and assumptions.

Sulfur emissions are controlled by limiting the fuel sulfur content to a maximum of 0.5% by weight. Emissions of NO_x, PM, PM₁₀, CO, and VOC are controlled by combustion design and good combustion practices. Emissions of any hazardous air pollutants are controlled by the use of fuel oil Nos. 6 and 2 and good combustion design.

2. List all *new insignificant* activities in accordance with §11-60.1-82.

No additional changes/additions to insignificant activities are proposed with this application.

C. Maximum Operating Schedule (to the extent needed to determine or regulate emissions):

1. Total hours per day, per week, and/or per month. Depending on future dispatch requirements, the plant may cycle off line daily, or operate at reduced loads. While these expected operating levels are less than continuous, there may be times when the units must be run continuously for extended periods of time. Thus, this application does not propose any annual operating limits.
2. Total hours per year. Up to 8,760 hours per year.
3. If operation is seasonal or irregular, describe. Refer to I.C.1 above.

D. Cite and describe all applicable requirements as defined in HAR §11-60.1-81, including the following:

1. Description of or reference to any applicable test methods for determining compliance with each applicable requirement. See Form C-2.
2. Explanation of all proposed exemptions from any applicable requirements. See Forms C-1 and C-2.

- E. Identify and describe current operational limitations or work practices the source plans to implement that affect emissions of any regulated or hazardous air pollutant. Provide all calculations and assumptions.

See item I.B.1. above for current work practices that affect emissions of any regulated or hazardous air pollutant.

Hawaiian Electric requests incorporation of the Greenhouse Gas Emissions Limitations into the Covered Source Permit CSP No. 0239-01-C, consistent with the Greenhouse Gas Emissions Reduction Plan submitted to the DOH on February 28, 2018, the subsequent updates submitted to the DOH on October 17, 2018 and May 15, 2019, and the latest update dated July 26, 2019, enclosed with this application.

- F. Provide a detailed schedule for construction or modification of the proposed source, including any major milestones, if applicable. Not applicable.

- G. Provide detailed information to define permit terms and conditions for any proposed *emissions trading* within the facility in accordance with HAR §11-60.1-96. No emissions trading is proposed.

- H. For *significant* modifications which increase the emissions of any air pollutant or result in the emission of any air pollutant not previously emitted, an assessment of the ambient air quality impact of the covered source or significant modification, with the inclusion of any available background air quality data. The assessment shall include all supporting data, calculations and assumptions, and a comparison with the National Ambient Air Quality Standards and State Ambient Air Quality Standards. Do not apply. The proposed modification will not increase the emissions of any air pollutant or result in the emission of any air pollutant not previously emitted.

- I. For *new* covered sources or *significant* modifications subject to the requirements of subchapter 7 of HAR Chapter 11-60.1, all analyses, assessments, monitoring, and other application requirements of subchapter 7. Do not apply. The proposed modification is not subject to Subchapter 7 of HAR Chapter 11-60.1.

- J. Provide the following for Compliance purposes:

1. A compliance plan, Form C-1.
2. A compliance certification, Form C-2.

II. Submit an application fee according to the Application Fees Schedule in the Instructions for Applying for an Air Pollution Control Permit.

III. Provide other information as follows:

- A. As required by any applicable requirement or as requested and deemed necessary by the director to make a decision on the application.
- B. As may be necessary to implement and enforce other applicable requirements of the Clean Air Act or of HAR Chapter 11-60.1 or to determine the applicability of such requirements.

IV. The Director reserves the right to request the following information:

- A. A risk assessment of the air quality related impacts caused by the covered source or significant modification to the surrounding environment.
- B. Results of source emissions testing, ambient air quality monitoring, or both.

- C. Information on other available control technologies.
- V. **An application shall be determined to be complete only when all of the following have been complied with:**
 - A. All information required or requested in numbers I, III, and IV has been submitted.
 - B. All documents requiring certification have been certified pursuant to HAR §11-60.1-4.
 - C. All applicable fees have been submitted.
 - D. The director has certified that the application is complete.
- VI. **The Director shall not continue to act upon or consider an incomplete application.**
 - A. The applicant shall be notified in writing whether the application is complete:
 - 1. For the requirements of subchapter 7, thirty days after receipt of the application.
 - 2. For the requirements of HAR subchapter 5, sixty days after receipt of the application. For purposes of this paragraph, the date of receipt of an application for a new covered source or significant modification subject to the requirements of subchapter 7 shall be the date the application is determined to be complete for the requirements of subchapter 7.
 - 3. Unless the Director requests additional information or notifies the applicant of incompleteness within sixty days after receipt of an application pursuant to VI.A.2 above, the application shall be deemed complete for the requirements of subchapter 5.
 - B. During the processing of an application that has been determined or deemed complete, if additional information is necessary to evaluate or take final action on the application, the Director may request such information in writing and set a reasonable deadline for a response.
- VII. **After receipt of a complete application, the Director, in writing, shall approve, conditionally approve, or deny an application within eighteen months, except as provided in HAR §11-60.1-88 and (A) and (B) below.**
 - A. Upon program approval, within nine months for an application containing an early reduction demonstration pursuant to section 112(i)(5) of the Clean Air Act.
 - B. Within twelve months for a new covered source or significant modification subject to the requirements of subchapter 7.
- VIII. **The Director shall provide reasonable procedures and resources to complete the review of the majority of the applications for a significant modification within nine months after receipt of a complete application. An application for significant modification shall be approved only if the Director determines that the significant modification will be in compliance with all applicable requirements.**
- IX. **The Director shall provide for public notice, including the method by which a public hearing can be requested, and an opportunity for public comment on the draft significant modification to the covered source in accordance with HAR §11-60.1-99.**
- X. **The Director shall provide a statement that sets forth the legal and factual bases for the draft permit conditions (including references to the applicable statutory or regulatory provisions) to EPA and any other person requesting it.**
- XI. **Each application for a significant modification, and the proposed Covered Source Permit reflecting the significant modification shall be subject to EPA oversight in accordance with HAR §11-60.1-95.**

**Revised Form S-6
Honolulu Generating Station
CSP No. 0238-01-C
July 2019**

S-6: Application for a Significant Modification to a Covered Source

In providing the required information, reference the corresponding letters and numbers listed below.

Provide a minimum of **two (2)** sets (1 original and 1 copy) of all application materials to the Hawaii Department of Health. Also, mail **one (1)** set directly to EPA at the following address:

Chief (Attention: AIR-3)
Permits Office, Air Division
U.S. Environmental Protection Agency
Region 9
75 Hawthorne Street
San Francisco, CA 94105

I. In accordance with Hawaii Administrative Rules (HAR) §11-60.1-104, the following information is required:

A. Equipment Specifications:

1. Maximum design capacity. Units 8 and 9 are Babcock & Wilcox boilers with steam turbines. See response to I.A.3 for additional information.
2. Fuel type. No. 6 and No. 2 fuel oil with 0.5% (max) by weight sulfur content for Units 8 and 9. The boilers also burn small quantities of spec used oil (less than 15,000 gal/yr).
3. Fuel use. Refer to the table below.

Maximum Design Fuel Use per Unit			
Unit ID	Nominal Capacity	Fuel Rate	Ignition Fuel
Unit 8	56 MW	589.0 MMBtu/hr	Propane
Unit 9	57 MW	631.5 MMBtu/hr	Propane

4. Production capacity. Does not apply.
 5. Production rates. Does not apply.
 6. Raw materials. Does not apply.
 7. Provide any manufacturer's literature. This application does not change any of Honolulu equipment's manufacturer's specifications.
- B. Provide detailed descriptions of all processes and products defined by Standard Industrial Classification Code (SICC). Also, provide any reasonably anticipated alternative operating scenarios, associated processes, and products, by SICC.

Electrical power generation through combustion of fossil fuels (SICC 4911) is the only product or process.

The alternative scenario is the ability to switch fuels. Should cheaper fuels become available, or the supply of No. 2 or No. 6 fuel becomes limited, Hawaiian Electric may propose an alternate scenario that would allow the fuel switch, provided that all permit conditions are met.

No additional changes to operating scenarios are proposed with this application.

1. Identify and describe in detail all air pollution control equipment and compliance monitoring devices or activities planned by the owner or operator, and to the extent of available information, an estimate of emissions before and after controls. Provide all calculations and assumptions.
Sulfur emissions are controlled by limiting the fuel sulfur content to 0.5 percent by weight. Emissions of NO_x, PM, PM₁₀, CO, and VOC are controlled by combustion design and good combustion practices. Emissions of any hazardous pollutants are controlled by the use of No. 2 and No. 6 fuel oils and combustion system design.
 2. List all **new insignificant** activities in accordance with §11-60.1-82.
No additional changes/additions to insignificant activities are proposed with this application.
- C. Maximum Operating Schedule (to the extent needed to determine or regulate emissions):
1. Total hours per day, per week, and/or per month. The planned operation of Units 8 and 9 is 24 hours per day 7 days a week. Depending on future dispatch requirements, the plant may cycle off-line daily, or operate at reduced loads. Unit 8 and 9 are currently deactivated.
 2. Total hours per year. Up to 8,760 hours per year.
 3. If operation is seasonal or irregular, describe. Unit 8 and 9 are currently deactivated.
- D. Cite and describe all applicable requirements as defined in HAR §11-60.1-81, including the following:
1. Description of or reference to any applicable test methods for determining compliance with each applicable requirement. See Form C-2.
 2. Explanation of all proposed exemptions from any applicable requirements. See Forms C-1 and C-2.
- E. Identify and describe current operational limitations or work practices the source plans to implement that affect emissions of any regulated or hazardous air pollutant. Provide all calculations and assumptions.
See item I.B.1. above for current work practices that affect emissions of any regulated or hazardous air pollutant.
Hawaiian Electric requests incorporation of the Greenhouse Gas Emissions Limitations into the Covered Source Permit CSP No. 0238-01-C, consistent with the Greenhouse Gas Emissions Reduction Plan submitted to the DOH on February 28, 2018, the subsequent updates submitted to the DOH on October 17, 2018 and May 15, 2019, and the latest update dated July 26, 2019, enclosed with this application.
- F. Provide a detailed schedule for construction or modification of the proposed source, including any major milestones, if applicable. Not applicable.
- G. Provide detailed information to define permit terms and conditions for any proposed **emissions trading** within the facility in accordance with HAR §11-60.1-96. No emissions trading is proposed.
- H. For **significant** modifications which increase the emissions of any air pollutant or result in the emission of any air pollutant not previously emitted, an assessment of the ambient air quality impact of the covered source or significant modification, with the inclusion of any available

background air quality data. The assessment shall include all supporting data, calculations and assumptions, and a comparison with the National Ambient Air Quality Standards and State Ambient Air Quality Standards. Do not apply. The proposed modification will not increase the emissions of any air pollutant or result in the emission of any air pollutant not previously emitted.

I. For *new* covered sources or *significant* modifications subject to the requirements of subchapter 7 of HAR Chapter 11-60.1, all analyses, assessments, monitoring, and other application requirements of subchapter 7. Do not apply. The proposed modification is not subject to Subchapter 7 of HAR Chapter 11-60.1.

J. Provide the following for Compliance purposes:

1. A compliance plan, Form C-1.
2. A compliance certification, Form C-2.

II. Submit an application fee according to the Application Fees Schedule in the Instructions for Applying for an Air Pollution Control Permit.

III. Provide other information as follows:

- A. As required by any applicable requirement or as requested and deemed necessary by the director to make a decision on the application.
- B. As may be necessary to implement and enforce other applicable requirements of the Clean Air Act or of HAR Chapter 11-60.1 or to determine the applicability of such requirements.

IV. The Director reserves the right to request the following information:

- A. A risk assessment of the air quality related impacts caused by the covered source or significant modification to the surrounding environment.
- B. Results of source emissions testing, ambient air quality monitoring, or both.
- C. Information on other available control technologies.

V. An application shall be determined to be complete only when all of the following have been complied with:

- A. All information required or requested in numbers I, III, and IV has been submitted.
- B. All documents requiring certification have been certified pursuant to HAR §11-60.1-4.
- C. All applicable fees have been submitted.
- D. The director has certified that the application is complete.

VI. The Director shall not continue to act upon or consider an incomplete application.

A. The applicant shall be notified in writing whether the application is complete:

1. For the requirements of subchapter 7, thirty days after receipt of the application.
2. For the requirements of HAR subchapter 5, sixty days after receipt of the application. For purposes of this paragraph, the date of receipt of an application for a new covered source or significant modification subject to the requirements of subchapter 7 shall be the date the application is determined to be complete for the requirements of subchapter 7.
3. Unless the Director requests additional information or notifies the applicant of incompleteness within sixty days after receipt of an application pursuant to VI.A.2 above, the application shall be deemed complete for the requirements of subchapter 5.

- B. During the processing of an application that has been determined or deemed complete, if additional information is necessary to evaluate or take final action on the application, the Director may request such information in writing and set a reasonable deadline for a response.
- VII. **After receipt of a complete application, the Director, in writing, shall approve, conditionally approve, or deny an application within eighteen months, except as provided in HAR §11-60.1-88 and (A) and (B) below.**
- A. Upon program approval, within nine months for an application containing an early reduction demonstration pursuant to section 112(i)(5) of the Clean Air Act.
 - B. Within twelve months for a new covered source or significant modification subject to the requirements of subchapter 7.
- VIII. **The Director shall provide reasonable procedures and resources to complete the review of the majority of the applications for a significant modification within nine months after receipt of a complete application. An application for significant modification shall be approved only if the Director determines that the significant modification will be in compliance with all applicable requirements.**
- IX. **The Director shall provide for public notice, including the method by which a public hearing can be requested, and an opportunity for public comment on the draft significant modification to the covered source in accordance with HAR §11-60.1-99.**
- X. **The Director shall provide a statement that sets forth the legal and factual bases for the draft permit conditions (including references to the applicable statutory or regulatory provisions) to EPA and any other person requesting it.**
- XI. **Each application for a significant modification, and the proposed Covered Source Permit reflecting the significant modification shall be subject to EPA oversight in accordance with HAR §11-60.1-95.**

**Revised Form S-6
Kanoelehua-Hill Generating Station
CSP No. 0234-01-C
July 2019**

S-6: Application for a Significant Modification to a Covered Source

In providing the required information, reference the corresponding letters and numbers listed below.

Provide a minimum of **two (2)** sets (1 original and 1 copy) of all application materials to the Hawaii Department of Health. Also, mail **one (1)** set directly to EPA at the following address:

Chief (Attention: AIR-3)
Permits Office, Air Division
U.S. Environmental Protection Agency
Region 9
75 Hawthorne Street
San Francisco, CA 94105

I. In accordance with Hawaii Administrative Rules (HAR) §11-60.1-104, the following information is required:

A. Equipment Specifications:

1. Maximum design capacity. Refer to the table below.
2. Fuel type.
 - Hill 5 and 6 utilize fuel oils No. 6 and No. 2.
 - Hill 5 uses propane as an ignition fuel.
 - CT-1 utilizes fuel oil No. 2 with a maximum sulfur content of 0.4 percent by weight.
 - D-11, D-15, D-16, and D-17 utilize fuel oil No. 2 with a maximum sulfur content of 0.0015 percent by weight and a minimum Cetane index of 40 or a maximum aromatic content of 35 volume percent.
 - Hill 5 and Hill 6 may consume up to 36,500 gal/rolling 12-month period of specification used oil. On November 22, 2017, the DOH approved consumption of specification used oil from Hawaii Petroleum.
 - Hawai'i Electric Light requested the addition of biodiesel and biodiesel/diesel blends in D-11, D-15, D-16, and D-17 in a permit renewal application dated August 31, 2012.
3. Fuel use. Refer to the table below.

Maximum Design Fuel Use per Unit			
ID	Capacity (Nominal)	Fuel Flow (MMBtu/hr)	Ignition Fuel
Hill 5	14 MW	197	Diesel/ Propane
Hill 6	23 MW	249	Diesel
CT-1	11.6 MW	177.2	Diesel
D-11	2.0 MW	20.2	Diesel
D-15	2.5 MW	29.1	Diesel
D-16	2.5 MW	29.1	Diesel
D-17	2.5 MW	29.1	Diesel

4. Production capacity. Does not apply.
5. Production rates. Does not apply.
6. Raw materials. Does not apply.
7. Provide any manufacturer's literature. This application does not change any of Kanoiehua-Hill equipment's manufacturer's specifications.

- B. Provide detailed descriptions of all processes and products defined by Standard Industrial Classification Code (SICC). Also, provide any reasonably anticipated alternative operating scenarios, associated processes, and products, by SICC.

Electrical power generation (SIC code 4911) is the only product or process.

Several types of alternative operating scenarios apply to the plant. The first includes the use of permanent and temporary replacement units in the event of a failure or major overhaul of an installed unit. In the event that the projected downtime of the installed unit increases the likelihood of an interruption in electrical service, the installed unit would be replaced with an equivalent unit. Emissions from the replacement unit will comply with the original unit's emission limits.

The second alternative operating scenario is unit operation during start-up, shutdown, maintenance and testing. Boiler startup operations may range up to 7 hours. Maintenance activities include soot blowing. The time period of this maintenance operation will not exceed 1.5-hours in duration two times per day. These maintenance activities are required to maximize generation efficiency and minimizing fuel usage.

A third alternate scenario is the ability to switch fuels. Should cheaper fuels become available, or the supply of normal fuel become limited, Hawai'i Electric Light proposes an alternate scenario that would allow the fuel switch provided that all permit conditions are met.

A fourth alternative scenario occurs during emergency load conditions. Certain equipment malfunctions (such as sudden loss of a unit) may necessitate the operation of Hill 5 and 6, CT-1 and D-11, D-15, D-16, and D-17, at loads as high as 110% of peak load. The time period of this operation will be limited to no more than 30 minutes in duration. This operation will not result in a 3-hr average emission rate that exceeds the maximum emission limits proposed in this application.

A fifth alternative involves the use of fuel additives to reduce corrosion, control biological growth, and enhance combustion, etc. Emissions during this scenario will not affect emission estimates.

No additional changes to operating scenarios are proposed with this application.

1. Identify and describe in detail all air pollution control equipment and compliance monitoring devices or activities planned by the owner or operator, and to the extent of available information, an estimate of emissions before and after controls. Provide all calculations and assumptions.

Sulfur emissions are controlled by limiting the fuel sulfur content to 0.4% by weight for CT-1, 0.0015% for the diesels, and 2% for the boilers. Emissions of PM₁₀, CO, and VOC are controlled by combustion design. CO emissions from D-11, D-15, D-16, and D-17 are controlled by the Diesel Oxidation Catalyst (DOC). The DOC will reduce CO emissions by at least 70 percent or limit CO emissions to 23 ppmvd at 15 percent O₂. Emissions of any hazardous pollutants are controlled by the use of No. 2 diesel oil for CT-1, D-11, D-15, D-16, and D-17 and No. 6 fuel oil used for the boilers and combustion system design for all units.

Compliance monitoring devices and activities are discussed in Form C-2.

2. List all *new insignificant* activities in accordance with §11-60.1-82.

No additional changes/additions to insignificant activities are proposed with this application.

- C. Maximum Operating Schedule (to the extent needed to determine or regulate emissions):
1. Total hours per day, per week, and/or per month. The planned operation of each unit is 24 hours per day, 365 days per year. Depending on future dispatch requirements, some units may cycle off-line daily, or operate at reduced loads. While these expected operating levels are less than continuous, there may be times when the units must be run continuously for extended periods of time. Thus, this application does not propose any annual operating limits.
 2. Total hours per year. Up to 8,760 hours per year.
 3. If operation is seasonal or irregular, describe. Operation is not seasonal or irregular.
- D. Cite and describe all applicable requirements as defined in HAR §11-60.1-81, including the following:
1. Description of or reference to any applicable test methods for determining compliance with each applicable requirement. See Form C-2.
 2. Explanation of all proposed exemptions from any applicable requirements. See Forms C-1 and C-2.
- E. Identify and describe current operational limitations or work practices the source plans to implement that affect emissions of any regulated or hazardous air pollutant. Provide all calculations and assumptions.
- See item I.B.1. above for current work practices that affect emissions of any regulated or hazardous air pollutant.
- With this application, Hawai'i Electric Light requests incorporation of the Greenhouse Gas Emissions Limitations into the Covered Source Permit CSP No. 0234-01-C, consistent with the Greenhouse Gas Emissions Reduction Plan submitted to the DOH on February 28, 2018, the subsequent updates submitted to the DOH on October 17, 2018 and May 15, 2019, and the latest update dated July 26, 2019, enclosed with this application.
- F. Provide a detailed schedule for construction or modification of the proposed source, including any major milestones, if applicable. Not Applicable.
- G. Provide detailed information to define permit terms and conditions for any proposed **emissions trading** within the facility in accordance with HAR §11-60.1-96. No emissions trading is proposed.
- H. For **significant** modifications which increase the emissions of any air pollutant or result in the emission of any air pollutant not previously emitted, an assessment of the ambient air quality impact of the covered source or significant modification, with the inclusion of any available background air quality data. The assessment shall include all supporting data, calculations and assumptions, and a comparison with the National Ambient Air Quality Standards and State Ambient Air Quality Standards. Does not apply. The proposed modification will not increase the emissions of any air pollutant or result in the emission of any air pollutant not previously emitted.
- I. For **new** covered sources or **significant** modifications subject to the requirements of subchapter 7 of HAR Chapter 11-60.1, all analyses, assessments, monitoring, and other

application requirements of subchapter 7. Does not apply. The proposed modification is not subject to Subchapter 7 of HAR Chapter 11-60.1.

- J. Provide the following for Compliance purposes:
 - 1. A compliance plan, Form C-1.
 - 2. A compliance certification, Form C-2.

- II. **Submit an application fee according to the Application Fees Schedule in the Instructions for Applying for an Air Pollution Control Permit.**

- III. **Provide other information as follows:**
 - A. As required by any applicable requirement or as requested and deemed necessary by the director to make a decision on the application.
 - B. As may be necessary to implement and enforce other applicable requirements of the Clean Air Act or of HAR Chapter 11-60.1 or to determine the applicability of such requirements.

- IV. **The Director reserves the right to request the following information:**
 - A. A risk assessment of the air quality related impacts caused by the covered source or significant modification to the surrounding environment.
 - B. Results of source emissions testing, ambient air quality monitoring, or both.
 - C. Information on other available control technologies.

- V. **An application shall be determined to be complete only when all of the following have been complied with:**
 - A. All information required or requested in numbers I, III, and IV has been submitted.
 - B. All documents requiring certification have been certified pursuant to HAR §11-60.1-4.
 - C. All applicable fees have been submitted.
 - D. The director has certified that the application is complete.

- VI. **The Director shall not continue to act upon or consider an incomplete application.**
 - A. The applicant shall be notified in writing whether the application is complete:
 - 1. For the requirements of subchapter 7, thirty days after receipt of the application.
 - 2. For the requirements of HAR subchapter 5, sixty days after receipt of the application. For purposes of this paragraph, the date of receipt of an application for a new covered source or significant modification subject to the requirements of subchapter 7 shall be the date the application is determined to be complete for the requirements of subchapter 7.
 - 3. Unless the Director requests additional information or notifies the applicant of incompleteness within sixty days after receipt of an application pursuant to VI.A.2 above, the application shall be deemed complete for the requirements of subchapter 5.
 - B. During the processing of an application that has been determined or deemed complete, if additional information is necessary to evaluate or take final action on the application, the Director may request such information in writing and set a reasonable deadline for a response.

- VII. **After receipt of a complete application, the Director, in writing, shall approve, conditionally approve, or deny an application within eighteen months, except as provided in HAR §11-60.1-88 and (A) and (B) below.**

- A. Upon program approval, within nine months for an application containing an early reduction demonstration pursuant to section 112(i)(5) of the Clean Air Act.
 - B. Within twelve months for a new covered source or significant modification subject to the requirements of subchapter 7.
- VIII. The Director shall provide reasonable procedures and resources to complete the review of the majority of the applications for a significant modification within nine months after receipt of a complete application. An application for significant modification shall be approved only if the Director determines that the significant modification will be in compliance with all applicable requirements.
- IX. The Director shall provide for public notice, including the method by which a public hearing can be requested, and an opportunity for public comment on the draft significant modification to the covered source in accordance with HAR §11-60.1-99.
- X. The Director shall provide a statement that sets forth the legal and factual bases for the draft permit conditions (including references to the applicable statutory or regulatory provisions) to EPA and any other person requesting it.
- XI. Each application for a significant modification, and the proposed Covered Source Permit reflecting the significant modification shall be subject to EPA oversight in accordance with HAR §11-60.1-95.

**Revised Form S-6
Keahole Generating Station
CSP No. 0007-01-C
July 2019**

S-6: Application for a Significant Modification to a Covered Source

In providing the required information, reference the corresponding letters and numbers listed below.

Provide a minimum of **two (2)** sets (1 original and 1 copy) of all application materials to the Hawaii Department of Health. Also, mail **one (1)** set directly to EPA at the following address:

Chief (Attention: AIR-3)
Permits Office, Air Division
U.S. Environmental Protection Agency
Region 9
75 Hawthorne Street
San Francisco, CA 94105

I. In accordance with Hawaii Administrative Rules (HAR) §11-60.1-104, the following information is required:

A. Equipment Specifications:

1. Maximum design capacity. Refer to the table below.
2. Fuel type.
 - No. 2 diesel fuel with 0.4 percent by weight maximum sulfur content for units CT-4, CT-5, and BS-1.
 - Starting May 3, 2013, No. 2 diesel with 0.0015 percent by weight sulfur content, minimum Cetane index of 40 or maximum aromatic content of 35% volume, for units D-21, D-22, and D-23.
 - Biodiesel (B100) and biodiesel/diesel blends with up to 1% diesel (B99) as alternate fuels for CT-4 and CT-5 were approved by the DOH on December 16, 2013.
3. Fuel use. Refer to the table below.

Maximum Capacity and Fuel Use Per Unit

Unit ID	Manufacturer	Model Number	Serial Number	Capacity (Nominal)	Fuel Flow Rate
D-21	General Motors	20-645F4B	74-B1-1078	2.5 MW	28.1 MMBtu/hr
D-22	General Motors	20-645F4B	66-K1-1062	2.5 MW	28.1 MMBtu/hr
D-23	General Motors	20-645E4	69-H1-1057	2.5 MW	28.1 MMBtu/hr
BS-1	Caterpillar	3412	81Z07275	500 kW	5.57 MMBtu/hr
CT-4	General Electric	LM2500	481-688	20 MW	275 MMBtu/hr
CT-5	General Electric	LM2500	481-692	20 MW	275 MMBtu/hr
ST-7				16 MW	NA
CT-2	Jupiter	GT-35	JF88702	18 MW	198 MMBtu/hr

4. Production capacity. Does not apply.
5. Production rates. Does not apply.
6. Raw materials. Does not apply.
7. Provide any manufacturer's literature. This application does not change any of Keahole equipment's manufacturer's specifications.

B. Provide detailed descriptions of all processes and products defined by Standard Industrial Classification Code (SICC). Also, provide any reasonably anticipated alternative operating scenarios, associated processes, and products, by SICC.

Electrical power generation (SIC code 4911) is the only product or process.

Several types of alternative operating scenarios apply to the generating station as described below:

a. Use of a temporary replacement unit in the event of a failure or major overhaul of an installed unit. In the event that the projected down time of the unit increases the likelihood of an interruption in electrical service, the down unit would be replaced with an equivalent unit. Emissions from the replacement unit will comply with the original unit's permitted emission limits.

b. CT-4 and CT-5 may operate below 25% of peak load during testing of the heat recovery steam generators and steam turbine and steam blows needed to clean the steam tubes prior to initial operation.

c. Should less expensive fuels become available, or the supply of No. 2 diesel become limited, Hawai'i Electric Light may use alternative fuels with prior approval from the Department of Health.

d. In the event of emergency load conditions such as the sudden loss of a unit, CT-2, CT-4 and CT-5 may operate up to 110 percent of peak load for up to 30 minutes. Such operation will not exceed the permitted 3-hour average emission rates.

e. Fuel additives to reduce corrosion, control biological growth, and enhance combustion may be used in CT-4 and CT-5.

f. Hawai'i Electric Light, with the approval from the Department of Health, may use alternate means and methods to improve combustion and/or reduce emissions for CT-4 and CT-5.

g. Hawai'i Electric Light requested to operate the combustion turbine generators, CT-2, CT-4 and CT-5, below minimum load with water injection to address system disturbances and frequency issues in a minor modification application dated 12/10/2015.

No additional changes to operating scenarios are proposed with this application.

1. Identify and describe in detail all air pollution control equipment and compliance monitoring devices or activities planned by the owner or operator, and to the extent of available information, an estimate of emissions before and after controls. Provide all calculations and assumptions.

Fuel injection timing retard (FITR) is used on D-21, D-22, and D-23 to control NO_x emissions. When CT-4 and CT-5 are operating in combined cycle mode at loads less than 50% of peak load and simple cycle mode, water injection is used on CT-4 and CT-5 to reduce NO_x emissions to 42 ppmvd at 15 percent O₂, with a fuel-bound nitrogen content of 0.0015 percent or less. When CT-4 and CT-5 are operating in combined cycle mode at 50% or more of peak load, water injection in combination with selective catalytic reduction (SCR) is used to reduce NO_x emissions to 15 ppmvd at 15 percent O₂, with a fuel-bound nitrogen content of 0.015 percent or less. The design of the SCR system will limit ammonia slip to 10 ppmvd at 15 percent O₂. Water injection is used on CT-2 reduce NO_x emissions to 47 ppmvd at 15 percent O₂, with a fuel-bound nitrogen content of 0.015 percent or less. SO₂ emissions are controlled by limiting the fuel sulfur content to 0.4 percent by weight for CT-4, CT-5, and BS-1 and 0.0015 percent by weight for D-21, D-22, and D-23. Emissions of PM, PM₁₀, CO, and VOC are controlled by combustion design and good combustion practices. CO emissions for D-21, D-22, and D-23 will be controlled by a DOC. The DOC will reduce CO emissions by at least 70 percent or limit CO to 23 ppmvd at 15% O₂. Emissions of hazardous air pollutants are controlled by the use of No. 2 fuel oil and combustion system design. Refer to Attachment S-1d for emission rate calculations.

Compliance monitoring devices and activities are discussed in Form C-2.

2. List all **new insignificant** activities in accordance with §11-60.1-82.
No additional changes/additions to insignificant activities are proposed with this application.

C. Maximum Operating Schedule (to the extent needed to determine or regulate emissions):

1. Total hours per day, per week, and/or per month. The planned operation of units D-22, D-23, CT-4, and CT-5 is up to 24 hours per day, seven days per week. Units BS-1 and unit D-21 are operated as needed. Depending on future dispatch requirements, the plant may cycle off-line daily, or operate at reduced loads. While expected operating levels are less than continuous, there may be times when the units must be run continuously for extended periods of time. Fuel consumption is limited on a rolling 12-month basis to 12,301,254 gallons (292,887 barrels) for CT-2.
2. Total hours per year. Units D-22, D-23, CT-4, and CT-5 will operate 8760 hours per year. Fuel consumption is limited on a rolling 12-month basis to 70,000 gallons in D-21. Operation of BS-1 is limited to 300 hours on a rolling 12-month basis. Fuel consumption is limited on a rolling 12-month basis to 12,301,254 gallons (292,887 barrels) for CT-2.
3. If operation is seasonal or irregular, describe. Refer to D.1 and 2 above.

D. Cite and describe all applicable requirements as defined in HAR §11-60.1-81, including the following:

1. Description of or reference to any applicable test methods for determining compliance with each applicable requirement. See Form C-2.
2. Explanation of all proposed exemptions from any applicable requirements. See Forms C-1 and C-2.

E. Identify and describe current operational limitations or work practices the source plans to implement that affect emissions of any regulated or hazardous air pollutant. Provide all calculations and assumptions.

See item I.B.1. above for current work practices that affect emissions of any regulated or hazardous air pollutant.

Hawai'i Electric Light requests incorporation of the Greenhouse Gas Emissions Limitations into the Keahole Covered Source Permit CSP No. 0007-01-C consistent with the Greenhouse Gas Emissions Reduction Plan submitted to the DOH on February 28, 2018, the subsequent updates submitted to the DOH on October 17, 2018 and May 15, 2019, and the latest update dated July 26, 2019, enclosed with this application.

F. Provide a detailed schedule for construction or modification of the proposed source, including any major milestones, if applicable. Not applicable.

G. Provide detailed information to define permit terms and conditions for any proposed **emissions trading** within the facility in accordance with HAR §11-60.1-96. No emissions trading is proposed.

H. For **significant** modifications which increase the emissions of any air pollutant or result in the emission of any air pollutant not previously emitted, an assessment of the ambient air quality impact of the covered source or significant modification, with the inclusion of any available background air quality data. The assessment shall include all supporting data, calculations

and assumptions, and a comparison with the National Ambient Air Quality Standards and State Ambient Air Quality Standards. Do not apply. The proposed modification will not increase the emissions of any air pollutant or result in the emission of any air pollutant not previously emitted.

- I. For *new* covered sources or *significant* modifications subject to the requirements of subchapter 7 of HAR Chapter 11-60.1, all analyses, assessments, monitoring, and other application requirements of subchapter 7. Do not apply. The proposed modification is not subject to Subchapter 7 of HAR Chapter 11-60.1.
- J. Provide the following for Compliance purposes:
 - 1. A compliance plan, Form C-1.
 - 2. A compliance certification, Form C-2.
- II. **Submit an application fee according to the Application Fees Schedule in the Instructions for Applying for an Air Pollution Control Permit.**
- III. **Provide other information as follows:**
 - A. As required by any applicable requirement or as requested and deemed necessary by the director to make a decision on the application.
 - B. As may be necessary to implement and enforce other applicable requirements of the Clean Air Act or of HAR Chapter 11-60.1 or to determine the applicability of such requirements.
- IV. **The Director reserves the right to request the following information:**
 - A. A risk assessment of the air quality related impacts caused by the covered source or significant modification to the surrounding environment.
 - B. Results of source emissions testing, ambient air quality monitoring, or both.
 - C. Information on other available control technologies.
- V. **An application shall be determined to be complete only when all of the following have been complied with:**
 - A. All information required or requested in numbers I, III, and IV has been submitted.
 - B. All documents requiring certification have been certified pursuant to HAR §11-60.1-4.
 - C. All applicable fees have been submitted.
 - D. The director has certified that the application is complete.
- VI. **The Director shall not continue to act upon or consider an incomplete application.**
 - A. The applicant shall be notified in writing whether the application is complete:
 - 1. For the requirements of subchapter 7, thirty days after receipt of the application.
 - 2. For the requirements of HAR subchapter 5, sixty days after receipt of the application. For purposes of this paragraph, the date of receipt of an application for a new covered source or significant modification subject to the requirements of subchapter 7 shall be the date the application is determined to be complete for the requirements of subchapter 7.
 - 3. Unless the Director requests additional information or notifies the applicant of incompleteness within sixty days after receipt of an application pursuant to VI.A.2 above, the application shall be deemed complete for the requirements of subchapter 5.

- B. During the processing of an application that has been determined or deemed complete, if additional information is necessary to evaluate or take final action on the application, the Director may request such information in writing and set a reasonable deadline for a response.
- VII. After receipt of a complete application, the Director, in writing, shall approve, conditionally approve, or deny an application within eighteen months, except as provided in HAR §11-60.1-88 and (A) and (B) below.**
- A. Upon program approval, within nine months for an application containing an early reduction demonstration pursuant to section 112(i)(5) of the Clean Air Act.
 - B. Within twelve months for a new covered source or significant modification subject to the requirements of subchapter 7.
- VIII. The Director shall provide reasonable procedures and resources to complete the review of the majority of the applications for a significant modification within nine months after receipt of a complete application. An application for significant modification shall be approved only if the Director determines that the significant modification will be in compliance with all applicable requirements.**
- IX. The Director shall provide for public notice, including the method by which a public hearing can be requested, and an opportunity for public comment on the draft significant modification to the covered source in accordance with HAR §11-60.1-99.**
- X. The Director shall provide a statement that sets forth the legal and factual bases for the draft permit conditions (including references to the applicable statutory or regulatory provisions) to EPA and any other person requesting it.**
- XI. Each application for a significant modification, and the proposed Covered Source Permit reflecting the significant modification shall be subject to EPA oversight in accordance with HAR §11-60.1-95.**

**Revised Form S-6
Puna Generating Station
CSP No. 0235-01-C
July 2019**

S-6: Application for a Significant Modification to a Covered Source

In providing the required information, reference the corresponding letters and numbers listed below.

Provide a minimum of **two (2)** sets (1 original and 1 copy) of all application materials to the Hawaii Department of Health. Also, mail **one (1)** set directly to EPA at the following address:

Chief (Attention: AIR-3)
Permits Office, Air Division
U.S. Environmental Protection Agency
Region 9
75 Hawthorne Street
San Francisco, CA 94105

I. In accordance with Hawaii Administrative Rules (HAR) §11-60.1-104, the following information is required:

A. Equipment Specifications:

1. Maximum design capacity. Refer to the table below.
2. Fuel type. CT-3 and PBSG1 burn No. 2 diesel fuel with a 0.4% maximum sulfur content. The boiler burns No. 2 and No. 6 fuel oil with a 2.0% maximum sulfur content. In addition the boiler burns a maximum of 200,000 gal/yr of specification used oil. On November 22, 2017, the DOH approved consumption of specification used oil from Hawaii Petroleum.
3. Fuel use. Refer to the table below.

Maximum Design Fuel Use per Unit		
Unit ID	Nominal Capacity	Heat Input (MMBtu/hr)
Boiler	15.5 MW	249
CT-3	20 MW	275
PBSG1	600 kW	6.34

4. Production capacity. Does not apply.
5. Production rates. Does not apply.
6. Raw materials. Does not apply.
7. Provide any manufacturer's literature. This application does not change any of Puna's equipment's manufacturer's specifications.

B. Provide detailed descriptions of all processes and products defined by Standard Industrial Classification Code (SICC). Also, provide any reasonably anticipated alternative operating scenarios, associated processes, and products, by SICC.

Electrical power generation (SIC code 4911) is the only product or process.

Several types of alternative operating scenarios apply to the plant. The first includes the use of a temporary replacement unit in the event of a failure or major overhaul of CT-3 or the boiler. In the event that the projected downtime increases the likelihood of an interruption in electrical service, CT-3 or the boiler would be temporarily replaced. Emissions from the replacement unit will comply with the original unit's operating restrictions and emission limits.

The second alternative operating scenario is unit operation during start-up, shut-down, maintenance, and testing of all units. Boiler start-up operations may range up to 8 hours. Maintenance activities include soot blowing. The time period of this maintenance operation

will not exceed 1-hour in duration two times per day. These maintenance activities are required to maximize generation efficiency and minimize fuel usage.

A third alternate scenario is the ability to switch fuels. Should cheaper fuels become available, or the supply of No. 2 or No. 6 fuel oil becomes limited, Hawai'i Electric Light proposes an alternate scenario that would allow the fuel switch provided that all emission limits and regulatory requirements are met.

A fourth alternative scenario occurs during emergency load conditions. Certain equipment malfunctions (such as sudden loss of a unit) may necessitate the operation of CT-3 at loads as high as 110% of peak load. The time period of this operation will be limited to no more than 30 minutes in duration. This operation will not result in a 3-hr average emission rate that exceeds the maximum emission limits.

A fifth alternative scenario occurs during unpredictable periods of equipment failure, upsets, or emergency conditions. During any emergency condition, Hawai'i Electric Light will operate the subject equipment in such a manner as to minimize emissions. Hawai'i Electric Light will comply with the Emergency Provisions (§11-60.1-16.5).

A sixth alternative scenario involves the burning of a maximum total of 200,000 gal/yr, 90 gal/hr, of specification (spec) used oil. The spec used oil consists of collected used oil, such as waste oil, lubricating oil, and waste diesel oil, crankcase oil, transformer oil (dielectric fluid), solvents and kerosene obtained from the equipment operating at the Hawai'i Electric Light facilities.

A seventh alternative scenario involves the use of fuel additives to reduce corrosion, control biological growth, enhance combustion, or other reasons. Additives used during this scenario shall not affect emission estimates.

Hawai'i Electric Light requested to operate the CT-3 below minimum load to address system disturbances and frequency issues in a minor modification application dated October 16, 2015.

No additional changes to operating scenarios are proposed with this application.

1. Identify and describe in detail all air pollution control equipment and compliance monitoring devices or activities planned by the owner or operator, and to the extent of available information, an estimate of emissions before and after controls. Provide all calculations and assumptions.

Water injection is used on CT-3 to reduce NO_x emissions to 42 ppmv at 15 percent O₂, dry with a fuel-bound nitrogen content of 0.015 percent or less. Fuel sulfur content is limited to 0.4 percent by weight for CT-3 and PBSG1 and 2.0% by weight for the boiler. Emissions of PM, PM₁₀, CO, and VOC are controlled by combustion design and good combustion practices. Emissions of any hazardous air pollutants are controlled by the use of No. 2 fuel oil for CT-3 and PBSG1, by the use of No. 6 fuel oil for the boiler, and combustion system design. Compliance monitoring devices and activities are discussed in form C-2.

2. List all *new insignificant* activities in accordance with §11-60.1-82.

No additional changes/additions to insignificant activities are proposed with this application.

- C. Maximum Operating Schedule (to the extent needed to determine or regulate emissions):
1. Total hours per day, per week, and/or per month. Depending on future power dispatch requirements, some units may cycle off-line daily, or operate at reduced loads. However, there may be times when a unit must be run continuously for extended periods of time. Thus, this application does not propose any annual operating limits. Units PBSG1 is limited to an annual operating hour limit of 300 hours.
 2. Total hours per year. Up to 8,760 hours per year each for CT-3 and the boiler. Units PBSG1 is limited to an annual operating hour limit of 300 hours.
 3. If operation is seasonal or irregular, describe. Refer to I.C.1 above.
- D. Cite and describe all applicable requirements as defined in HAR §11-60.1-81, including the following:
1. Description of or reference to any applicable test methods for determining compliance with each applicable requirement. See Form C-2.
 2. Explanation of all proposed exemptions from any applicable requirements. See Forms C-1 and C-2.
- E. Identify and describe current operational limitations or work practices the source plans to implement that affect emissions of any regulated or hazardous air pollutant. Provide all calculations and assumptions.
- See item I.B.1. above for current work practices that affect emissions of any regulated or hazardous air pollutant.
- With this application, Hawai'i Electric Light requests incorporation of the Greenhouse Gas Emissions Limitations into the Covered Source Permit CSP No. 0235-01-C, consistent with the Greenhouse Gas Emissions Reduction Plan submitted to the DOH on February 28, 2018, the subsequent updates submitted to the DOH on October 17, 2018 and May 15, 2019, and the latest update dated July 26, 2019, enclosed with this application.
- F. Provide a detailed schedule for construction or modification of the proposed source, including any major milestones, if applicable. Not applicable.
- G. Provide detailed information to define permit terms and conditions for any proposed **emissions trading** within the facility in accordance with HAR §11-60.1-96. No emissions trading is proposed.
- H. For **significant** modifications which increase the emissions of any air pollutant or result in the emission of any air pollutant not previously emitted, an assessment of the ambient air quality impact of the covered source or significant modification, with the inclusion of any available background air quality data. The assessment shall include all supporting data, calculations and assumptions, and a comparison with the National Ambient Air Quality Standards and State Ambient Air Quality Standards. Do not apply. The proposed modification will not increase the emissions of any air pollutant or result in the emission of any air pollutant not previously emitted.
- I. For **new** covered sources or **significant** modifications subject to the requirements of subchapter 7 of HAR Chapter 11-60.1, all analyses, assessments, monitoring, and other application requirements of subchapter 7. Do not apply. The proposed modification is not subject to Subchapter 7 of HAR Chapter 11-60.1.

- J. Provide the following for Compliance purposes:
 - 1. A compliance plan, Form C-1.
 - 2. A compliance certification, Form C-2.
- II. **Submit an application fee according to the Application Fees Schedule in the Instructions for Applying for an Air Pollution Control Permit.**
- III. **Provide other information as follows:**
 - A. As required by any applicable requirement or as requested and deemed necessary by the director to make a decision on the application.
 - B. As may be necessary to implement and enforce other applicable requirements of the Clean Air Act or of HAR Chapter 11-60.1 or to determine the applicability of such requirements.
- IV. **The Director reserves the right to request the following information:**
 - A. A risk assessment of the air quality related impacts caused by the covered source or significant modification to the surrounding environment.
 - B. Results of source emissions testing, ambient air quality monitoring, or both.
 - C. Information on other available control technologies.
- V. **An application shall be determined to be complete only when all of the following have been complied with:**
 - A. All information required or requested in numbers I, III, and IV has been submitted.
 - B. All documents requiring certification have been certified pursuant to HAR §11-60.1-4.
 - C. All applicable fees have been submitted.
 - D. The director has certified that the application is complete.
- VI. **The Director shall not continue to act upon or consider an incomplete application.**
 - A. The applicant shall be notified in writing whether the application is complete:
 - 1. For the requirements of subchapter 7, thirty days after receipt of the application.
 - 2. For the requirements of HAR subchapter 5, sixty days after receipt of the application. For purposes of this paragraph, the date of receipt of an application for a new covered source or significant modification subject to the requirements of subchapter 7 shall be the date the application is determined to be complete for the requirements of subchapter 7.
 - 3. Unless the Director requests additional information or notifies the applicant of incompleteness within sixty days after receipt of an application pursuant to VI.A.2 above, the application shall be deemed complete for the requirements of subchapter 5.
 - B. During the processing of an application that has been determined or deemed complete, if additional information is necessary to evaluate or take final action on the application, the Director may request such information in writing and set a reasonable deadline for a response.
- VII. **After receipt of a complete application, the Director, in writing, shall approve, conditionally approve, or deny an application within eighteen months, except as provided in HAR §11-60.1-88 and (A) and (B) below.**
 - A. Upon program approval, within nine months for an application containing an early reduction demonstration pursuant to section 112(i)(5) of the Clean Air Act.

- B. Within twelve months for a new covered source or significant modification subject to the requirements of subchapter 7.
- VIII. **The Director shall provide reasonable procedures and resources to complete the review of the majority of the applications for a significant modification within nine months after receipt of a complete application. An application for significant modification shall be approved only if the Director determines that the significant modification will be in compliance with all applicable requirements.**
- IX. **The Director shall provide for public notice, including the method by which a public hearing can be requested, and an opportunity for public comment on the draft significant modification to the covered source in accordance with HAR §11-60.1-99.**
- X. **The Director shall provide a statement that sets forth the legal and factual bases for the draft permit conditions (including references to the applicable statutory or regulatory provisions) to EPA and any other person requesting it.**
- XI. **Each application for a significant modification, and the proposed Covered Source Permit reflecting the significant modification shall be subject to EPA oversight in accordance with HAR §11-60.1-95.**

**Revised Form S-6
Kahului Generating Station
CSP No. 0232-01-C
July 2019**

S-6: Application for a Significant Modification to a Covered Source

In providing the required information, reference the corresponding letters and numbers listed below.

Provide a minimum of **two (2)** sets (1 original and 1 copy) of all application materials to the Hawaii Department of Health. Also, mail **one (1)** set directly to EPA at the following address:

Chief (Attention: AIR-3)
Permits Office, Air Division
U.S. Environmental Protection Agency
Region 9
75 Hawthorne Street
San Francisco, CA 94105

I. In accordance with Hawaii Administrative Rules (HAR) §11-60.1-104, the following information is required:

A. Equipment Specifications:

1. Maximum design capacity. Refer to the table below.
2. Fuel type.
 - No. 6 fuel oil with 2.0% (max) by weight sulfur content, and in emergencies, No. 2 fuel oil with 0.5% (max) sulfur by weight.
 - No more than 300,000 gal/yr of specification (spec) used oil. On December 13, 2017, the DOH approved consumption of specification used oil from Maui Petroleum.
3. Fuel use. Refer to the table below.

Maximum Capacity and Fuel Use Per Unit

Unit ID	Manufacturer	Model Number	Serial Number	Capacity (Nominal)	Fuel Flow Rate	Ignition Fuel
K-1	Combustion Engineering	None	13413	5.0 MW	94.0 MMBtu/hr	Electric
K-2	Combustion Engineering	None	15345	5.0 MW	94.0 MMBtu/hr	Propane
K-3	Combustion Engineering	None	17343	11.5 MW	172.0 MMBtu/hr	Propane
K-4	Babcock & Wilcox	None	PFI3030	12.5 MW	181.0 MMBtu/hr	Propane

4. Production capacity. Does not apply.
5. Production rates. Does not apply.
6. Raw materials. Does not apply.
7. Provide any manufacturer's literature. This application does not change any of Kahului equipment's manufacturer's specifications.

B. Provide detailed descriptions of all processes and products defined by Standard Industrial Classification Code (SICC). Also, provide any reasonably anticipated alternative operating scenarios, associated processes, and products, by SICC.

Electrical power generation (SIC code 4911) is the only product or process.

Several types of alternative operating scenarios apply to the plant. The first alternative operating scenario is unit operation during start-up, shut-down, maintenance, and testing. Boiler start-up operations may occur up to 225 times per year per boiler and occasionally range up to 6 hours.

A second alternate scenario is the ability to switch fuels. Should cheaper fuels become available or the supply of No. 6 fuel oil become limited, MECO may propose an alternate scenario that would allow the fuel switch, provided that all emission limits and regulatory requirements of the DOH rules are met.

A third alternative scenario involves boiler soot-blowing. This is a necessary maintenance operation and may result in a temporary increase in opacity.

A fourth alternative scenario is the use of fuel additives and other products which may be used to control algae, inhibit corrosion, enhance combustion, etc. Emissions during this scenario will comply with all permit conditions.

No additional changes to operating scenarios are proposed with this application.

1. Identify and describe in detail all air pollution control equipment and compliance monitoring devices or activities planned by the owner or operator, and to the extent of available information, an estimate of emissions before and after controls. Provide all calculations and assumptions.

Sulfur emissions are controlled by limiting the fuel sulfur content to 2 percent for No. 6 fuel oil and 0.5 percent for No. 2 fuel oil. Emissions of NO_x, PM, PM₁₀, CO, and VOC are controlled by combustion design and good combustion practices. Emissions of any hazardous air pollutants are controlled by the use of No. 6 fuel oil or No. 2 fuel oil and combustion system design.

Compliance monitoring devices and activities are discussed in Form C-2.

2. List all *new insignificant* activities in accordance with §11-60.1-82.

No additional changes/additions to insignificant activities are proposed with this application.

C. Maximum Operating Schedule (to the extent needed to determine or regulate emissions):

1. Total hours per day, per week, and/or per month. The planned operation of units K-1 through K-4 is 24 hours per day, seven days per week. Depending on future dispatch requirements, the plant may cycle off-line daily, or operate at reduced loads. While these expected operating levels are less than continuous, there may be times when the units must be run continuously for extended periods of time.
2. Total hours per year. Up to 8,760 hours per year.
3. If operation is seasonal or irregular, describe. Operation is not seasonal or irregular.

D. Cite and describe all applicable requirements as defined in HAR §11-60.1-81, including the following:

1. Description of or reference to any applicable test methods for determining compliance with each applicable requirement. See Form C-2.
2. Explanation of all proposed exemptions from any applicable requirements. See Forms C-1 and C-2.

- E. Identify and describe current operational limitations or work practices the source plans to implement that affect emissions of any regulated or hazardous air pollutant. Provide all calculations and assumptions.

See item I.B.1. above for current work practices that affect emissions of any regulated or hazardous air pollutant.

With this application, Maui Electric requests incorporation of the Greenhouse Gas Emissions Limitations into the Covered Source Permit CSP No. 0232-01-C, consistent with the Greenhouse Gas Emissions Reduction Plan submitted to the DOH on February 28, 2018, the subsequent updates submitted to the DOH on October 17, 2018 and May 15, 2019, and the latest update dated July 26, 2019, enclosed with this application.

- F. Provide a detailed schedule for construction or modification of the proposed source, including any major milestones, if applicable. Not applicable.

- G. Provide detailed information to define permit terms and conditions for any proposed **emissions trading** within the facility in accordance with HAR §11-60.1-96. No emissions trading is proposed.

- H. For **significant** modifications which increase the emissions of any air pollutant or result in the emission of any air pollutant not previously emitted, an assessment of the ambient air quality impact of the covered source or significant modification, with the inclusion of any available background air quality data. The assessment shall include all supporting data, calculations and assumptions, and a comparison with the National Ambient Air Quality Standards and State Ambient Air Quality Standards. Do not apply. The proposed modification will not increase the emissions of any air pollutant or result in the emission of any air pollutant not previously emitted.

- I. For **new** covered sources or **significant** modifications subject to the requirements of subchapter 7 of HAR Chapter 11-60.1, all analyses, assessments, monitoring, and other application requirements of subchapter 7. Do not apply. The proposed modification is not subject to Subchapter 7 of HAR Chapter 11-60.1.

- J. Provide the following for Compliance purposes:

1. A compliance plan, Form C-1.
2. A compliance certification, Form C-2.

II. Submit an application fee according to the Application Fees Schedule in the Instructions for Applying for an Air Pollution Control Permit.

III. Provide other information as follows:

- A. As required by any applicable requirement or as requested and deemed necessary by the director to make a decision on the application.
- B. As may be necessary to implement and enforce other applicable requirements of the Clean Air Act or of HAR Chapter 11-60.1 or to determine the applicability of such requirements.

IV. The Director reserves the right to request the following information:

- A. A risk assessment of the air quality related impacts caused by the covered source or significant modification to the surrounding environment.
- B. Results of source emissions testing, ambient air quality monitoring, or both.

- C. Information on other available control technologies.
- V. **An application shall be determined to be complete only when all of the following have been complied with:**
 - A. All information required or requested in numbers I, III, and IV has been submitted.
 - B. All documents requiring certification have been certified pursuant to HAR §11-60.1-4.
 - C. All applicable fees have been submitted.
 - D. The director has certified that the application is complete.
- VI. **The Director shall not continue to act upon or consider an incomplete application.**
 - A. The applicant shall be notified in writing whether the application is complete:
 - 1. For the requirements of subchapter 7, thirty days after receipt of the application.
 - 2. For the requirements of HAR subchapter 5, sixty days after receipt of the application. For purposes of this paragraph, the date of receipt of an application for a new covered source or significant modification subject to the requirements of subchapter 7 shall be the date the application is determined to be complete for the requirements of subchapter 7.
 - 3. Unless the Director requests additional information or notifies the applicant of incompleteness within sixty days after receipt of an application pursuant to VI.A.2 above, the application shall be deemed complete for the requirements of subchapter 5.
 - B. During the processing of an application that has been determined or deemed complete, if additional information is necessary to evaluate or take final action on the application, the Director may request such information in writing and set a reasonable deadline for a response.
- VII. **After receipt of a complete application, the Director, in writing, shall approve, conditionally approve, or deny an application within eighteen months, except as provided in HAR §11-60.1-88 and (A) and (B) below.**
 - A. Upon program approval, within nine months for an application containing an early reduction demonstration pursuant to section 112(i)(5) of the Clean Air Act.
 - B. Within twelve months for a new covered source or significant modification subject to the requirements of subchapter 7.
- VIII. **The Director shall provide reasonable procedures and resources to complete the review of the majority of the applications for a significant modification within nine months after receipt of a complete application. An application for significant modification shall be approved only if the Director determines that the significant modification will be in compliance with all applicable requirements.**
- IX. **The Director shall provide for public notice, including the method by which a public hearing can be requested, and an opportunity for public comment on the draft significant modification to the covered source in accordance with HAR §11-60.1-99.**
- X. **The Director shall provide a statement that sets forth the legal and factual bases for the draft permit conditions (including references to the applicable statutory or regulatory provisions) to EPA and any other person requesting it.**
- XI. **Each application for a significant modification, and the proposed Covered Source Permit reflecting the significant modification shall be subject to EPA oversight in accordance with HAR §11-60.1-95.**

**Revised Form S-6
Maalaea Generating Station
CSP No. 0067-01-C
July 2019**

S-6: Application for a Significant Modification to a Covered Source

In providing the required information, reference the corresponding letters and numbers listed below.

Provide a minimum of **two (2)** sets (1 original and 1 copy) of all application materials to the Hawaii Department of Health. Also, mail **one (1)** set directly to EPA at the following address:

Chief (Attention: AIR-3)
Permits Office, Air Division
U.S. Environmental Protection Agency
Region 9
75 Hawthorne Street
San Francisco, CA 94105

I. In accordance with Hawaii Administrative Rules (HAR) §11-60.1-104, the following information is required:

A. Equipment Specifications:

1. Maximum design capacity. Refer to the table below.
2. Fuel type.
 - Fuel oil No. 2 diesel with 0.4% maximum sulfur content and biodiesel.
 - Spec used oil (not to exceed 150,000 gal/yr).
 - Fuel oil No. 2 with a maximum sulfur content of 0.0015 percent by weight and a minimum Cetane index of 40 or a maximum aromatic content of 35 volume percent.
3. Fuel use. Refer to the table below.

Maximum Design Fuel Use per Unit

Unit ID	Make	Model Number	Unit Type	Nominal Output	Nominal Heat Input
M1-M3	General Motors	20-645E4	Diesel Engine	2.5 MW	29.2 MMBtu/hr
M4 & M6	Cooper Bessemer	LSV-20-T	Diesel Engine	5.6 MW	58.8 MMBtu/hr
M5 & M7	Cooper Bessemer	LSV-20-T	Diesel Engine	5.6 MW	58.8 MMBtu/hr
M8-M9	Colt Industries	C-P PC2V	Diesel Engine	5.6 MW	60.2 MMBtu/hr
M10-M13	Mitsubishi Hvy. Ind.	185V52/55A	Diesel Engine	12.5 MW	122.7 MMBtu/hr
X1-X2	General Motors	20-645E4	Diesel Engine	2.5 MW	28.5 MMBtu/hr
SG1	General Motors / Detroit	12V92TAB/8 123-7416	Diesel Engine	600 kW	6.34 MMBtu/hr
M14 & M16	General Electric	LM2500	Combustion Turbine	20 MW	275 MMBtu/hr
M17 & M19	General Electric	LM2500	Combustion Turbine	20 MW	275 MMBtu/hr

4. Production capacity. Does not apply.
5. Production rates. Does not apply.
6. Raw materials. Does not apply.
7. Provide any manufacturer's literature. This application does not change any of Maalaea equipment's manufacturer's specifications.

- B. Provide detailed descriptions of all processes and products defined by Standard Industrial Classification Code (SICC). Also, provide any reasonably anticipated alternative operating scenarios, associated processes, and products, by SICC.

Electrical power generation (SIC code 4911) is the only product or process.

Several types of alternative operating scenarios apply to the plant. The first alternative operating scenario is the ability to conduct steam blows activity.

The second alternative operating scenario includes the use of a temporary replacement unit for the diesel engine generators and combustion turbines, in the event of a failure or major overhaul of an installed unit. In the event that the projected down-time of the installed unit increases the likelihood of an interruption in electrical service, the installed unit would be temporarily replaced. Emissions from the temporary replacement unit will comply with the original unit's emission and operating limits.

A third alternative scenario is the ability to operate below the 25% load for maintenance and testing, provided that all emission limits and regulatory requirements of the DOH rules are met.

A fourth alternative scenario is the ability to burn alternative fuels. Should cheaper fuels become available or the supply of No. 6 fuel oil become limited, Maui Electric proposes an alternate scenario that would allow the fuel switch, provided that all emission limits and regulatory requirements of the DOH rules are met.

A fifth alternative operating scenario is the use of fuel additives and other products which may be used to control algae, inhibit corrosion, enhance combustion, etc. Emissions during this scenario will comply with all permit conditions.

A sixth alternative operating scenario is the ability to operate the combustion turbines up to 110% above peak load if equipment malfunction such as a sudden loss of a unit occurs, provided conditions specified in CSP No. 0067-01-C are met.

No additional changes to operating scenarios are proposed with this application.

1. Identify and describe in detail all air pollution control equipment and compliance monitoring devices or activities planned by the owner or operator, and to the extent of available information, an estimate of emissions before and after controls. Provide all calculations and assumptions.

Fuel Injection Timing Retard (FITR) is used on diesel engine generating units M12, M13, X1, and X2 to control NOx emissions. Water injection is used on M14, M16, M17, and M19 to limit NOx emissions to 42 ppmvd at 15 percent O₂, dry with a fuel-bound nitrogen content of 0.015 percent by weight or less. Sulfur emissions are controlled by limiting the fuel sulfur content to 0.4 percent for units M4 through M13, M14, M16, M17, and M19 and 0.0015% for units M1 through M3, X1, and X2. CO emissions from units M1 through M13, X1, and X2 are controlled by the Diesel Oxidation Catalyst (DOC). The DOC will reduce CO emissions by at least 70 percent or limit CO emissions to 23 ppmvd or less at 15 percent O₂. Emissions of PM, PM10, CO and VOC are controlled by combustion design and good combustion practices. Emissions of hazardous air pollutants are controlled by the use of No. 2 fuel oil and combustion system design.

Compliance monitoring devices and activities are discussed in Form C-2.

2. List all **new insignificant** activities in accordance with §11-60.1-82.
No additional changes/additions to insignificant activities are proposed with this application.
- C. Maximum Operating Schedule (to the extent needed to determine or regulate emissions):
1. Total hours per day, per week, and/or per month. The planned operation is full load the majority of the time. Depending on future dispatch requirements, the plant may cycle off-line daily, or operate at reduced loads. While these expected operating levels are less than continuous, there may be times when the units must be run continuously for extended periods of time.
 2. Total hours per year. Up to 8,760 hours per year. Units X1 and X2 are limited by PSD Permit HI 86-02 to 4,380 hours per year, per unit. Unit SG1 is limited by PSD Permit HI 90-02 to 300 hours per year.
 3. If operation is seasonal or irregular, describe. Operation is not seasonal or irregular.
- D. Cite and describe all applicable requirements as defined in HAR §11-60.1-81, including the following:
1. Description of or reference to any applicable test methods for determining compliance with each applicable requirement. See Form C-2.
 2. Explanation of all proposed exemptions from any applicable requirements. See Forms C-1 and C-2.
- E. Identify and describe current operational limitations or work practices the source plans to implement that affect emissions of any regulated or hazardous air pollutant. Provide all calculations and assumptions.
See item I.B.1. above for current work practices that affect emissions of any regulated or hazardous air pollutant.
Maui Electric requests incorporation of the Greenhouse Gas Emissions Limitations into the Covered Source Permit CSP No. 0067-01-C, consistent with the Greenhouse Gas Emissions Reduction Plan submitted to the DOH on February 28, 2018, the subsequent updates submitted to the DOH on October 17, 2018 and May 15, 2019, and the latest update dated July 26, 2019, enclosed with this application.
- F. Provide a detailed schedule for construction or modification of the proposed source, including any major milestones, if applicable. Not applicable.
- G. Provide detailed information to define permit terms and conditions for any proposed **emissions trading** within the facility in accordance with HAR §11-60.1-96. No emissions trading is proposed.
- H. For **significant** modifications which increase the emissions of any air pollutant or result in the emission of any air pollutant not previously emitted, an assessment of the ambient air quality impact of the covered source or significant modification, with the inclusion of any available background air quality data. The assessment shall include all supporting data, calculations and assumptions, and a comparison with the National Ambient Air Quality Standards and State Ambient Air Quality Standards. Do not apply. The proposed modification will not increase the emissions of any air pollutant or result in the emission of any air pollutant not previously emitted.

- I. For *new* covered sources or *significant* modifications subject to the requirements of subchapter 7 of HAR Chapter 11-60.1, all analyses, assessments, monitoring, and other application requirements of subchapter 7. Do not apply. The proposed modification is not subject to Subchapter 7 of HAR Chapter 11-60.1.
- J. Provide the following for Compliance purposes:
 1. A compliance plan, Form C-1.
 2. A compliance certification, Form C-2.
- II. **Submit an application fee according to the Application Fees Schedule in the Instructions for Applying for an Air Pollution Control Permit.**
- III. **Provide other information as follows:**
 - A. As required by any applicable requirement or as requested and deemed necessary by the director to make a decision on the application.
 - B. As may be necessary to implement and enforce other applicable requirements of the Clean Air Act or of HAR Chapter 11-60.1 or to determine the applicability of such requirements.
- IV. **The Director reserves the right to request the following information:**
 - A. A risk assessment of the air quality related impacts caused by the covered source or significant modification to the surrounding environment.
 - B. Results of source emissions testing, ambient air quality monitoring, or both.
 - C. Information on other available control technologies.
- V. **An application shall be determined to be complete only when all of the following have been complied with:**
 - A. All information required or requested in numbers I, III, and IV has been submitted.
 - B. All documents requiring certification have been certified pursuant to HAR §11-60.1-4.
 - C. All applicable fees have been submitted.
 - D. The director has certified that the application is complete.
- VI. **The Director shall not continue to act upon or consider an incomplete application.**
 - A. The applicant shall be notified in writing whether the application is complete:
 1. For the requirements of subchapter 7, thirty days after receipt of the application.
 2. For the requirements of HAR subchapter 5, sixty days after receipt of the application. For purposes of this paragraph, the date of receipt of an application for a new covered source or significant modification subject to the requirements of subchapter 7 shall be the date the application is determined to be complete for the requirements of subchapter 7.
 3. Unless the Director requests additional information or notifies the applicant of incompleteness within sixty days after receipt of an application pursuant to VI.A.2 above, the application shall be deemed complete for the requirements of subchapter 5.
 - B. During the processing of an application that has been determined or deemed complete, if additional information is necessary to evaluate or take final action on the application, the Director may request such information in writing and set a reasonable deadline for a response.

- VII. **After receipt of a complete application, the Director, in writing, shall approve, conditionally approve, or deny an application within eighteen months, except as provided in HAR §11-60.1-88 and (A) and (B) below.**
- A. Upon program approval, within nine months for an application containing an early reduction demonstration pursuant to section 112(i)(5) of the Clean Air Act.
 - B. Within twelve months for a new covered source or significant modification subject to the requirements of subchapter 7.
- VIII. **The Director shall provide reasonable procedures and resources to complete the review of the majority of the applications for a significant modification within nine months after receipt of a complete application. An application for significant modification shall be approved only if the Director determines that the significant modification will be in compliance with all applicable requirements.**
- IX. **The Director shall provide for public notice, including the method by which a public hearing can be requested, and an opportunity for public comment on the draft significant modification to the covered source in accordance with HAR §11-60.1-99.**
- X. **The Director shall provide a statement that sets forth the legal and factual bases for the draft permit conditions (including references to the applicable statutory or regulatory provisions) to EPA and any other person requesting it.**
- XI. **Each application for a significant modification, and the proposed Covered Source Permit reflecting the significant modification shall be subject to EPA oversight in accordance with HAR §11-60.1-95.**

**Revised Form S-6
Palaau Generating Station
CSP No. 0031-04-C
July 2019**

S-6: Application for a Significant Modification to a Covered Source

In providing the required information, reference the corresponding letters and numbers listed below.

Provide a minimum of **two (2)** sets (1 original and 1 copy) of all application materials to the Hawaii Department of Health. Also, mail **one (1)** set directly to EPA at the following address:

Chief (Attention: AIR-3)
Permits Office, Air Division
U.S. Environmental Protection Agency
Region 9
75 Hawthorne Street
San Francisco, CA 94105

I. In accordance with Hawaii Administrative Rules (HAR) §11-60.1-104, the following information is required:

A. Equipment Specifications:

1. Maximum design capacity. Refer to the table below.
2. Fuel type.
 - No. 2 fuel oil with maximum sulfur content of 0.4 percent by weight for CT1.
 - No. 2 diesel with maximum 0.0015 percent by weight sulfur content, minimum Cetane index of 40 or maximum aromatic content of 35% volume for Units CAT1 and CAT2, CUM3 through CUM6, CAT7 through CAT9.
 - Specification used oil for Units CUM3 through CUM6 and CAT7 through CAT9.
3. Fuel use.
 - The total combined fuel consumption of CUM3-CUM6 shall not exceed 1,650,000 gallons in any rolling twelve-month (12-month) period.
 - The total combined specification used oil consumption of CUM3-CUM6 and CAT7-CAT9 shall not exceed 10,000 gallons in any rolling twelve-month (12-month) period.
 - The total fuel consumption of CT1 shall not exceed 1,230,000 gallons in any rolling twelve-month (12-month) period.

Maximum Design Fuel Use per Unit						
Unit ID	Make	Model Number	Unit Type	Nominal Rating (MW)	Nominal Heat Input (MMBtu/hr)	Fuel (gal/hr)
CUM3, CUM4, or CUM6	Cummins	KTA50	Diesel Engine	1.0	9.09	64.9
CUM5	Cummins	KTTA50	Diesel Engine	1.0	9.52	68.0
CAT7, CAT8, or CAT9	Caterpillar	3608	Diesel Engine	2.2	23.38	167.0
CAT1 or CAT2	Caterpillar	3516	Diesel Engine	1.25	12.62	90.63
CT1	Solar International	Centaur T4001	Combustion Turbine	2.0	34.0	240.0

4. Production capacity. Does not apply.
5. Production rates. Does not apply.
6. Raw materials. Does not apply.
7. Provide any manufacturer's literature. This application does not change any of Palaa equipment's manufacturer's specifications.

- B. Provide detailed descriptions of all processes and products defined by Standard Industrial Classification Code (SICC). Also, provide any reasonably anticipated alternative operating scenarios, associated processes, and products, by SICC.

Electrical power generation through combustion of fossil fuels (SICC 4911) is the only product or process.

Several types of alternative operating scenarios apply to the plant. A first alternate scenario includes the use of a temporary replacement unit in the event of a failure or major overhaul of an installed unit, provided the requirements in Attachment IIA Section C.7.a are met.

A second alternative scenario is the ability to switch fuels. Should cheaper fuels become available, Maui Electric may propose an alternate scenario that would allow the fuel switch, provided that all emission limits and regulatory requirements of the DOH rules are met.

No additional changes to operating scenarios are proposed with this application.

1. Identify and describe in detail all air pollution control equipment and compliance monitoring devices or activities planned by the owner or operator, and to the extent of available information, an estimate of emissions before and after controls. Provide all calculations and assumptions.

NO_x emissions from Units CUM3 through CUM6, CAT1, and CAT2 are controlled by fuel injection timing retard (FITR). NO_x emissions from Units CAT7 through CAT9 are controlled by FITR and intake air cooling. Emissions of PM/PM₁₀, CO, and VOC are controlled by combustion design. SO₂ emissions are controlled by limiting the fuel sulfur content to 0.4 percent by weight for Unit CT1 and 0.0015 percent by weight for units CUM3 through CUM6, CAT7 through CAT9, CAT1, and CAT2. CO emissions will be controlled by the DOC for units CUM3 through CUM6, CAT7 through CAT9, CAT1, and CAT2. The DOC will reduce CO emissions by at least 70 percent or limit CO to 23 ppmvd at 15% O₂. Emissions of any hazardous pollutants are controlled by the use of No. 2 fuel oil and combustion system design.

2. List all *new insignificant* activities in accordance with §11-60.1-82.

No additional changes/additions to insignificant activities are proposed with this application.

- C. Maximum Operating Schedule (to the extent needed to determine or regulate emissions):

1. Total hours per day, per week, and/or per month. The planned operation of the facility is 24 hours per day, seven days per week. Depending on future dispatch requirements, the plant may cycle off-line daily, or operate at reduced loads. While these expected operating levels are less than continuous, there may be times when the units must be run continuously for extended periods of time. Thus, this application does not propose any annual operating limits.

2. Total hours per year. Up to 8,760 hours per year.

3. If operation is seasonal or irregular, describe. Refer to I.C.1 above.

- D. Cite and describe all applicable requirements as defined in HAR §11-60.1-81, including the following:
1. Description of or reference to any applicable test methods for determining compliance with each applicable requirement. See Form C-2.
 2. Explanation of all proposed exemptions from any applicable requirements. See Forms C-1 and C-2.
- E. Identify and describe current operational limitations or work practices the source plans to implement that affect emissions of any regulated or hazardous air pollutant. Provide all calculations and assumptions.
- Pollution controls include a fuel sulfur content limit, good combustion practices, and FITR.
- Maui Electric requests incorporation of the Greenhouse Gas Emissions Limitations into the Covered Source Permit CSP No. 0031-04-C consistent with the Greenhouse Gas Emissions Reduction Plan submitted to the DOH on February 28, 2018, the subsequent updates submitted to the DOH on October 17, 2018 and May 15, 2019, and the latest update dated July 26, 2019, enclosed with this application.
- F. Provide a detailed schedule for construction or modification of the proposed source, including any major milestones, if applicable. Not applicable.
- G. Provide detailed information to define permit terms and conditions for any proposed **emissions trading** within the facility in accordance with HAR §11-60.1-96. No emissions trading is proposed.
- H. For **significant** modifications which increase the emissions of any air pollutant or result in the emission of any air pollutant not previously emitted, an assessment of the ambient air quality impact of the covered source or significant modification, with the inclusion of any available background air quality data. The assessment shall include all supporting data, calculations and assumptions, and a comparison with the National Ambient Air Quality Standards and State Ambient Air Quality Standards. Do not apply. The proposed modification will not increase the emissions of any air pollutant or result in the emission of any air pollutant not previously emitted.
- I. For **new** covered sources or **significant** modifications subject to the requirements of subchapter 7 of HAR Chapter 11-60.1, all analyses, assessments, monitoring, and other application requirements of subchapter 7. Do not apply. The proposed modification is not subject to Subchapter 7 of HAR Chapter 11-60.1.
- J. Provide the following for Compliance purposes:
1. A compliance plan, Form C-1.
 2. A compliance certification, Form C-2.

II. **Submit an application fee according to the Application Fees Schedule in the Instructions for Applying for an Air Pollution Control Permit.**

III. Provide other information as follows:

- A. As required by any applicable requirement or as requested and deemed necessary by the director to make a decision on the application.
- B. As may be necessary to implement and enforce other applicable requirements of the Clean Air Act or of HAR Chapter 11-60.1 or to determine the applicability of such requirements.

IV. The Director reserves the right to request the following information:

- A. A risk assessment of the air quality related impacts caused by the covered source or significant modification to the surrounding environment.
- B. Results of source emissions testing, ambient air quality monitoring, or both.
- C. Information on other available control technologies.

V. An application shall be determined to be complete only when all of the following have been complied with:

- A. All information required or requested in numbers I, III, and IV has been submitted.
- B. All documents requiring certification have been certified pursuant to HAR §11-60.1-4.
- C. All applicable fees have been submitted.
- D. The director has certified that the application is complete.

VI. The Director shall not continue to act upon or consider an incomplete application.

- A. The applicant shall be notified in writing whether the application is complete:
 - 1. For the requirements of subchapter 7, thirty days after receipt of the application.
 - 2. For the requirements of HAR subchapter 5, sixty days after receipt of the application. For purposes of this paragraph, the date of receipt of an application for a new covered source or significant modification subject to the requirements of subchapter 7 shall be the date the application is determined to be complete for the requirements of subchapter 7.
 - 3. Unless the Director requests additional information or notifies the applicant of incompleteness within sixty days after receipt of an application pursuant to VI.A.2 above, the application shall be deemed complete for the requirements of subchapter 5.
- B. During the processing of an application that has been determined or deemed complete, if additional information is necessary to evaluate or take final action on the application, the Director may request such information in writing and set a reasonable deadline for a response.

VII. After receipt of a complete application, the Director, in writing, shall approve, conditionally approve, or deny an application within eighteen months, except as provided in HAR §11-60.1-88 and (A) and (B) below.

- A. Upon program approval, within nine months for an application containing an early reduction demonstration pursuant to section 112(i)(5) of the Clean Air Act.
- B. Within twelve months for a new covered source or significant modification subject to the requirements of subchapter 7.

VIII. The Director shall provide reasonable procedures and resources to complete the review of the majority of the applications for a significant modification within nine months after receipt of a complete application. An application for significant modification shall be approved only if the Director determines that the significant modification will be in compliance with all applicable requirements.

- IX. The Director shall provide for public notice, including the method by which a public hearing can be requested, and an opportunity for public comment on the draft significant modification to the covered source in accordance with HAR §11-60.1-99.
- X. The Director shall provide a statement that sets forth the legal and factual bases for the draft permit conditions (including references to the applicable statutory or regulatory provisions) to EPA and any other person requesting it.
- XI. Each application for a significant modification, and the proposed Covered Source Permit reflecting the significant modification shall be subject to EPA oversight in accordance with HAR §11-60.1-95.

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Hamakua Energy, LLC

45-300 Lehua Street, P.O. Box 40 • Honokaa, Hawaii 96727 • ph 808.775.1711 • fax 808.778.1801

November 14, 2018

Marianne Rossio, P.E.
Hawaii Department of Health
Clean Air Branch
2827 Waimano Home Road
Hale Ola Building, Room 130
Pearl City, Hawaii 96782-1487

Subject: Revised GHG Reduction Plan
Hamakua Energy Plant
45-300 Lehua Street, Honokaa, Hawaii
Hamakua Energy LLC
Covered Source Permit (CSP) No. 0243-01-C

Dear Ms. Rossio:
Hamakua Energy, LLC has reviewed options to meet the GHG reduction goals set forth in HAR §11-60.1-204 and is pleased to submit the enclosed GHG Reduction Plan.

I certify that I have knowledge of the facts herein set forth, that the same are true, accurate and complete to the best of my knowledge and belief, and that all information not identified by me as confidential in nature shall be treated by the Department of Health as public record. I further state that I will assume responsibility for the construction, modification, or operation of the source in accordance with the Hawaii Administrative Rules (HAR), Title 11, Chapter 60.1, Air Pollution Control, and any permit issued thereof.

If you have any questions, please contact Kevin Monahan at (661) 393-0885.

Sincerely,

A handwritten signature in blue ink that reads "Kevin Monahan". The signature is fluid and cursive.

Kevin Monahan
Asset Manager

Attachment: Biodiesel Test Plan – Hamakua Energy Plant
Cc: Dale Hamamoto

**Hamakua Energy LLC
Hamakua Energy Power (HEP) Facility
45-300 Lehua Street
Honoka'a, Hawai'i 96727**

**Greenhouse Gas Emissions Reduction Plan
GHG (ERP – Revision 1)**

October 29, 2018



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Summary of Revisions

- Minor changes throughout to increase clarity and correct grammatical errors,
- Revised Section 1.1 - **Background** – Addressing Lower East Rift Zone eruption and shutdown of Puna Geothermal Ventures.
- Revised Section 2.3 - **GHG Facility-wide Emissions Cap** – Explaining that Hamakua Energy can only certify its own GHG emissions data, that each entity in the GHG Partnership is responsible for certifying its respective GHG emissions data, and referencing impending Hamakua Energy biodiesel test burn request and CSP minor modification application to store and fire biodiesel.
- Revised Section 3.1 – **Partnering with Other Power Producers in Hawai'i** – Referencing no interisland power connections and load shift to Hamakua Energy due to loss of PGV output. Revising discussion of regulatory approval or disapproval to include regulatory agencies in general.
- Revised Section 3.3 – **Fuel Switching, Including Biogenic Fuels** – Referencing loss of PGV output as a factor in evaluating use of biodiesel at the HEP Facility; conforming changes in Section 3.7, Section 5.2.
- Revised Section 3.6 – **Restrictive Operations** – Referencing effects of loss of PGV output and increased dispatch of HEP Facility on Restrictive Operations.
- Revised Appendix B – **ERP Partnership Baseline CO₂e Emissions and Proposed CSP Limits** – Provided by Hawaiian Electric Company, Inc. with revised title; showing adjustments to ERP baseline CO₂e emissions and CO₂e emissions ERP cap for partnership and certain partnership members; showing no change to HEP individual baseline CO₂e emissions or proposed CO₂e emissions ERP cap.

1. INTRODUCTION

1.1 Background

Hamakua Energy, LLC (Hamakua Energy) owns and operates the 65 megawatt (MW) electric generation Hamakua Energy Power facility (HEP Facility)¹ located at Honoka'a on the Hamakua Coast of Hawai'i Island. The HEP Facility supplies electricity to the Hawai'i Electric Light Company, Inc. (Hawai'i Electric Light) in accordance with a Power Purchase Agreement (PPA), under which, among other things, Hawai'i Electric Light determines when and to what load to dispatch the HEP Facility.

Hamakua Energy acquired the HEP Facility from Hamakua Energy Partners, LP effective November 24, 2017. The HEP Facility has been in operation since 2000 and operates pursuant to Covered Source Permit (CSP) No. 0243-01-C, which was transferred from Hamakua Energy Partners to Hamakua Energy effective November 24, 2017. Among other requirements, the HEP Facility is subject to Hawai'i's greenhouse gas reduction regulations set forth in Hawai'i Administrative Rules (HAR) §11-60.1-201 et. seq. (The Greenhouse Gas Reduction Rule). Prior to the transfer, Hamakua Energy Partners had submitted a proposed Greenhouse Gas Emission Reduction Plan (GHG ERP) for the HEP Facility to the Hawai'i Department of Health (DOH) as required by HAR §11-60.1-204. However, DOH had not accepted the proposed GHG ERP, in part due to the DOH's disagreement with Hamakua Energy Partners' proposed baseline year and GHG emissions reductions approach.

At a meeting on September 29, 2017, Hamakua Energy informally advised DOH Clean Air Branch representatives that, upon successful acquisition of the HEP Facility, it would submit a revised GHG ERP to DOH with a baseline year of 2010 and that it intended to meet the facility-wide GHG emissions cap by 2020 through (i) partnering, (ii) use of biofuels, and, if necessary, (iii) by restrictive operations. Subsequent to the transfer of ownership, Hamakua Energy confirmed its selection of 2010 as the HEP Facility's GHG emissions baseline year and its compliance intentions in a

¹ The HEP Facility has a "nominal" capacity of 65 megawatts as described in its Covered Source Permit. However, by terms of the Power Purchase Agreement with Hawai'i Electric Light, the "Firm Capacity" of the HEP Facility is 60 megawatts.

letter to DOH dated December 7, 2017. By letter dated January 2, 2018, DOH approved Hamakua Energy's selection of the HEP Facility's 2010 GHG emissions for determining its facility-wide GHG emissions cap.

In discussions with DOH staff about compliance issues and challenges, Hamakua representatives raised concerns about the effects natural disasters might have on achieving the GHG emissions reduction requirements, particularly the requirement to reduce GHG emissions by at least 16 percent below 2010 GHG emissions (what Hamakua Energy called "low probability – high consequence events"). Despite these concerns, Hamakua Energy submitted its GHG ERP to DOH on March 28, 2018. In brief, the GHG ERP identified 2010 as the baseline year, with GHG compliance limits being met by partnering with the Hawaiian Electric Companies, use of biodiesel, and, if necessary, restrictive operations. Barely a month later, on May 3, 2018, the volcanic eruption began in the Lower East Rift Zone (LERZ) in the Puna District of Hawai'i Island.

Among other things, the LERZ volcanic eruption threatened the Puna Geothermal Ventures geothermal electrical generation plant (PGV), which resulted in the shutdown of PGV operations. Eventually, the volcanic eruption engulfed part of the PGV facility and currently it is unknown when, if ever, PGV will resume operations.

Pursuant to a power purchase agreement with Hawai'i Electric Light Company, PGV generated approximately 25 to 30 percent of Hawai'i Electric Light's electric power. The loss of PGV's generation imposed a two-fold strain on Hawai'i Island, and therefore on other generating facilities on the island: First, the loss of 25 to 30 percent of generation requires Hawai'i Electric Light to generate more electric power as well as purchase incrementally more from HEP. Due to losing PGV's energy, Hawai'i Electric Light significantly increased the dispatch of the HEP Facility to levels greater than four to five times (i.e., 4-5X) higher than experienced prior to the LERZ volcanic eruption. Second, PGV produced renewable energy. Replacing renewable energy with primarily fossil fuel generation substantially increased the challenges of meeting Hawai'i's GHG reduction requirements.

Although at its current operating level HEP would exceed the proposed GHG Facility-wide Emissions Cap of 153,699 (short) tons per year, and in fact would exceed the Baseline Annual Emissions rate of 182,975 (short) tons per year based on 2010, as proposed in HEP GHG ERP dated February 28, 2018, HEP has nonetheless determined that it will retain the identical proposed values in this revised GHG ERP. Partnering and the use of biodiesel will be HEP's primary methods of meeting its Facility-wide GHG Emissions Cap on an annual basis. To assure that biodiesel would be available as a control technology for GHG compliance at the earliest possible time, HEP has accelerated its efforts to modify its covered source permit (CSP) to enable biodiesel operation, and to secure a source of biodiesel for day to day operations.

In a separate filing, the HEP facility is requesting authorization to perform a biodiesel test burn. Based on the results of the test burn, the HEP facility plans to submit an application to DOH to approve a minor modification to its CSP to allow the use of biodiesel as necessary to meet Hawai'i Island's electricity needs. Ultimately, this approach helps ensure that Hawai'i Island residents will have an adequate supply of electricity while helping to ensure that GHG emission reduction targets are met.

1.2 Purpose

Hamakua Energy respectfully submits this revised Greenhouse Gas Emissions Reduction Plan (GHG ERP) to DOH as required by HAR §11-60.1-204. The GHG Control Assessment in this plan is required by HAR §11-60.1-204(d)(2) to determine if the proposed facility-wide GHG emission cap, consisting of a 16% reduction of carbon dioxide equivalent (CO₂e) emissions from the 2010 baseline year, is attainable.

1.3 HEP Facility Description

The HEP Facility is located at 45-300 Lehua Street in Honoka'a, Hawai'i. The HEP Facility is situated on part of the former Hamakua Sugar Plantation and Mill property immediately northwest of the Haina Camp and approximately one mile north of the Town of Honoka'a. The total facility area is approximately 22.8 acres. Figure 1 and Figure 2 provide a site location map.

The HEP Facility consists of two Combustion Turbine Generators (CTs), two Heat Recovery Steam Generators (HRSGs), one Steam Turbine Generator (STG), and associated auxiliary equipment systems. Figure 3 provides a site layout map that depicts the location and facility equipment and ancillary operations.

The HEP Facility has the capability to burn low-sulfur petroleum fuels and uses naphtha as the primary low-sulfur petroleum fuel, with ultralow sulfur diesel (ULSD) used for startup. Naphtha and ULSD produced at Island Energy Services' O'ahu refinery are delivered by barge to the port of Hilo, Hawai'i, and are then transported by truck approximately 45 miles to the HEP Facility. Naphtha is stored in two storage tanks, each with a capacity of 1.4 million gallons. Diesel is stored in a 359,000 gallon capacity tank, with a "day tank" having a capacity of 10,000 gallons used for backup fuels and for startups.

Major equipment at the HEP Facility includes:

- Two (2) 23 megawatt General Electric LM2500 Combustion Turbines generators (CTs), each with a maximum heat input of 231 MBtu/hour, and each with a water injection system for control of NO_x emissions. The CTs are fired primarily on naphtha, with ULSD burned during startup.
- Two (2) "unfired" Aalborg Engineering Heat Recovery Steam Generators (HRSGs), each with a selective catalytic reduction (SCR) system (with ammonia injection) for control of NO_x

emissions. The heat source for the HRSGs is the hot exhaust gas from the CTs.

- One (1) 19 MW (nominal) Steam Turbine Generator (STG).
- One (1) 1,250 kW “black start” diesel engine generator using ULSD.
- One (1) emergency fire pump using ULSD.
- Two (2) 1.4 million gallon external floating roof petroleum tanks for storage and transfer of naphtha (or gasoline).
- One (1) 359,000-gallon tank for ULSD storage and transfer.
- One (1) 10,000 gallon day tank for storage and transfer of liquid fuels.
- One (1) multi-cell cooling tower.
- One (1) anhydrous ammonia system consisting of one 12,000 gallon storage tank (10,000 gallons usable capacity), fill station, controls, monitoring and alarms and associated piping, valve and instrumentation.



Figure 1 - Site Location - Hawai'i Island



Figure 2 - Site Location - Honoka'a

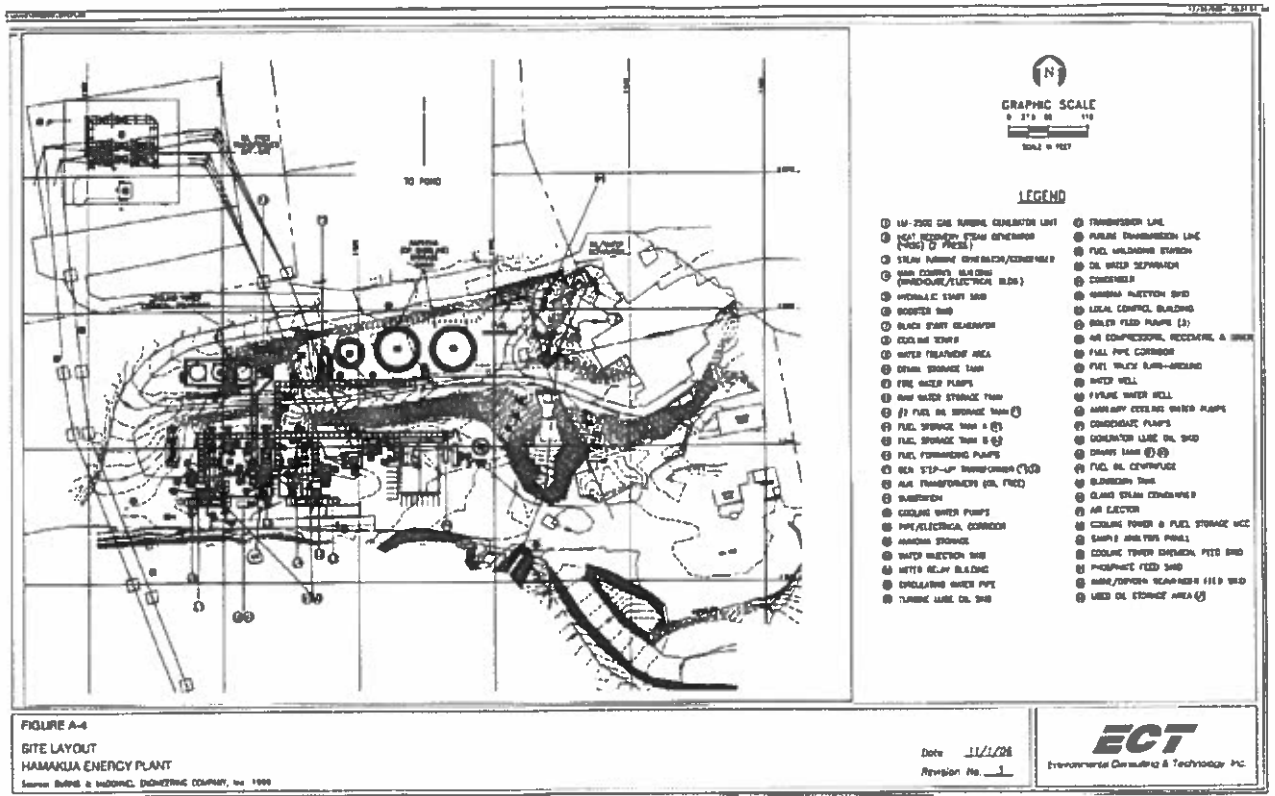


Figure 3 - Site Layout

2. REGULATORY BASIS

2.1 Regulatory Background

As stated in Section 1.1, the HEP Facility is subject to the Greenhouse Gas Reduction Rule. Under the Greenhouse Gas Reduction Rule, the HEP Facility is required to prepare and submit for approval to DOH a GHG ERP in accordance with HAR §11-60.1-204 (d). The GHG ERP consists of:

- (1) Establishing a facility baseline GHG emission rate (HAR §11-60.1204(d)(1));
- (2) Establishing a facility-wide GHG emission cap (§11-60.1-204(d)(2));

- (3) Performing a GHG emissions control assessment, which consists of identifying available control measures (§11-60.1-204(d)(3)), identifying technically feasible control measures (§11-60.1-204(4); evaluating the control effectiveness and cost of feasible control measures (§11-60.1204(d)(5); and identifying the proposed GHG emissions control strategy for the facility (§11-60.1-204(d)(6)).

2.2 GHG Baseline Emissions Rate

Hamakua Energy has selected 2010 annual GHG emissions as the HEP Facility GHG emissions baseline: 182,975 (short) tons per year (tpy) of CO₂e.

2.3 GHG Facility-wide Emissions Cap

In accordance with HAR §204(c), Hamakua Energy has established a facility-wide GHG emissions cap of 153,699 (short) tons per year (tpy) of CO₂e to be achieved by 2020.

As noted in Section 1 of this GHG ERP, in accordance with HAR §11-60.1204(d)(6)(A), Hamakua Energy has chosen partnering as a primary element of its GHG emissions control strategy for the HEP Facility. Details of the partnering arrangement are found in Section 3, including reference to the aggregate GHG emissions cap for the partnership. The proposed GHG Emissions Caps for the partnership and the respective partners are presented in Appendix B, ERP Partnership Baseline CO₂e Emissions and Proposed CSP Limits." Appendix B in this GHG ERP Revision 1, is slightly different from that presented in HEP's GHG ERP of February 28, 2018. However, the GHG Facility-wide Emissions Cap has not changed.

With reference to Appendix B, it is important to emphasize that Hamakua Energy is able only to certify its own GHG emissions for the 2010 baseline year and for the proposed CO₂e emissions cap. It is Hamakua Energy's understanding that each of the other partners referenced in Appendix B is responsible for certifying its respective emissions data for partnership purposes.

Also, as noted in Section 1, Hamakua Energy is requesting authorization from DOH to perform a test burn of biodiesel fuel.

² United States Environmental Protection Agency, "Prevention of Significant Deterioration and Title V Permitting Guidance for Greenhouse Gases," page 17, 1990 Workshop Manual.

Based on the test burn results, Hamakua Energy will apply for a minor modification of its CSP to allow storing and firing biodiesel to produce electricity.

2.4 GHG Emissions Control Assessment

The GHG control assessment referred to in Section 2.1(3) is similar to the United States Environmental Protection Agency's best available control technology (BACT) analysis required under the federal Clean Air Act (CAA). Section 169(3) of the CAA defines BACT as:

"... an emission limitation based on the maximum degree of reduction of each pollutant subject to regulation under this chapter [of the Clean Air Act] emitted from or which results from any major emitting facility, which the permitting authority, on a case-by-case basis, taking into account energy, environmental, and economic impacts and other costs, determines is achievable for such facility through application of production processes and available methods, systems, and techniques, including fuel cleaning, clean fuels, or treatment or innovative fuel combustion techniques for control of each such pollutant."

In accordance with EPA BACT guidance,² the analysis presented employs the EPA-preferred "top-down," five-step analysis process to determine the appropriate emission control technologies and/or emissions limitations:

- Step 1 - Identify All Control Technologies
- Step 2 - Eliminate Technically Infeasible Options
- Step 3 - Rank Remaining Control Technologies by Control Effectiveness
- Step 4 - Evaluate Most Effective Controls
- Step 5 - Select BACT

Although this GHG ERP control assessment employs the top-down BACT analysis, there are "unique" issues in the analysis for GHG that do not arise in BACT for criteria pollutants (EPA, 2011b). For example, EPA recognizes that the range of potentially available control options for Step 1 of the BACT process is currently limited and emphasizes the importance of energy efficiency in BACT reviews. Specifically, EPA states:³

³ United States Environmental Protection Agency, "PSD and Title V Permitting Guidance for Greenhouse Gases," March, 2011.

“The application of methods, systems, or techniques to increase energy efficiency is a key GHG-reducing opportunity that falls under the category of “lower-polluting processes/practices.” Use of inherently lower-emitting technologies, including energy efficiency measures, represents an opportunity for GHG reductions in these BACT reviews. In some cases, a more energy efficient process or project design may be used effectively alone; whereas in other cases, an energy efficient measure may be used effectively in tandem with end-of-stack controls to achieve additional control of criteria pollutants.”⁴

Where EPA requirements are concerned, EPA provides permitting authorities with the discretion to use energy-efficient measures as “the foundation for a BACT analysis for GHGs . . .”⁵

The following sections present the GHG assessment conducted for the HEP Facility’s CTs and HRSGs. It utilizes information from various reference and research documents developed by or for various government entities including the EPA, the Department of Energy’s National Energy Technology Laboratory, the Interagency Task Force on Carbon Capture and Sequestration.

Also note, the HEP Facility has two insignificant GHG emission sources: (1) a black start generator; and (2) an emergency fire pump. These are not included in the GHG Control Assessment as stated in Section 3.

3. IDENTIFY ALL CONTROL TECHNOLOGIES

Hamakua Energy LLC investigated available control measures for reducing greenhouse gas emissions at the HEP Facility. The sole focus of this investigation was on the combustion turbines, HRSG, and steam turbine generator (STG). There are no potential GHG emissions reductions available from the storage tanks or cooling tower since they do not contain or generate GHG emissions. The potential GHG reductions available from the black start generator and the emergency fire pump are minimal, since they are of relatively small fuel-burning capacity compared to the CT-HRSG-STG combination, and they are generally operated only several hours per year, and by permit operated less than 52 hours per year.

⁴ Ibid.

⁵ Ibid.

Our review of the potential control measures for the CT, HRSG, and STG included:

- Partnering with Other Power Producers
- Carbon Capture and Storage
- Fuel Switching, Including Biogenic Fuels
- Energy Efficiency Upgrades
- Combustion or Operational Improvements
- Restrictive Operations
- Planned Upgrades, Overhaul or Retirement of Equipment
- Regulatory Mandates, Emission Standards and Binding Agreements

3.1 Partnering with Other Power Producers in Hawai'i

Hamakua Energy approached Hawai'i Electric Light⁶ regarding a partnership for purposes of compliance with the Greenhouse Gas Emissions Rule, and Hamakua Energy and Hawai'i Electric Light subsequently agreed to include the HEP Facility as a member of the Hawaiian Electric Companies' GHG partnership.

There are no electric grid interconnections between any of the Hawaiian Islands. The power generation facilities operating on each island are interdependent by virtue of being interconnected to the same electric grid on each island. If one or more of them cannot produce their scheduled power output, the other facilities on the specific island must generate more power to make up for the shortfall. An unscheduled outage that takes a major generating unit offline for a period of time can significantly shift loading, and consequently the GHG emissions, from one facility to another. This is precisely what has happened on Hawai'i Island with the loss of PGV's electric power generation.

As indicated in Appendix B, "ERP Partnership Baseline CO₂e Emissions and Proposed CSP Limits," the aggregate GHG emissions cap for the Partnership Facilities would be 7,023,258 (short) tons per year, and the respective GHG Facility-wide Emissions Cap for the HEP Facilities would be 153,699 (short) tons per year.

⁶ Hamakua Energy and Hawai'i Electric Light have executed a partnership agreement. Other members of the partnership for purposes of GHG compliance include Maui Electric Company, Ltd., Hawaiian Electric Company, AES Hawaii, and Kalaeloa Energy Partners LP. Such other members' participation in the partnership is documented in separate agreements between the independent power producers and the utilities serving the applicable islands.

If the partnership becomes unavailable for any reason, including, but not limited to regulatory agency disapproval, Hamakua Energy will rely on the other control measures identified in this GHG ERP to meet its GHG emissions cap of 153,699 (short) tons per year.

3.2 Carbon Capture and Storage

Carbon Capture and Storage (also known as carbon capture and sequestration or CCS), includes a range of technologies that capture carbon dioxide (CO₂) from the burning of carbon-based fuels for power generation, and from the manufacturing of steel, cement and other industrial facilities, and transport it by either pipeline or ship for underground storage.

According to the U.S. Department of Energy's National Energy Technology Laboratory (NETL), there are commercially available CO₂ capture technologies that are being used in various industrial applications. There are several options for capture and several options for transport and use or storage of captured carbon described in the referenced literature; however, these technologies are not commercially available for implementation on fossil fuel power plants for three primary reasons:

- (1) They have not been demonstrated at the scale necessary for power plant application.
- (2) Current CO₂ capture technologies require so much power that they substantially compromise the capability of a facility to generate and meet its electric power obligations.
- (3) The relative cost of current capture technologies are excessive compared to other control technologies.

Review of the BACT/LAER/RACT⁷ Clearinghouse uncovered no power plants that use CCS for greenhouse gas emissions removal.

Review of the following GHG BACT analyses also helped to confirm that CCS is not currently technically or economically feasible for combustion turbines or other fossil fuel burning power plants:

- CPV Valley Energy Center in New York State (2012) – 630 MW combined cycle electric generating facility burning natural gas and No. 2 fuel oil.
- Empire District Riverton Unit 12 in Kansas (2013) – 150 MW combined cycle electric generating facility burning natural gas.

⁷ Per common EPA terminology, BACT = Best Available Control Technology, LAER = Lowest Achievable Emissions Rate, and RACT = Reasonably Achievable Control Technology.

- AES Huntington Beach Generating Station in California (2012) – 939 MW combined cycle electric generating facility burning natural gas.
- Portland General Electric Company in Oregon (2010) – 300 MW reciprocating engine-driven generators and a simple-cycle combustion turbine.

In addition, CCS was not identified as a “demonstrated measure” in EPA’s GHG Abatement Measures analysis for existing power plants.⁸

3.3 Fuel Switching, Including Biogenic Fuels

The HEP Facility is currently capable of receiving, handling, storing, and operating on a variety of distillate liquid fuels, including No. 2 oils (e.g., diesel or ULSD) and naphtha. ULSD is typically used for startup due to its “lightoff” characteristics, and then operation is switched to naphtha because it is less expensive. It would be fairly straightforward to substitute a biofuel such as biodiesel (or a blend of No. 2 oil and biodiesel) as the fuel properties are similar. The most significant changes may involve change-out of gasket and tubing materials that may not be compatible with biofuels. According to their manufacturer, the CT engines are capable of operating on biodiesel or blends of biodiesel and No. 2 oils without modification to the generators themselves.

Fuel Options

Hamakua Energy has reviewed fuel switching options and/or co-firing a variety of “clean fuels” at the HEP Facility for purposes of GHG emissions compliance.

Natural Gas. Switching from naphtha to natural gas, or co-firing natural gas with naphtha, could lower GHG emissions for the CT generators at the HEP Facility from about 150 to 110 (short) tons per year of GHG emissions for every MBtu of fuel burned, or a decrease of about 40 (short) tons per year or approximately 28%. The State of Hawaii, however, produces no natural gas and has no proven gas reserves. Hawai’i has the lowest total natural gas consumption in the nation and the lowest per capita consumption of natural gas.

Liquefied Natural Gas (LNG) and Liquid Propane Gas (LPG). The use of LNG in quantities sufficient to support power generation in Hawai’i has

⁸ EPA, June 10, 2014, *Technical Support Document (TSD) for Carbon Pollution Guidelines for Existing Power Plants: Emission Guidelines for Greenhouse Gas Emissions from Existing Stationary Sources: Electric Utility Generating Units*

been evaluated and considered by the Hawai'i Gas Company and the Hawaiian Electric Companies in recent years. However, there are presently no commercial activities to produce and/or deliver LNG at the scale needed for commercial viability. LNG is not currently available nor expected to be available on Hawai'i Island in quantities sufficient to support power generation at the HEP Facility. Similarly, LPG also is not available or expected to be available in sufficient quantities. The control technology alternative to use gaseous fuels at the HEP Facility would be reassessed if and when LNG and/or LPG become available in sufficient quantities for power generation on Hawai'i Island, including infrastructure for the receiving, handling, storage, and delivery of the fuels to the HEP Facility.

Synthetic Natural Gas (SNG). Synthetic natural gas is currently produced on O'ahu, however distribution of that synthetic gas is limited to parts of O'ahu. Hawai'i State energy policies encourage the development of synthetic natural gas production using biomass as a feedstock, however, there is currently no production of synthetic gas using biomass in the state in significant enough quantities to support a power plant the size of the HEP Facility.⁹

Liquid Biogenic Fuels (e.g., biodiesel). As described above, the HEP Facility would be capable of operating on liquid biogenic fuels (e.g., biodiesel), or blends of biogenic liquid fuels having similar fuel properties (e.g., blend of ULSD and biodiesel). Hamakua Energy views the use of liquid biogenic fuels at the HEP Facility to be a reasonable control technology alternative for GHG emissions compliance especially in view of the loss of PGV's output and the resulting increased dispatch of the HEP Facility. Also, should partnering with other power producers in Hawai'i become unavailable, liquid biogenic fuels would be a the primary control technology. As noted in Section 1 and Section 2.3, Hamakua Energy is currently requesting authorization from DOH to perform a test burn of biodiesel fuel. Based on the test burn results, Hamakua Energy will apply for a minor modification of its CSP to allow storing and firing biodiesel to produce electricity.

Facility Modifications for Fuel Switching

Biodiesel. As described above, qualifying the use of biodiesel at the HEP Facility is expected to be a relatively straightforward process.

LNG or LPG. The HEP Facility could be converted to operate on gaseous fuels such LNG or LPG, but this would require significant modifications to the facility. LNG would typically be delivered to the site in isotainers. Isotainers would be filled at an LNG production facility either on the mainland or another country and shipped to Hawai'i Island via either Hilo

⁹ U.S. Dept. of Energy, State Energy Profile - <http://www.eia.gov/state/analysis.cfm?sid=HI> (last updated October 19, 2017)

Harbor or Kawaihae Harbor. Then isotainers would be trucked to the HEP Facility where they would be stored prior to use. Major modifications would have to be made to the CTs in order to utilize LNG. The fuel delivery system would have to be changed to allow for either LNG only or for dual fuel (e.g., LNG and diesel/naphtha). The combustors and fuel nozzles on the CTs would have to be changed to different models. The control system would have to be modified to accommodate the LNG and dual fuel process. The modifications to the CTs alone would cost approximately \$2 million each. In addition, a gasification facility would have to be designed for and constructed at the HEP Facility, and empty isotainers trucked back to the port to be shipped back to the LNG supplier. Several hundred isotainers would have to be in service and in transit through every stage of the process to make this work.

CSP Modifications for Fuel Switch

The CSP would have to be modified to allow the HEP Facility to operate on fuels other than No. 2 oil (such as ULSD) or naphtha.

Once the CSP is modified to allow operation on biodiesel, and if biodiesel is available on Hawai'i Island in sufficient quantities, then Hamakua Energy plans to substitute biodiesel for ULSD for startups of the combustion turbines. Moreover, depending on the availability and commercial terms for larger quantities of biodiesel to be delivered to the HEP Facility, Hamakua energy may employ increased usage of biodiesel at the HEP Facility to the benefit of Hawai'i Electric Light's customers.

3.4 Energy Efficiency Upgrades

The HEP Facility is a combined cycle plant that uses waste heat from the General Electric LM2500 combustion turbines (CTs) to produce steam in the heat recovery steam generators (HRSGs). Electric generators are connected to each CT and the steam turbine. This combined cycle operating mode is a very efficient power plant thermal cycle. Accordingly, there is very limited opportunity for significant additional energy efficiency upgrades that would result in meaningful reductions in GHG emissions.

Combined-cycle power plants such as the HEP Facility are generally about 30% more energy efficient than simple-cycle plants, and accordingly, produce about 30% less GHG emissions for every kilowatt of energy produced. Even though the HEP Facility may be operated in either a combined-cycle or simple-cycle mode, historically the HEP Facility has

overwhelmingly been dispatched by Hawai'i Electric Light to operate in combined-cycle mode as illustrated below.

Hamakua Energy - Net Generation

Year	Simple Cycle MWH	Combined Cycle MWH	Total MWH	Simple Cycle %	Combined Cycle %
2010	0	286,176	286,176	0.0%	100.0%
2011	1,504	214,366	215,870	0.7%	99.3%
2012	0	231,240	231,240	0.0%	100.0%
2013	0	167,665	167,665	0.0%	100.0%
2014	0	182,292	182,292	0.0%	100.0%
2015	0	224,284	224,284	0.0%	100.0%
2016	0	131,165	131,165	0.0%	100.0%
2017	0	145,070	145,070	0.0%	100.0%

The LM 2500 combustion turbines are among the most efficient engines available in the industry. Based on discussions with representatives from General Electric, there are no energy efficiency upgrades available for the combustion turbines in use at the HEP Facility. The only option for energy efficiency upgrades for the CT's may be complete equipment replacement. Complete equipment replacement would "redefine the source" and the EPA has stated in various guidance documents that inherently lower emitting processes and practices that would redefine the emissions source need not be considered for Best Available Control Technologies (BACT) reviews.¹⁰ Approximately every 50,000 operating hours (i.e., equivalent to approximately six calendar years) each of the HEP Facility's CT's is taken out of service for a complete overhaul by a qualified contractor such as the General Electric Company. Similarly, approximately every four running years the STG is inspected and overhauled. These overhauls tend to return the CTs and STG to thermal efficiencies typical of new equipment.

The HRSG's are periodically inspected by HRST Inc., a company known throughout the industry for performing these types of inspections. According to the HRST Inc., there are no energy efficiency upgrades available for the HRSG's at the HEP Facility.

In summary, by design, operating practices, and maintenance practices the HEP Facility is a very efficient power generating facility. Moreover, there is very little opportunity to improve the thermal efficiency, and no means to improve the thermal efficiency by an amount sufficient to satisfy the GHG emissions reduction requirements for the HEP Facility.

¹⁰ EPA, "Prevention of Significant Deterioration and Title V Permitting Guidance for Greenhouse Gases", page 26. EPA-457/B-11-001, March 2011.

3.5 Combustion or Operational Improvements

Based on discussions with representatives from General Electric, the original equipment manufacturer of the CTs, there are no combustion or operational improvements available for the CTs at the HEP Facility. Since there is no supplementary firing in the HRSGs and no combustion takes place in the HSRG's or the STG, combustion improvements are not available for these units.

3.6 Restrictive Operations

Prior to the LERZ eruption in May 2018 and the subsequent shutdown of the PGV facility and the loss of at least 25 percent of the electrical generation capacity on Hawai'i Island, Hawai'i Electric Light had published forecast power production for the HEP Facility for the future years in its Power Supply Improvement Plans.¹¹ Based on those forecasts, the HEP Facility was expected to consistently be operated at levels that result in annual GHG emissions well below its facility GHG emissions cap of 153,699 (short) tons per year (tpy) of CO₂e through 2030, the year in which its PPA with Hawai'i Electric Light is scheduled to terminate.

With the loss of PGV's output, however, Hawai'i Electric Light has been dispatching the HEP Facility at levels that could cause it to exceed its GHG Facility-wide Emissions Cap. Accordingly, as discussed above, it would be necessary for the HEP Facility to rely on the applicable GHG control technologies (i.e., Partnering with Other Power Producers in Hawai'i, Fuel Switching Including Biogenic Fuels, and/or Restrictive Operations) to assure compliance with the GHG conditions in the CSP.

As discussed in more detail below Restrictive Operations would be the least desirable GHG control technology option. The HEP Facility is one of, if not the most energy efficient power generation facility available on Hawai'i Island and the electric grid of Hawai'i Electric Light. If no other options are available, Restrictive Operations may voluntarily be employed by Hamakua Energy to assure compliance with the GHG permit conditions of the HEP Facility's CSP. This would only occur if Partnering with Other Power Producers in Hawai'i and Fuel Switching Including Biogenic Fuels are unavailable, emergency provisions of the HEP Facility's CSP do not apply, and the HEP Facility would otherwise violate the GHG permit conditions of its CSP.

¹¹ On July 14, 2017, the Hawai'i Public Utilities Commission accepted the Hawaiian Electric Companies' Power Supply Improvement Plans (PSIPs) Update. Docket No. 2014-0183, Decision & Order No. 34696, July 14, 2017.

Restrictive Operations present other issues:

- The HEP Facility is contractually obligated to Hawai'i Electric Light by its PPA to be available to produce electricity throughout the year. The PPA provides for limited forced (unscheduled) outages. If Restrictive Operations were imposed by Hamakua Energy in order to comply with its GHG Facility-wide Emissions Cap, then the HEP Facility may not be available for dispatch to levels requested by Hawai'i Electric Light, and consequently, the cost to produce electric power to meet the needs of Hawai'i Electric Light's customers would be higher than it would be otherwise.
- Under the PPA with Hawai'i Electric Light, Hamakua Energy may have to pay penalties for lower availability and/or higher forced outage rates that are proportional to the degree of Restrictive Operations that it imposed on the HEP Facility.
- In a most extreme circumstance, there may not be sufficient power generation on Hawai'i Island to meet the demand of customers resulting in power outages.

3.7 Planned Upgrades, Overhaul, or Retirement of Equipment

Hamakua Energy has no planned upgrades or retirements of major equipment at the HEP Facility. As noted earlier, however, the Hamakua Energy does plan for and execute routine periodic overhauls for the CTs and the steam generator and these periodic overhauls help ensure the reliability and efficiency of the HEP Facility. Additionally, as noted above, Hamakua Energy is pursuing the option of firing with biodiesel, which may entail making minor fuel handling adjustments in order to accommodate biodiesel at the HEP Facility.

3.8 Outstanding Regulatory Mandates, Emission Standards, and Binding Agreements

There are no outstanding regulatory mandates, emission standards, or binding agreements that will reduce GHG emissions from the HEP Facility.

3.9 Other GHG Reduction Initiatives That May Affect the HEP Facility's GHG Emissions

Except for Partnering with Other Power Producers in Hawai'i, Fuel Switching Including Biogenic Fuels, and Restrictive Operations, as

discussed above, Hamakua Energy has no other GHG reduction initiatives planned for the HEP Facility.

4 TECHNICALY FEASIBLE MEASURES

The three (3) technically feasible measures for compliance with GHG conditions of its CSP in order of priority are: (1) Partnering with Other Power Producers in Hawai'i, (2) Fuel Switching Including Biogenic Fuels, and (3) Restrictive Operations. Hamakua Energy has executed a GHG Partnering Agreement with Hawai'i Electric Light. Partnering will constitute the primary control measure for GHG compliance. Secondly, Hamakua Energy is committed to qualifying the HEP Facility to operate on biodiesel and/or a blend of biodiesel and ULSD, and plans to initiate efforts for qualification in 2018. Thirdly, if and only if there is no alternative to meet the GHG permit conditions of its CSP, Restrictive Operation would be implemented.

If LNG or LPG becomes available on Hawai'i Island in sufficient quantities for power generation, the technical and commercial feasibility of using LNG and/or LPG at the HEP Facility would be reevaluated.

5 CONTROL EFFECTIVENESS AND COST EVALUATION

The relative cost effectiveness for the feasible control measures is discussed below.

5.1 Partnering with Other Power Producers in Hawai'i

As a member of the above-described GHG Reduction Partnership, Hamakua Energy would be responsible for seeking and implementing changes to its operations for the benefit of customers of Hawai'i Electric Light. In particular, with the increasing amounts of renewable energy generation on Hawai'i Island, the HEP Facility becomes a more valuable resource when it can be scheduled and dispatched with more flexibility similar to a "peaking" generating unit. To achieve this flexibility, changes to the CSP would be needed to allow more than one startup per day per CT. Accordingly, pursuant to the GHG Reduction Partnership agreement with Hawaii Electric Light, Hamakua Energy would seek Department of Health approval to modify its CSP to potentially allow more than one startup per day per CT. It would also be beneficial to shorten the startup times (i.e., the duration from startup initiation to turnover of dispatch to System Operation of Hawai'i Electric Light). This may involve physical

modifications to equipment and/or procedural changes at the HEP Facility. Accordingly, in accordance with the GHG Reduction Partnership agreement, Hamakua Energy would evaluate and implement appropriate changes (including CSP modifications if applicable) pursuant to its GHG Reduction Partnership agreement with Hawai'i Electric Light Company, Inc.

5.2 Fuel Switching or Biogenic Fuels

As described above, Hamakua Energy is committed to seek qualification of the HEP Facility for operation on biodiesel and/or blends of biodiesel and ULSD. The qualification process will include three parts: (1) organization of a pilot test including procurement of biodiesel, modification of equipment at HEP Facility to facilitate use of the biodiesel from a temporary storage tank, contracting for emissions testing, and coordination with Hawai'i Electric Light Company for dispatch; (2) implementation of pilot tests at multiple load points, including emissions testing at each load point; and (3) compilation of pilot test results and preparation and submission of a modification to the CSP.

As noted above, in view of the loss of PGV's output and the resulting increased dispatch of the HEP Facility, Hamakua Energy has already begun the process of requesting approval to perform a biodiesel test burn. Based on publicly available technical reports for the use of biodiesel at other facilities similar to the HEP Facility, Hamakua Energy anticipates that the HEP Facility will ultimately be permitted to fire the CTs with biodiesel.

If biodiesel becomes available on Hawai'i Island in quantities sufficient for sustained power generation at reasonable commercial terms, then Hamakua Energy may consider operating the HEP Facility on an everyday basis using biodiesel.

If biodiesel becomes available on Hawai'i Island in quantities sufficient for sustained power generation, the GHG Partnership Agreement is void or otherwise not in effect, and emergency conditions of the GHG permit conditions of the CSP do not apply, then the HEP Facility may be operated on using biodiesel for purposes of GHG compliance. Depending on the price of biodiesel at such time relative to naphtha, this could result in higher-priced energy being made available to the customers of Hawai'i Electric Light. There would not be an incremental cost to Hamakua Energy in this instance because the PPA with Hawai'i Electric Light provides for compensation to Hamakua Energy based on the delivered price of the fuel being utilized at the HEP Facility.

5.3 Restrictive Operations

Restrictive Operation is the least desirable GHG control option because it may result in higher-priced energy being made available to the customers of Hawai'i Electric Light, and/or in the worst case, result in regional blackouts. The cost for Restrictive Operation to Hamakua Energy may have two components: (1) reduced energy sales; and (2) increased penalties for reduced service availability. The potential costs to Hamakua Energy for Restrictive Operation would vary depending on the degree of Restrictive Operation that would be implemented. The cost of lost energy sales would be very difficult to predict and would depend on the price of fuel at the time and the load to which the HEP Facility would have otherwise been dispatched if Restrictive Operation was not implemented.

6 PROPOSED CONTROL STRATEGY

As detailed above, Hamakua Energy's control strategy for GHG emissions compliance in order of priority for implementation would be: (1) Partnering with Other Power Producers in Hawai'i, (2) Fuel Switching Including Biogenic Fuels, and (3) Restrictive Operations, absent any relief for emergencies.

Appendix A

REFERENCES

Government reference documents:

- U.S. Department of Energy, National Energy Technology Laboratory. 2013. *DOE/NETL Advanced Carbon Dioxide Capture R&D Program: Technology Update*. (Website: <http://www.netl.doe.gov/File%20Library/Research/Coal/carbon%20capture/handbook/CO2-Capture-Tech-Update-2013.pdf>)
- U.S. Energy Information Administration. 2014. *Hawaii State Energy Profile*. (Website: <http://www.eia.gov/state/print.cfm?sid=HI>)
- U.S. Environmental Protection Agency. 2011. *PSD and Title V Permitting Guidance for Greenhouse Gases*. EPA-457/B-11-001. Research Triangle Park, NC.
- U.S. Environmental Protection Agency. 1990. *Draft New Source Review Workshop Manual: Prevention of Significant Deterioration and Nonattainment Area Permitting*. (Website: <http://www.epa.gov/region07/air/hnr/hnrmemos/1990wman.pdf>)
- Referenced Greenhouse Gas BACT Analyses:**
- Black and Veatch Holding Company. 2012. *PSD Air Construction Permit Application, Addendum – Greenhouse Gas BACT Analysis, Empire District Electric Company, Riverton HEP Facility, Unit 12 Conversion to Combined Cycle Project*. (Website: http://www.kdheks.gov/bar/empire/Empire_Riverton_GHG_BACT_Addendum.pdf)
- CH2MHill. 2012. *BACT Determination for the Huntington Beach Energy Project*. (Website: http://www.energy.ca.gov/sitingcases/huntington_beach_energy/documents/applicant/AFC/Volume%20%20Appendices/HBEP_Appendix%205.1D_BACT%20Determination.pdf)
- SLR International Corp. 2010. *Addendum to the Port Westward II Project Prevention of Significant Deterioration Application – Greenhouse Gas BACT Analysis*. (Website: <http://www.deq.state.or.us/nwr/permits/05-2606-AppdxD1-09262010-AQ.pdf>)
- TRC Environmental Corporation. 2012. *CPV Valley Energy Center 630 MW Combined Cycle HEP Facility PSD and Part 201 Air Permit Application Supplement*. (Website: http://www.cpvvalley.com/pdfs/CPV_Valley_FEIS/Volume_II_FEIS_CPV_Valley_Energy/Appendix%203/Appendix_3B_Part1.pdf)

Appendix B

Table A-1: ERP Partnership Baseline CO₂e Emissions and Proposed CSP Limits (1)

Company	Covered Source	Baseline		CSP Limits		
		CO ₂ e Emissions (metric tpy)	CO ₂ e Emissions (tpy)	CO ₂ e Reduction (%)	CO ₂ e Reduction (tpy)	CO ₂ e Lim (tpy)
Hawaiian Electric (HE)	Kahe	2,518,411	2,776,073	23.1%	642,321	2,133,752
	Waiau	974,642	1,074,359	24.8%	266,074	808,286
	Honolulu	121,208	133,609	100.0%	133,609	0
	CIPGS	13,559	14,946	-259.6%	-38,794	53,740
HESubtotal		3,627,821	3,998,988	25.1%	1,003,210	2,995,778
Maui Electric (ME)	Kahului	209,414	230,839	33.0%	76,206	154,633
	Maalaea	562,012	619,512	25.8%	159,649	459,864
	Palaau	25,615	28,236	6.3%	1,782	26,454
ME Subtotal		797,041	878,587	27.0%	237,636	640,951
Hawaii'i Electric Light (HEL)	Kanoelehua-Hill	202,106	222,784	22.6%	50,328	172,456
	Keahole	173,623	191,387	-26.6%	-50,821	242,208
	Puna	90,438	99,691	68.2%	67,944	31,747
	Shipman	9,246	10,192	100.0%	10,192	0
HEL Subtotal		475,413	524,053	14.8%	77,642	446,411
Hawaiian Electric Companies		4,900,275	5,401,629	24.4%	1,318,488	4,083,141
AES Hawaii'i		1,525,526	1,681,605	-0.6%	-10,000	1,691,606
Hamakua Energy Power		165,992	182,975	16.0%	29,276	153,699
Kalaeloa Partners, LP		993,198	1,094,813	0.0%	0	1,094,813
Partnership Total		7,584,991	8,361,022	16.00%	1,337,764	7,023,258

Notes:

- (1) Excludes biogenic CO₂ emissions.
- (2) Selections of facility emissions baselines are described in the individual GHG Emission Reduction Plans for the Hawaiian Electric Companies, AES Hawaii'i, Kalaeloa Partners, LP (KPLP), and Hamakua Energy Power (HEP).
- (3) CIPGS (Campbell Industrial Park Generating Station) is designated as the Main CSP for the Hawaiian Electric Companies' Emissions Reduction Plan

Hamakua Energy, LLC

45-300 Lehua Street, P. O. Box 40 • Honokaa, Hawaii 96727 • ph 808.7751711 • fax 808.7781801

Marianne Rossio, P.E. Manager
Hawai'i Department of Health – Clean Air Branch
2827 Waimano Home Road
Hale Ola Building, Room 130
Pearl City, Hawai'i 96782

Re: Hamakua Energy, LLP
Greenhouse Gas Emissions Reduction Plan
Significant Permit Modification
Covered Source Permit (CSP) No. 0243-01-C
Hamakua Energy, LLC
Located at: 45-300 Lehua Street, Honokaa, Hawaii

Dear Ms. Rossio:

By letter dated January 2, 2018, regarding Hamakua Energy, LLC's request for approval to use the Hamakua Energy facility's 2010 greenhouse gas emissions as the baseline for determining its facility-wide greenhouse gas emission cap required by Hawai'i Administrative Rules (HAR) 11-60.1-204(c), the Department of Health (DOH), among other things, instructed Hamakua Energy to submit to DOH by March 31, 2018, a completed Greenhouse Gas Emission Reduction Plan (ERP) and a significant permit modification application for incorporating the ERP in the CSP. Hamakua Energy submitted its ERP to DOH by letter dated February 28, 2018.

With this letter, Hamakua Energy submits its significant permit modification application and required forms for incorporating the ERP in the facility's CSP, as well as a check for \$2,000.00 for the application fee. In accordance with Form S-1 instruction D, Hamakua Energy requests inclusion in the facility's CSP of the following permit condition regarding the ERP control strategy:

In the event the partnership identified in Attachment __, Special Condition No. __ terminates or otherwise becomes unavailable, the permittee shall employ the remaining control strategy mechanisms identified in the Greenhouse Gas Emissions Reduction Plan to comply with the facility-wide greenhouse gas emissions cap designated in Attachment __, Special Condition ____.

The following language was provided by the DoH and is acceptable to Hamakua Energy, LLC for inclusion in the new CSP:

Prior to employing fuel switching to biodiesel and/or a blend of biodiesel and ULSD, Hamakua Energy, LLC with the Hamakua Energy Power Facility shall perform the requisite demonstration pilot tests including emissions measurements as prescribed in Hamakua Energy's GHG emissions reduction plan, to produce the technical and operational information and data necessary to support modification of this Covered Source Permit (CSP).

If you have any questions or need further information, please contact Kevin Monahan at 661.387.7864.

Sincerely,

A handwritten signature in blue ink that reads "Kevin Monahan". The signature is fluid and cursive, with the first name "Kevin" and last name "Monahan" clearly legible.

Kevin Monahan

Asset Manager and Responsible Official

Hamakua Energy, LLC

Cc: Ed Yamamoto, DOH

U.S. EPA Administrator, Region IX

C-1: Compliance Plan

The Responsible Official shall submit a Compliance Plan as indicated in the Instructions for Applying for an Air Pollution Control Permit and at such other times as requested by the Director of Health (hereafter, Director).

Use separate sheets of paper if necessary.

1. Compliance status with respect to all Applicable Requirements:

Will your facility be in compliance, or is your facility in compliance, with all applicable requirements in effect at the time of your permit application submittal?

YES {If YES, complete items a and c below}

NO {If NO, complete items a, b, and c below}

a. Identify all applicable requirement(s) for which compliance is achieved.

HAR § 11-60.1-3, §11-60.1-90, §11-60.1-161, 40CFR60.330

40 CFR60.1106, 40 CFR68, HAR §11-60.1-5, §11-60.1-32

§ 11-60.1-38, §11-60.1-140 SIP, §11-60-24, 40 CFR60.332, 40 CFR60.333

40 CFR60.1126, 40 CFR 82 subpart F, §11-60.1-11

SIP §11-60-15, 40 CFR60.334, 40 CFR60.116b

Provide a statement that the source is in compliance and will continue to comply with all such requirements.

HEP is in compliance with all requirements stated in the CSP and will remain in compliance with all such requirements.

b. Identify all applicable requirement(s) for which compliance is NOT achieved.

N/A

Provide a detailed Schedule of Compliance Schedule and a description of how the source will achieve compliance with all such applicable requirements.

<u>Description of Remedial Action</u>	<u>Expected Date of Completion</u>
N/A	

- c. Identify any other applicable requirement(s) with a future compliance date that your source is subject to. These applicable requirements may take effect AFTER permit issuance:

<u>Applicable Requirement</u>	<u>Effective Date</u>	<u>Currently in Compliance?</u>
HAR § 11-60.1-204(b); § 11-60.1-204(d)	6/30/2014	Yes
HAR § 11-60.1-204(c); § 11-60.1-204(j)	6/30/2014	Yes
_____	_____	_____
_____	_____	_____
_____	_____	_____

If the source is not currently in compliance, provide a Schedule of Compliance and a description of how the source will achieve compliance with all such applicable requirements:

<u>Description of Proposed Action/Steps to Achieve Compliance</u>	<u>Expected Date of Achieving Compliance</u>
N/A	
_____	_____
_____	_____
_____	_____
_____	_____

Provide a statement that the source on a timely basis will meet all these applicable requirements:

N/A

If the expected date of achieving compliance will NOT meet the applicable requirement's effective date, provide a more detailed description of each remedial action and the expected date of completion:

<u>Description of Remedial Action and Explanation</u>	<u>Expected Date of Completion</u>
N/A	
_____	_____
_____	_____
_____	_____
_____	_____

2. Compliance Progress Reports:

- a. If a compliance plan is being submitted to remedy a violation, complete the following information:

Frequency of Submittal: N/A
(less than or equal to 6 months)

Beginning Date: _____

b. Date(s) that the Action described in (1)(b) was achieved:

<u>Remedial Action</u>	<u>Date Achieved</u>
N/A	

c. Narrative description of why any date(s) in (1)(b) was not met, and any preventive or corrective measures taken in the interim:

N/A

RESPONSIBLE OFFICIAL

(as defined in HAR §11-60.1-1)

Name (Last): Monahan (First): Kevin (MI):

Title: Asset Manager Phone: (661) 387-7864

Mailing Address: 34759 Lencioni Avenue

City: Bakersfield State: CA Zip Code: 93308

Certification by Responsible Official

(pursuant to HAR §11-60.1-4)

I certify that I have knowledge of the facts herein set forth, that the same are true, accurate and complete to the best of my knowledge and belief, and that all information not identified by me as confidential in nature shall be treated by the Department of Health as public record. I further state that I will assume responsibility for the construction, modification, or operation of the source in accordance with the Hawaii Administrative Rules, Title 11, Chapter 60.1, Air Pollution Control, and any permit issued thereof.

Name (Print/Type): Kevin Monahan

(Signature):  Date: 3/28/2018

Facility Name: Hamakua Energy, LLC

Location: 45-300 Lehua Street, Honokaa, HI 96727

Permit Number: CSP No. 0243-01-C

FOR AGENCY USE ONLY
File/Application No.: _____
Island: _____
Date Received: _____

C-2: Compliance Certification

The Responsible Official shall submit a Compliance Certification as indicated in the Instructions for Applying for an Air Pollution Control Permit and at such other times as requested by the Director of Health (hereafter, Director).

Complete as many copies of this form as needed. Use separate sheets of paper if necessary.

RESPONSIBLE OFFICIAL


(as defined in HAR §11-60.1-1)

Name (Last): Monahan (First): Kevin (MI): _____
 Title: Asset Manager Phone: (661) 387-7864
 Mailing Address: 34759 Lencioni Avenue
 City: Bakersfield State: CA Zip Code: 93308

Certification by Responsible Official

(pursuant to HAR §11-60.1-4)

I certify that I have knowledge of the facts herein set forth, that the same are true, accurate and complete to the best of my knowledge and belief, and that all information not identified by me as confidential in nature shall be treated by the Department of Health as public record. I further state that I will assume responsibility for the construction, modification, or operation of the source in accordance with the Hawaii Administrative Rules, Title 11, Chapter 60.1, Air Pollution Control, and any permit issued thereof.

Name (Print Type): Kevin Monahan
 (Signature):  Date: 3/28/2018

Facility Name: Hamakua Energy Plant

Location: _____

FOR AGENCY USE ONLY	
File/Application No.:	_____
Island:	_____
Date Received:	_____

Honokaa, Hawaii

5. Describe the methods to be used in determining compliance of the emissions unit with the applicable requirement(s), including any monitoring, recordkeeping, reporting requirements, and/or test methods:

See Compliance Certification Tables from 2013 renewal

Provide a detailed description of the methods used to determine compliance (e.g. monitoring device type and location, test method description, or parameter being recorded, frequency of recordkeeping, etc.):

See Compliance Certification Tables from 2013 renewal

6. Statement of Compliance with Enhanced Monitoring and Compliance Certification Requirements.

- a. Will the emissions unit identified in this application be in compliance with applicable enhanced monitoring and compliance certification requirements?

YES NO

- b. If YES, identify the requirements and the provisions being taken to achieve compliance:

See Compliance Certification Tables from 2013 renewal

- c. If NO, describe below which requirements will not be met:
-
-
-
-
-
-

STANDARD PERMIT APPLICATION FORM
HAWAII DEPARTMENT OF HEALTH
ENVIRONMENTAL MANAGEMENT DIVISION
CLEAN AIR BRANCH
P.O. Box 3378 · Honolulu, HI 96801-3378 · Phone: (808) 586-4200

1. Company Name: Hamakua Energy, LLC
2. Facility Name (if different from the Company): Hamakua Energy Plant
3. Mailing Address: 45-300 Lehua Street
City: Honoka'a State: HI Zip Code: 96727
Phone Number: (808) 775-1711
4. Name of Owner/Owner's Agent: Kevin Monahan
Title: Asset Manager Phone: (661) 387-7864
Mailing Address: 34759 Lencioni Avenue
City: Bakersfield State: CA Zip Code: 93308
5. Plant Site Manager/Other Contact: Allen Hess
Title: General Manager Phone: (808) 775-1711
Mailing Address: 45-300 Lehua Street
City: Honoka'a State: HI Zip Code: 96727
6. Permit Application Basis: (Check One.)
 Initial Permit for a New Source Initial Permit for an Existing Source
 Renewal of Existing Permit General Permit
 Temporary Source Transfer of Permit
 Modification: ==> Is Modification? Significant Minor Uncertain
7. If renewal or modification, include existing permit number: CSP# 0243-01-C
8. Does the Proposed Source require a County Special Management Area Permit? Yes No
9. Type of Source (Check One): Covered Source Covered and PSD Source
 Noncovered Source Uncertain
10. Standard Industrial Classification Code (SICC), if known: 4911

11. Proposed Equipment/Plant Location: Existing Plant
 City: _____ State: _____ Zip Code: _____
 UTM Coordinates: _____
12. General Nature of Business: Electricity Production
13. Date of Planned Commencement of Construction or Modification: Existing Plant
14. Is *any* of the equipment to be leased to another individual or entity? Yes No
15. Type of Organization: Corporation Individual Owner Partnership
 Government Agency (Government Facility Code: _____)
 Other: Limited Liability Company

Any applicant for a permit who fails to submit any relevant facts or who has submitted incorrect information in any permit application shall, upon becoming aware of such failure or incorrect submittal, promptly submit such supplementary facts or corrected information. In addition, an applicant shall provide additional information as necessary to address any requirements that become applicable to the source after the date it filed a complete application, but prior to the issuance of the noncovered source permit or release of a draft covered source permit. (§11-60.1-1)

RESPONSIBLE OFFICIAL

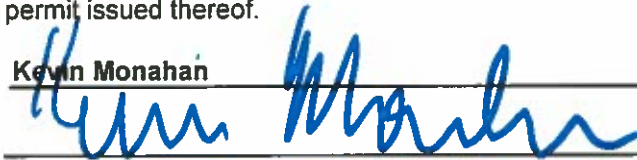
(as defined in §11-60.1-1):

Name (Last): Monahan (First): Kevin (MI): _____
 Title: Asset Manager Phone: (661) 387-7864
 Mailing Address: P.O. Box 40
 City: Honokaa State: HI Zip Code: 96727

CERTIFICATION by Responsible Official

(pursuant to §11-60.1-4)

I certify that I have knowledge of the facts herein set forth, that the same are true, accurate and complete to the best of my knowledge and belief, and that all information not identified by me as confidential in nature shall be treated by the Department of Health as public record. I further state that I will assume responsibility for the construction, modification, or operation of the source in accordance with the Hawaii Administrative Rules, Title 11, Chapter 60.1, Air Pollution control, and any permit issued thereof.

NAME (Print/Type): Kevin Monahan
 (Signature):  Date: 3/28/2018

FOR AGENCY USE ONLY:	
File/Application No.:	_____
Island:	_____
Date Received:	_____

Submit the following documents as part of your application:

A. The **Emissions Units Table**, filled in as completely as possible. Use separate sheets of paper as needed. General instructions include the following:

1. Identify each **emission point** with a unique number for this plant site, consistent with emission point identification used on the location drawing and previous permits; if known, provide the SICC number. Emission points shall be identified and described in sufficient detail to establish the basis for fees and applicability of requirement of HAR, Chapter 11-60.1. Examples of emission point names are: heater, vent, boiler, tank, baghouse, fugitive, etc. Abbreviations may be used.
 - a. For each emission point use as many lines as necessary to list regulated and hazardous air pollutant data. For hazardous air pollutants, also list the Chemical Abstracts Service number (CAS#).
 - b. Indicate the emission points that discharge together for any length of time.
 - c. The **Equipment Date** is the date of equipment construction, reconstruction, or modification. Provide supporting documentation.
2. State the **maximum emission rates** in terms sufficient to establish compliance with the applicable requirements and standard reference test methods. Provide all supporting emission calculations and assumptions:
 - a. Include all regulated and hazardous air pollutants and air pollutants for which the source is major, as defined in HAR §11-60.1-1. Examples of regulated pollutant names are: Carbon Monoxide (CO), Nitrogen Oxides (NO_x), Sulfur Dioxide (SO₂), Volatile Organic Compounds (VOC), particulate matter (PM), and particulate less than 10 microns (PM₁₀). Abbreviations may be used.
 - b. Include fugitive emissions.
 - c. **Pounds per hour (#/HR)** is the maximum potential emission rate expected by applicant.
 - d. **Tons per year** is the annual maximum potential emissions expected by the applicant, taking into account the typical operating schedule.
3. Describe **Stack Source Parameters**:
 - a. **Stack Height** is the height above the ground.
 - b. **Direction** refers to the exit direction of stack emissions: up, down or horizontal.
 - c. **Flow Rate** is the actual, not the calculated, flow rate.
4. Provide any additional information, if applicable, as follows:
 - a. If combinations of different fuels are used that cause any of the stack source parameters to differ, complete one row for each possible set of stack parameters and identify each fuel in the **Equipment Description**.
 - b. For a rectangular stack, indicate the length and width.
 - c. Provide any information on stack parameters or any stack height limitations developed pursuant to Section 123 of the Clean Air Act.

B. A **process flow diagram** identifying all equipment used in the process, including the following:

1. Identify and describe each emission point.
2. Identify the locations of safety valves, bypasses, and other such devices which when activated may release air pollutants to the atmosphere.

C. A **facility location map**, drawn to a reasonable scale and showing the following:

1. The property involved and all structures on it. Identify property/fence lines plainly.
2. Layout of the facility.
3. Location and identification of the proposed emissions unit on the property.
4. Location of the property and equipment with respect to streets and all adjacent property. Show the location of all structures within 100 meters of the applicant's emissions unit. Provide the building dimensions (height, length, and width) of all structures that have heights greater than 40% of the stack height of the emissions unit.

D. Provide a description of any proposed modifications or permit revisions. Include any justification or supporting information for the proposed modifications or permit revisions

- A. Emissions Units Table - Please see table from 2013 renewal submittal.
- B. Process Flow Diagram - Please see process flow diagram from 2013 renewal submittal.
- C. Facility Location Map - Please see location map from 2013 renewal submittal.
- D. Description of proposed modifications - Hamakua Energy, LLC proposes that GHG reduction methods described in the GHG Reduction Plan be included with the permit. Please see the GHG Reduction Plan.

S-6: Application for a Significant Modification to a Covered Source

1. In accordance with HAR 11-60.1-104 the following information is provided:
 - A. Equipment Specifications:
 1. Maximum Design Capacity. **65 MW**
 2. Fuel Type. **Naphtha and Ultra Low Sulfur Diesel (ULSD)**
 3. Fuel Use. **494 MBtu/hr**
 4. Production Capacity. **60 MW**
 5. Production Rates. **60 MW/hr**
 6. Raw Materials. **None**
 7. Manufacturer's Literature. **None**
 - B. Provide detailed descriptions of all processes and products defined by SICC.
 1. Describe in detail all air pollution control equipment. **There are no air pollution controls for CO2.**
 2. List all new insignificant activities IAW HAR 11-60.1-82. **N/A**
 - C. Maximum Operating Schedule
 1. Total hours per day. **24**
 2. Total hours per year. **8,784** (i.e., for a "leap year")
 3. If operation is seasonal or irregular, describe. **HEP is dispatched as needed by HELCO.**
 - D. Cite and describe all applicable requirements as defined in HAR 11-60.1-81 including the following:
 1. Description of or reference to any applicable test methods for determining compliance with each applicable requirement. **None**
 2. Explanation of all proposed exemptions from any applicable requirements. **None**
 - E. Identify and describe current operational limitations or work practices the source plans to implement that affect emissions of any regulated or hazardous air pollutant. Provide all calculations and assumptions. **Not Applicable.**
 - F. Provide detailed schedule for construction or modification of the proposed source, including any major milestones, if applicable. **Not Applicable.**
 - G. Provide detailed information to define permit terms and conditions for any proposed emissions trading within the facility IAW HAR 11-60.1-96. **Please see the attached GHG Emissions Reduction Plan for Hamakua Energy, LLC.**
 - H. For significant modifications which increase the emissions of any air pollutant or result in the emission of any air pollutant not previously emitted, an assessment of the ambient air quality impact of the covered source or significant modification, with the inclusion of any available background air quality data. The assessment shall include all supporting data, calculations and assumptions, and a comparison with the National Air Quality Standards and State Ambient Air Quality Standards. **Not Applicable**
 - I. For new covered sources or significant modifications subject to the requirements of subchapter 7 of HAR Chapter 11-60.1, all analyses, assessments, monitoring, and other application requirements of subchapter 7. **Not Applicable.**
 - J. Provide the following for compliance purposes:

1. A Compliance Plan, Form C-1. See attached form C-1.

2. A Compliance Certification, Form C-2. See attached form C-2.

II. Submit an application fee according to the Application Fee Schedule in the instructions for Applying for an Air Pollution Control Permit. A check for \$2,000 is enclosed with application.

**Hamakua Energy LLC
Hamakua Energy Power (HEP) Facility
45-300 Lehua Street
Honoka'a, Hawai'i 96727**

**Greenhouse Gas Emissions Reduction Plan
(GHG ERP)**

February 28, 2018



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1. INTRODUCTION

1.1 Background

Hamakua Energy, LLC (Hamakua Energy) owns and operates the 65 megawatt (MW) electric generation Hamakua Energy Power facility (HEP Facility)¹ located at Honoka'a on the Hamakua Coast of Hawai'i Island. The HEP Facility supplies electricity to the Hawai'i Electric Light Company, Inc. (Hawai'i Electric Light) in accordance with a Power Purchase Agreement (PPA), under which, among other things, Hawai'i Electric Light determines when and to what load to dispatch the HEP Facility.

Hamakua Energy acquired the HEP Facility from Hamakua Energy Partners, LP effective November 24, 2017. The HEP Facility has been in operation since 2000 and operates pursuant to Covered Source Permit (CSP) No. 0243-01-C, which was transferred from Hamakua Energy Partners to Hamakua Energy effective November 24, 2017. Among other requirements, the HEP Facility is subject to Hawai'i's greenhouse gas reduction regulations set forth in Hawai'i Administrative Rules (HAR) §11-60.1-201 et. seq. (The Greenhouse Gas Reduction Rule). Prior to the transfer, Hamakua Energy Partners had submitted a proposed Greenhouse Gas Emission Reduction Plan (GHG ERP) for the HEP Facility to the Hawai'i Department of Health (DOH) as required by HAR §11-60.1-204. However, DOH had not accepted the proposed GHG ERP, in part due to the DOH's disagreement with Hamakua Energy Partners' proposed baseline year and GHG emissions reductions approach.

At a meeting on September 29, 2017, Hamakua Energy informally advised DOH Clean Air Branch representatives that, upon successful acquisition of the HEP Facility, it would submit a revised GHG ERP to DOH with a baseline year of 2010 and that it intended to meet the facility-wide GHG emissions cap by 2020 through (i) partnering, (ii) use of biofuels, and, if necessary, (iii) by restrictive operations. Subsequent to the transfer of ownership, Hamakua Energy confirmed its selection of 2010 as the HEP Facility's GHG emissions baseline year and its compliance intentions in a letter to DOH dated December 7, 2017. By letter dated January 2, 2018, DOH approved Hamakua Energy's selection of the HEP Facility's 2010 GHG emissions for determining its facility-wide GHG emissions cap.

¹ The HEP Facility has a "nominal" capacity of 65 megawatts as described in its Covered Source Permit. However, by terms of the Power Purchase Agreement with Hawai'i Electric Light, the "Firm Capacity" of the HEP Facility is 60 megawatts.

1.2 Purpose

Hamakua Energy respectfully submits this Greenhouse Gas Emissions Reduction Plan (GHG ERP) to DOH as required by HAR §11-60.1-204. The GHG Control Assessment in this plan is required by HAR §11-60.1-204(d)(2) to determine if the proposed facility-wide GHG emission cap, consisting of a 16% reduction of carbon dioxide equivalent (CO₂e) emissions from the 2010 baseline year, is attainable.

1.3 HEP Facility Description

The HEP Facility is located at 45-300 Lehua Street in Honoka'a, Hawai'i. The HEP Facility is situated on part of the former Hamakua Sugar Plantation and Mill property immediately northwest of the Haina Camp and approximately one mile north of the Town of Honoka'a. The total facility area is approximately 22.8 acres. Figure 1 and 2 provide a site location map.

The HEP Facility consists of two Combustion Turbine Generators (CTs), two Heat Recovery Steam Generators (HRSGs), one Steam Turbine Generator (STG), and associated auxiliary equipment systems. Figure 2 provides a site layout map that depicts the location and facility equipment and ancillary operations.

The HEP Facility has the capability to burn low-sulfur petroleum fuels and uses naphtha as the primary low-sulfur petroleum fuel, with ultralow sulfur diesel (ULSD) used for startup. Naphtha and ULSD produced at Island Energy Services' O'ahu refinery are delivered by barge to the port of Hilo, Hawai'i, and are then transported by truck approximately 45 miles to the HEP Facility. Naphtha is stored in two storage tanks, each with a capacity of 1.4 million gallons. Diesel is stored in a 359,000 gallon capacity tank, with a "day tank" having a capacity of 10,000 gallons used for backup fuels and for startups.

Major equipment at the HEP Facility includes:

- Two (2) 23 megawatt General Electric LM2500 Combustion Turbines generators (CTs), each with a maximum heat input of 231 MBtu/hour, and each with a water injection system for control of NO_x emissions. The CTs are fired primarily on naphtha, with ULSD burned during startup.
- Two (2) "unfired" Aalborg Engineering Heat Recovery Steam Generators (HRSGs), each with a selective catalytic reduction (SCR) system (with ammonia injection) for control of NO_x emissions. The heat source for the HRSGs is the hot exhaust gas from the CTs.

- One (1) 19 MW (nominal) Steam Turbine Generator (STG).
- One (1) 1,250 kW “black start” diesel engine generator using ULSD).
- One (1) emergency fire pump using ULSD.
- Two (2) 1.4 million gallon external floating roof petroleum tanks for storage and transfer of naphtha (or gasoline).
- One (1) 359,000-gallon tank for ULSD storage and transfer.
- One (1) 10,000 gallon day tank for storage and transfer of liquid fuels.
- One (1) multi-cell cooling tower.
- One (1) anhydrous ammonia system consisting of one 12,000 gallon storage tank (10,000 gallons usable capacity), fill station, controls, monitoring and alarms and associated piping, valve and instrumentation.



Figure 1 - Site Location - Hawai'i Island



Figure 2 - Site Location - Honoka'a

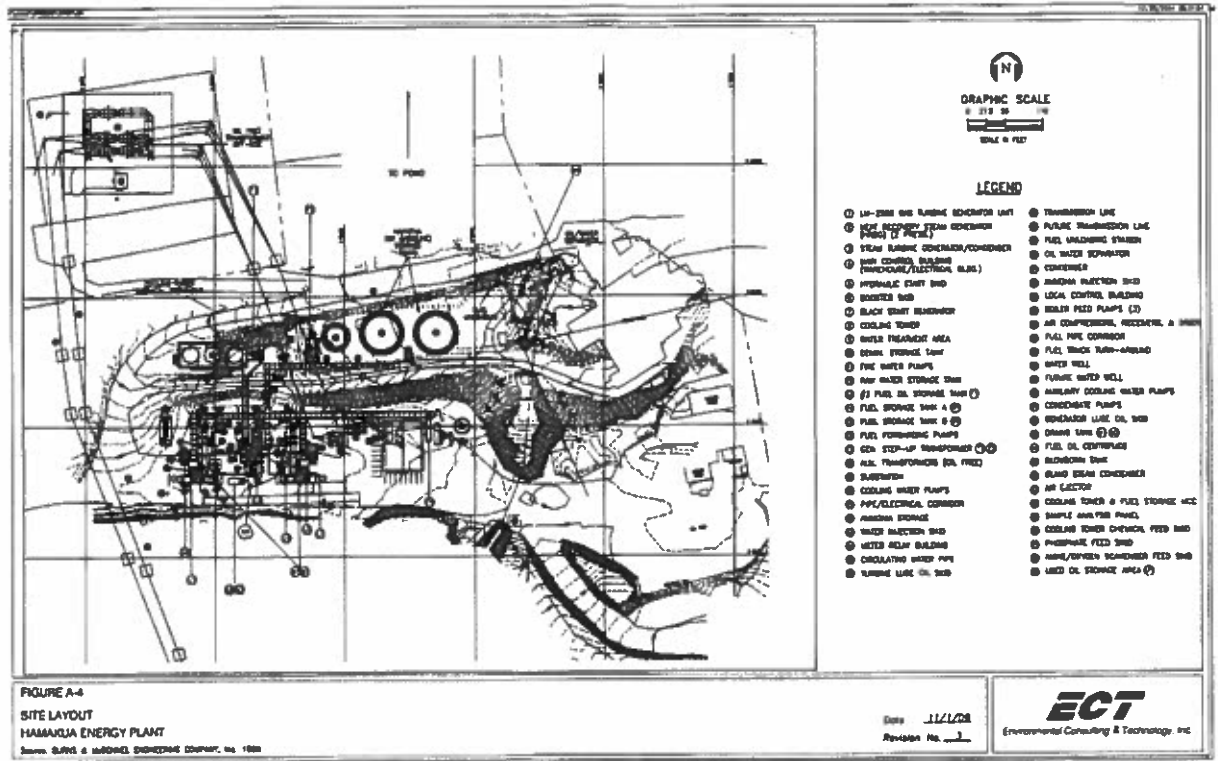


Figure 3 - Site Layout

2. REGULATORY BASIS

2.1 Regulatory Background

As stated in Section 1.1, the HEP Facility is subject to the Greenhouse Gas Reduction Rule. Under the Greenhouse Gas Reduction Rule, the HEP Facility is required to prepare and submit for approval to DOH a GHG ERP in accordance with HAR §11-60.1-204 (d). The GHG ERP consists of:

- (1) Establishing a facility baseline GHG emission rate (HAR §11-60.1-204(d)(1));
- (2) Establishing a facility-wide GHG emission cap (§11-60.1-204(d)(2));
- (3) Performing a GHG emissions control assessment, which consists of identifying available control measures (§11-60.1-204(d)(3)), identifying technically feasible control measures (§11-60.1-204(4)); evaluating the control effectiveness and cost of feasible control measures (§11-60.1-204(d)(5)); and identifying the proposed GHG emissions control strategy for the facility (§11-60.1-204(d)(6)).

2.2 GHG Baseline Emissions Rate

Hamakua Energy has selected 2010 annual GHG emissions as the HEP Facility GHG emissions baseline: 182,975 (short) tons per year (tpy) of CO₂e.

2.3 GHG Facility-wide Emissions Cap

In accordance with HAR §204(c), Hamakua Energy has established a facility-wide GHG emissions cap of 153,699 (short) tons per year (tpy) of CO₂e to be achieved by 2020.

As noted in Section 1 of this GHG ERP, in accordance with HAR §11-60.1-204(d)(6)(A), Hamakua Energy has chosen partnering as the primary element of its GHG emissions control strategy for the HEP Facility. Details of the partnering arrangement are found in Section 3, including reference to the GHG emissions cap for the partnership. The proposed GHG Emissions Caps for the partnership and the respective partners are presented in Appendix B, "GHG Reduction Partnership."

2.4 GHG Emissions Control Assessment

The GHG control assessment referred to in Section 2.1(3) is similar to the United States Environmental Protection Agency's best available control technology (BACT) analysis required under the federal Clean Air Act (CAA). Section 169(3) of the CAA defines BACT as:

"... an emission limitation based on the maximum degree of reduction of each pollutant subject to regulation under this chapter [of the Clean Air Act] emitted from or which results from any major emitting facility, which the permitting authority, on a case-by-case basis, taking into account energy, environmental, and economic impacts and other costs, determines is achievable for such facility through application of production processes and available methods, systems, and techniques, including fuel cleaning, clean fuels, or treatment or innovative fuel combustion techniques for control of each such pollutant."

In accordance with EPA BACT guidance,² the analysis presented employs the EPA-preferred "top-down," five-step analysis process to determine the appropriate emission control technologies and/or emissions limitations:

- Step 1 - Identify All Control Technologies
- Step 2 - Eliminate Technically Infeasible Options
- Step 3 - Rank Remaining Control Technologies by Control Effectiveness

² United States Environmental Protection Agency, "Prevention of Significant Deterioration and Title V Permitting Guidance for Greenhouse Gases," page 17, 1990 Workshop Manual.

- Step 4 - Evaluate Most Effective Controls
- Step 5 - Select BACT

Although this GHG ERP control assessment employs the top-down BACT analysis, there are “unique” issues in the analysis for GHG that do not arise in BACT for criteria pollutants (EPA, 2011b). For example, EPA recognizes that the range of potentially available control options for Step 1 of the BACT process is currently limited and emphasizes the importance of energy efficiency in BACT reviews. Specifically, EPA states:³

“The application of methods, systems, or techniques to increase energy efficiency is a key GHG-reducing opportunity that falls under the category of “lower-polluting processes/practices.” Use of inherently lower-emitting technologies, including energy efficiency measures, represents an opportunity for GHG reductions in these BACT reviews. In some cases, a more energy efficient process or project design may be used effectively alone; whereas in other cases, an energy efficient measure may be used effectively in tandem with end-of-stack controls to achieve additional control of criteria pollutants.”⁴

Where EPA requirements are concerned, EPA provides permitting authorities with the discretion to use energy-efficient measures as “the foundation for a BACT analysis for GHGs . . .”⁵

The following sections present the GHG assessment conducted for the HEP Facility’s CTs and HRSGs. It utilizes information from various reference and research documents developed by or for various government entities including the EPA, the Department of Energy’s National Energy Technology Laboratory, the Interagency Task Force on Carbon Capture and Sequestration.

Also note, the HEP Facility has two insignificant GHG emission sources: (1) a black start generator; and (2) an emergency fire pump. These are not included in the GHG Control Assessment as stated in Section 3.

3. IDENTIFY ALL CONTROL TECHNOLOGIES

Hamakua Energy LLC investigated available control measures for reducing greenhouse gas emissions at the HEP Facility. The sole focus of this investigation was on the combustion turbines, HRSG, and steam turbine generator (STG). There are no potential GHG emissions reductions available from the storage tanks or cooling tower since they do not contain or generate GHG emissions. The potential GHG reductions available from

³ United States Environmental Protection Agency, “PSD and Title V Permitting Guidance for Greenhouse Gases,” March, 2011.

⁴ Ibid.

⁵ Ibid.

the black start generator and the emergency fire pump are minimal, since they are of relatively small fuel-burning capacity compared to the CT-HRSG-STG combination, and they are generally operated only several hours per year, and by permit operated less than 52 hours per year.

Our review of the potential control measures for the CT, HRSG, and STG included:

- Partnering with Other Power Producers
- Carbon Capture and Storage
- Fuel Switching, Including Biogenic Fuels
- Energy Efficiency Upgrades
- Combustion or Operational Improvements
- Restrictive Operations
- Planned Upgrades, Overhaul or Retirement of Equipment
- Regulatory Mandates, Emission Standards and Binding Agreements

3.1 Partnering with Other Power Producers in Hawai'i

Hamakua Energy approached Hawai'i Electric Light⁶ regarding a partnership for purposes of compliance with the Greenhouse Gas Emissions Rule, and Hamakua Energy and Hawai'i Electric Light subsequently agreed to include the HEP Facility as a member of the Hawaiian Electric Companies' GHG Partnership.

The power generation facilities operating on each of Hawai'i's islands are interdependent by virtue of being interconnected to the same electric grid on each island. If one or more of them cannot produce their scheduled power output, the other facilities on the island have to generate more power to make up for the shortfall. An unscheduled outage that takes a major generating unit offline for a period of time can significantly shift loading, and consequently the GHG emissions, from one facility to another.

As indicated in Appendix B, "GHG Reduction Partnership," the aggregate GHG emissions cap for the Partnership Facilities would be 6,982,040 (short) tons per year, and the respective GHG emissions cap for the HEP Facilities would be 153,699 (short) tons per year.

The agreement between Hamakua Energy and Hawai'i Electric Light to form a GHG Partnership is subject to review and approval by the Hawai'i Public

⁶ Hamakua Energy and Hawai'i Electric Light have executed a partnership agreement. Other members of the partnership for purposes of GHG compliance include Maui Electric Company, Ltd., Hawaiian Electric Company, AES Hawaii, and Kalaeloa Energy Partners LP. Such other members' participation in the partnership is documented in separate agreements between the independent power producers and the utilities serving the applicable islands.

Utilities Commission (PUC). If the proposed partnership with the Hawaiian Electric Companies is terminated due to an unfavorable PUC decision or a PUC decision that includes modifications to the partnership agreement that are unacceptable to Hamakua Energy or Hawai'i Electric Light, then the partnership agreement would terminate. If this occurs Hamakua Energy would employ other control measures identified in this GHG ERP to meet its GHG emissions cap of 153,699 (short) tons per year.

3.2 Carbon Capture and Storage

Carbon Capture and Storage (also known as carbon capture and sequestration or CCS), includes a range of technologies that capture carbon dioxide (CO₂) from the burning of carbon-based fuels for power generation, and from the manufacturing of steel, cement and other industrial facilities, and transport it by either pipeline or ship, for underground storage.

According to the U.S. Department of Energy's National Energy Technology Laboratory (NETL), there are commercially available CO₂ capture technologies that are being used in various industrial applications. There are several options for capture and several options for transport and use or storage of captured carbon described in the referenced literature; however, these technologies are not commercially available for implementation on fossil fuel power plants for three primary reasons:

- (1) They have not been demonstrated at the scale necessary for power plant application.
- (2) Current CO₂ capture technologies require so much power that they substantially compromise the capability of a facility to generate and meet its electric power obligations.
- (3) The relative cost of current capture technologies are excessive compared to other control technologies.

Review of the BACT/LAER/RACT⁷ Clearinghouse uncovered no power plants that use CCS for greenhouse gas emissions removal.

Review of the following GHG BACT analyses also helped to confirm that CCS is not currently technically or economically feasible for combustion turbines or other fossil fuel burning power plants:

- CPV Valley Energy Center in New York State (2012) – 630 MW combined cycle electric generating facility burning natural gas and No. 2 fuel oil.
- Empire District Riverton Unit 12 in Kansas (2013) – 150 MW combined cycle electric generating facility burning natural gas.

⁷ Per common EPA terminology, BACT = Best Available Control Technology, LAER = Lowest Achievable Emissions Rate, and RACT = Reasonably Achievable Control Technology.

- AES Huntington Beach Generating Station in California (2012) – 939 MW combined cycle electric generating facility burning natural gas.
- Portland General Electric Company in Oregon (2010) – 300 MW reciprocating engine-driven generators and a simple-cycle combustion turbine.

In addition, CCS was not identified as a “demonstrated measure” in EPA’s GHG Abatement Measures analysis for existing power plants.⁸

3.3 Fuel Switching, Including Biogenic Fuels

The HEP Facility is currently capable of receiving, handling, storing, and operating on a variety of distillate liquid fuels, including No. 2 oils (e.g., diesel or ULSD) and naphtha. ULSD is typically used for startup due to its “light-off” characteristics, and then operation is switched to naphtha because it is less expensive. It would be fairly straightforward to substitute a biofuel such as biodiesel (or a blend of No. 2 oil and biodiesel) as the fuel properties are similar. The most significant changes may involve change-out of gasket and tubing materials that would not be compatible with biofuels. The CT engines are capable of operating on biodiesel or blends of biodiesel and No. 2 oils without modification to the generators themselves.

Fuel Options

Hamakua Energy has reviewed fuel switching options and/or co-firing a variety of “clean fuels” at the HEP Facility for purposes of GHG emissions compliance.

Natural Gas. Switching from naphtha to natural gas, or co-firing natural gas with naphtha, could lower GHG emissions for the CT generators at the HEP Facility from about 150 to 110 (short) tons per year of GHG emissions for every MBtu of fuel burned, or a decrease of about 40 (short) tons per year or approximately 28%. The State of Hawaii, however, produces no natural gas and has no proven gas reserves. Hawai’i has the lowest total natural gas consumption in the nation and the lowest per capita consumption of natural gas.

Liquefied Natural Gas (LNG) and Liquid Propane Gas (LPG). The use of LNG in quantities sufficient to support power generation in Hawai’i has been evaluated and considered by the Hawai’i Gas Company and the Hawaiian Electric Companies in recent years. However, there are presently no commercial activities to produce and/or deliver LNG at the scale needed for commercial viability. LNG is not currently available nor expected to be available on Hawai’i Island in quantities sufficient to support power

⁸ EPA, June 10, 2014, *Technical Support Document (TSD) for Carbon Pollution Guidelines for Existing Power Plants: Emission Guidelines for Greenhouse Gas Emissions from Existing Stationary Sources: Electric Utility Generating Units*

generation at the HEP Facility. Similarly, LPG is also not available or expected to be available in sufficient quantities. The control technology alternative to use gaseous fuels at the HEP Facility would be reassessed if and when LNG and/or LPG become available in sufficient quantities for power generation on Hawai'i Island, including infrastructure for the receiving, handling, storage, and delivery of the fuels to the HEP Facility.

Synthetic Natural Gas (SNG). Synthetic natural gas is currently produced on O'ahu, however distribution of that synthetic gas is limited to parts of O'ahu. Hawai'i State energy policies encourage the development of synthetic natural gas production using biomass as a feedstock, however, there is currently no production of synthetic gas using biomass in the state in significant enough quantities to support a power plant the size of the HEP Facility.⁹

Liquid Biogenic Fuels (e.g., biodiesel). As described above, the HEP Facility would be capable of operating on liquid biogenic fuels (e.g., biodiesel), or blends of biogenic liquid fuels having similar fuel properties (e.g., blend of ULSD and biodiesel). Hamakua Energy views the use of liquid biogenic fuels at the HEP Facility to be a reasonable control technology alternative for GHG emissions compliance should Partnering with Other Power Producers in Hawai'i become unavailable. Accordingly, Hamakua Energy plans to implement the necessary steps to modify the HEP Facility to accommodate biodiesel (e.g., change-out of gaskets and flexible tubing to materials that are compatible with biodiesel) and perform requisite demonstration pilot tests including emissions measurements, subject to DOH approval, to produce the technical and operational information and data necessary to support modification of its CSP to allow operation on biodiesel and/or blends of biodiesel and ULSD.

Facility Modifications for Fuel Switching

Biodiesel. As described above, qualifying the use of biodiesel at the HEP Facility is expected to be a relatively straightforward process.

LNG or LPG. The HEP Facility could be converted to operate on gaseous fuels such LNG or LPG, but this would require significant modifications to the facility. LNG would typically be delivered to the site in isotainers. Isotainers would be filled at an LNG production facility either on the mainland or another country and shipped to Hawai'i Island via either Hilo Harbor or Kawaihae Harbor. Then isotainers would be trucked to the HEP Facility where they would be stored prior to use. Major modifications would have to be made to the CTs in order to utilize LNG. The fuel delivery system would have to be changed to allow for either LNG only or for dual fuel (e.g., LNG and diesel/naphtha). The combustors and fuel nozzles on the CTs would have to be changed to different models. The control system would have to be modified to accommodate the LNG and dual fuel process. The modifications

⁹ U.S. Dept. of Energy, State Energy Profile - <http://www.eia.gov/state/analysis.cfm?sid=HI> (last updated October 19, 2017)

to the CTs alone would cost approximately \$2 million each. In addition, a gasification facility would have to be designed for and constructed at the HEP Facility, and empty isotainers trucked back to the port to be shipped back to the LNG supplier. Several hundred isotainers would have to be in service and in transit through every stage of the process to make this work.

CSP Modifications for Fuel Switch

The CSP would have to be modified to allow the HEP Facility to operate on fuels other than No. 2 oil (such as ULSD) or naphtha.

Once the CSP is modified to allow operation on biodiesel, and if biodiesel is available on Hawai'i Island in sufficient quantities, then Hamakua Energy plans to substitute biodiesel for ULSD for startups of the combustion turbines. Moreover, depending on the availability and commercial terms for larger quantities of biodiesel to be delivered to the HEP Facility, Hamakua Energy will consider substituting biodiesel or biodiesel-ULSD blends for naphtha for everyday operation of the combustion turbine.

3.4 Energy Efficiency Upgrades

The HEP Facility is a combined cycle plant that uses waste heat from the General Electric LM2500 combustion turbines (CTs) to produce steam in the heat recovery steam generators (HRSGs). Electric generators are connected to each CT and the steam turbine. This combined cycle operating mode is a very efficient power plant thermal cycle. Accordingly, there is very limited opportunity for significant additional energy efficiency upgrades that would result in meaningful reductions in GHG emissions.

Combined-cycle power plants such as the HEP Facility are generally about 30% more energy efficient than simple-cycle plants, and accordingly, produce about 30% less GHG emissions for every kilowatt of energy produced. Even though the HEP Facility may be operated in either a combined-cycle or simple-cycle mode, historically the HEP Facility has overwhelmingly been dispatched by Hawai'i Electric Light to operate in combined-cycle mode as illustrated below.

Hamakua Energy - Net Generation

Year	Simple Cycle MWH	Combined Cycle MWH	Total MWH	Simple Cycle %	Combined Cycle %
2010	0	286,176	286,176	0.0%	100.0%
2011	1,504	214,366	215,870	0.7%	99.3%
2012	0	231,240	231,240	0.0%	100.0%
2013	0	167,665	167,665	0.0%	100.0%
2014	0	182,292	182,292	0.0%	100.0%
2015	0	224,284	224,284	0.0%	100.0%
2016	0	131,165	131,165	0.0%	100.0%
2017	0	145,070	145,070	0.0%	100.0%

The LM 2500 combustion turbines are among the most efficient engines available in the industry. Based on discussions with representatives from General Electric, there are no energy efficiency upgrades available for the combustion turbines in use at the HEP Facility. The only option for energy efficiency upgrades for the CT's may be complete equipment replacement. Complete equipment replacement would "redefine the source" and the EPA has stated in various guidance documents that inherently lower emitting processes and practices that would redefine the emissions source need not be considered for Best Available Control Technologies (BACT) reviews.¹⁰

Approximately every 50,000 operating hours (i.e., equivalent to approximately six calendar years) each of the HEP Facility's CT's is taken out of service for a complete overhaul by a qualified contractor such as the General Electric Company. Similarly, approximately every four running years the STG is inspected and overhauled. These overhauls tend to return the CTs and STG to thermal efficiencies typical of new equipment.

The HRSG's are periodically inspected by HRST Inc., a company known throughout the industry for performing these types of inspections. According to the HRST Inc., there are no energy efficiency upgrades available for the HRSG's at the HEP Facility.

In summary, by design, operating practices, and maintenance practices the HEP Facility is a very efficient power generating facility. Moreover, there is very little opportunity to improve the thermal efficiency, and no means to improve the thermal efficiency by an amount sufficient to satisfy the GHG emissions reduction requirements for the HEP Facility.

3.5 Combustion or Operational Improvements

Based on discussions with representatives from General Electric, the original equipment manufacturer of the CTs, there are no combustion or operational improvements available for the CTs at the HEP Facility. Since there is no supplementary firing in the HRSGs and no combustion takes place in the HRSG's or the STG, combustion improvements are not available for these units.

¹⁰ EPA, "Prevention of Significant Deterioration and Title V Permitting Guidance for Greenhouse Gases", page 26. EPA-457/B-11-001, March 2011.

3.6 Restrictive Operations

Hawai'i Electric Light has published forecast power production for the HEP Facility for the future years in its Power Supply Improvement Plans.¹¹ Based on these forecasts, the HEP Facility is expected to consistently be operated at levels that result in annual GHG emissions well below its facility GHG emissions cap of 153,699 (short) tons per year (tpy) of CO₂e through 2030, the year in which its PPA with Hawai'i Electric Light is scheduled to terminate. However, in the unlikely event Hawai'i Electric Light dispatches the HEP Facility at levels that would cause it to exceed its GHG Emissions Cap, it may be necessary for the HEP Facility to rely on the applicable GHG control technologies (i.e., Partnering with Other Power Producers in Hawai'i, Fuel Switching Including Biogenic Fuels, and/or Restrictive Operations) to assure compliance with the GHG conditions in the CSP.

As discussed in more detail below Restrictive Operations would be the least desirable GHG control technology option. The HEP Facility is one of, if not the most energy efficient power generation facility available on Hawai'i Island and the electric grid of Hawai'i Electric Light. If no other options are available, Restrictive Operations may voluntarily be employed by Hamakua Energy to assure compliance with the GHG permit conditions of the HEP Facility's CSP. This would only occur if Partnering with Other Power Producers in Hawai'i and Fuel Switching Including Biogenic Fuels are unavailable, emergency provisions of the HEP Facility's CSP do not apply, and the HEP Facility would otherwise violate the GHG permit conditions of its CSP.

Restrictive Operations present other issues:

- The HEP Facility is contractually obligated to Hawai'i Electric Light by its PPA to be available to produce electricity throughout the year. The PPA provides for limited forced (unscheduled) outages. If Restrictive Operations were voluntarily imposed by Hamakua Energy, then the HEP Facility may not be available for dispatch to levels requested by Hawai'i Electric Light, and consequently, the cost to produce electric power to meet the needs of Hawai'i Electric Light's customers would be higher than it would be otherwise.
- Hamakua Energy may have to pay penalties for lower availability and/or higher forced outage rates that are proportional to the degree of Restrictive Operations that it voluntarily imposed on the HEP Facility.

¹¹ On July 14, 2017, the Hawai'i Public Utilities Commission accepted the Hawaiian Electric Companies' Power Supply Improvement Plans (PSIPs) Update. Docket No. 2014-0183, Decision & Order No. 34696, July 14, 2017.

- In a most extreme circumstance, there may not be sufficient power generation on Hawai'i Island to meet the demand of customers resulting in power outages.

3.7 Planned Upgrades, Overhaul, or Retirement of Equipment

Hamakua Energy has no planned upgrades or retirements of major equipment at the HEP Facility. As noted earlier, however, the Hamakua Energy does plan for and execute routine periodic overhauls for the CTs and the steam generator and these periodic overhauls help ensure the reliability and efficiency of the HEP Facility.

3.8 Outstanding Regulatory Mandates, Emission Standards, and Binding Agreements

There are no outstanding regulatory mandates, emission standards, or binding agreements that will reduce GHG emissions from the HEP Facility.

3.9 Other GHG Reduction Initiatives That May Affect the HEP Facility's GHG Emissions

Except for Partnering with Other Power Producers in Hawai'i, Fuel Switching Including Biogenic Fuels, and Restrictive Operations, as discussed above, Hamakua Energy has no other GHG reduction initiatives planned for the HEP Facility.

4 TECHNICALLY FEASIBLE MEASURES

The three (3) technically feasible measures for compliance with GHG conditions of its CSP in order of priority are: (1) Partnering with Other Power Producers in Hawai'i, (2) Fuel Switching Including Biogenic Fuels, and (3) Restrictive Operations. Hamakua Energy has executed a GHG Partnering Agreement with Hawai'i Electric Light. Subject to PUC approval of that agreement, Partnering will constitute the primary control measure for GHG compliance. Secondly, Hamakua Energy is committed to qualifying the HEP Facility to operate on biodiesel and/or a blend of biodiesel and ULSD, and plans to initiate efforts for qualification in 2018. Thirdly, if and only if there is no alternative to meet the GHG permit conditions of its CSP, Restrictive Operation would be implemented.

If LNG or LPG becomes available on Hawai'i Island in sufficient quantities for power generation, the technical and commercial feasibility of using LNG and/or LPG at the HEP Facility would be reevaluated.

5 CONTROL EFFECTIVENESS AND COST EVALUATION

The relative cost effectiveness for the feasible control measures is discussed below.

5.1 Partnering with Other Power Producers in Hawai'i

As a member of the above-described GHG Reduction Partnership, and if approved by the PUC, Hamakua Energy would be responsible for seeking and implementing changes to its operations for the benefit of customers of Hawai'i Electric Light. In particular, with the increasing amounts of renewable energy generation on Hawai'i Island, the HEP Facility becomes a more valuable resource when it can be scheduled and dispatched with more flexibility similar to a "peaking" generating unit. To achieve this flexibility, changes to the CSP would be needed to allow more than one startup per day per CT. Accordingly, pursuant to the GHG Reduction Partnership agreement with Hawaii Electric Light, Hamakua Energy would seek Department of Health approval to modify its CSP to potentially allow more than one startup per day per CT. It would also be beneficial to shorten the startup times (i.e., the duration from startup initiation to turnover of dispatch to System Operation of Hawai'i Electric Light). This may involve physical modifications to equipment and/or procedural changes at the HEP Facility. Accordingly, in accordance with the GHG Reduction Partnership agreement, Hamakua Energy would evaluate and implement appropriate changes pursuant to its GHG Reduction Partnership agreement with Hawai'i Electric Light.

5.2 Fuel Switching or Biogenic Fuels

As described above, Hamakua Energy is committed to seek qualification of the HEP Facility for operation on biodiesel and/or blends of biodiesel and ULSD. The qualification process will include three parts: (1) organization of a pilot test including procurement of biodiesel, modification of equipment at HEP Facility to facilitate use of the biodiesel from a temporary storage tank, contracting for emissions testing, and coordination with Hawai'i Electric Light Company for dispatch; (2) implementation of pilot tests at multiple load points, including emissions testing at each load point; and (3) compilation of pilot test results and preparation and submission of a modification to the CSP.

Once the HEP Facility is qualified for operation on biodiesel and/or a blend of biodiesel and ULSD, it is anticipated that the biofuel alternative (instead of ULSD) will be utilized for daily startups of the CTs. The incremental cost for this is not expected to be significant.

If biodiesel becomes available on Hawai'i Island in quantities sufficient for sustained power generation at reasonable commercial terms, then Hamakua Energy may consider operating the HEP Facility on an everyday basis using biodiesel.

If biodiesel becomes available on Hawai'i Island in quantities sufficient for sustained power generation, the GHG Partnership Agreement is void or otherwise not in effect, and emergency conditions of the GHG permit conditions of the CSP do not apply, then the HEP Facility may be operated on using biodiesel for purposes of GHG compliance. Depending on the price of biodiesel at such time relative to naphtha, this could result in higher-priced energy being made available to the customers of Hawai'i Electric Light. There would not be an incremental cost to Hamakua Energy in this instance because the PPA with Hawai'i Electric Light provides for compensation to Hamakua Energy based on the delivered price of the fuel being utilized at the HEP Facility.

5.3 Restrictive Operations

Restrictive Operation is the least desirable GHG control option because it may result in higher-priced energy being made available to the customers of Hawai'i Electric Light, and/or in the worst case, result in regional blackouts. The cost for Restrictive Operation to Hamakua Energy may have two components: (1) reduced energy sales; and (2) increased penalties for reduced service availability. The potential costs to Hamakua Energy for Restrictive Operation would vary depending on the degree of Restrictive Operation that would be implemented. The cost of lost energy sales would be very difficult to predict, and would depend on the price of fuel at the time and the load to which the HEP Facility would have otherwise been dispatched if Restrictive Operation was not implemented.

6 PROPOSED CONTROL STRATEGY

As detailed above, Hamakua Energy's control strategy for GHG emissions compliance in order of priority for implementation would be: (1) Partnering with Other Power Producers in Hawai'i, (2) Fuel Switching Including Biogenic Fuels, and (3) Restrictive Operations, absent any relief for emergencies.

Appendix A

REFERENCES

Government reference documents:

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Appendix B

GHG Reduction Partnership Baseline CO₂e Emissions and 2019 CO₂e Permit Limits

Company	Covered Source	Baseline		Proposed 2019		CO ₂ e Limit (tpy)
		CO ₂ e Emissions (metric tpy)	CO ₂ e Reduction (%)	CO ₂ e Reduction (tpy)	CO ₂ e Limit (tpy)	
Hawaiian Electric (HE)	Kahe	2,518,411	23.0%	638,218	2,137,855	2,137,855
	Waialae	974,643	24.6%	264,520	809,840	809,840
	Honolulu	121,208	100.0%	133,609	0	0
	CIPGS	13,559	-260.2%	-38,896	53,842	53,842
HE Total		3,627,821	24.9%	997,461	3,001,537	
Maui Electric (ME)	Kahului	209,414	32.9%	75,909	154,930	154,930
	Maalaea	562,012	25.6%	158,764	460,748	460,748
	Palaau	25,615	6.1%	1,731	26,505	26,505
ME Total		797,041	26.9%	236,404	642,183	
Hawaiian Electric Light (HEL)	Kaunohoua-Hill	202,106	22.4%	49,998	172,785	172,785
	Keahole	173,623	-26.8%	-51,285	242,672	242,672
	Puna	90,438	68.1%	67,883	31,808	31,808
	Shipman	9,246	100.0%	10,192	0	0
HEL Total		475,413	14.7%	76,788	447,265	
HE/ME/HEL Total		4,900,275	24.3%	1,310,644	4,090,985	
AES Hawaii		1,525,526	-0.6%	-10,000	1,691,605	1,691,605
	HEP	166,992	16.0%	29,276	163,999	163,999
	KPLP	948,689	0.0%	0	1,046,761	1,046,761
Partnership Total		7,540,482	16.00%	1,329,920	6,982,040	

Notes:

1. Excludes biogenic CO₂ emissions.
2. AES baseline is 2010 basis, adjusted as agreed with DOH.
3. KPLP baseline is 2009 basis adjusted for CEMS correction factor, as agreed with DOH.
4. All other baselines are 2010 actual emissions as reported in EPA's e-GGRT reporting system, except for HE CIPS and HEL Shipman. For calendar year 2010 CIPGS and Shipman emissions were lower than the 25,000 metric tpy reporting threshold. CIPGS and Shipman emissions are calculated as specified by EPA's GHG Mandatory Reporting Rule.
5. CIPGS is designated as the Main CSP for the Hawaiian Electric Companies' GHG Emissions Reduction Plan.