



March 25, 2019

The Honorable Chair and Members of the
Hawai'i Public Utilities Commission
465 South King Street
Kekuanaoa Building, 1st Floor
Honolulu, Hawai'i 96813

FILED
2019 MAR 25 P 3:52
PUBLIC UTILITIES
COMMISSION

Dear Commissioners:

Subject: Transmittal No. 13-07 – Schedules EV-F and EV-U
Electric Vehicle Charging Services Pilots
Hawaiian Electric Companies' Annual Report

In accordance with Ordering Paragraph 1 of Decision and Order No. 31338 filed on July 1, 2013, as modified by Decision and Order No. 34592 filed on June 2, 2017 in Docket No. 2016-0168, the Hawaiian Electric Companies respectfully submit their annual report on the status of implementing pilot rates for the commercial charging of electric vehicles, for the year ending December 31, 2018.¹

Sincerely,

Kevin M. Katsura
Director
Regulatory Non-Rate Proceedings

Attachment

Cc: Division of Consumer Advocacy
Department of Business, Economic Development, and Tourism (electronic copy)
OpConnect, LLC (electronic copy)

¹ The "Hawaiian Electric Companies" are Hawaiian Electric Company, Inc., Maui Electric Company, Limited and Hawai'i Electric Light Company, Inc.

Hawaiian Electric Companies Electric Vehicle Pilot Rates Report

Annual Report on the Progress and Status of the Commercial Public Electric Vehicle Charging Service Pilot Rates

Transmittal No. 13-07

March 25, 2019

Table of Contents

- Executive Summary..... 4
- Background 5
- Schedule EV-U Tariff 6
 - Adoption of EV-U and status of Schedule EV-U Tariff 6
 - Utilization across the Companies..... 9
 - Utilization at Hawaiian Electric 11
 - Utilization at Hawai’i Electric Light 21
 - Utilization at Maui Electric..... 26
 - Analysis of EV-U rate..... 29
 - Summary of Cost and Revenue 33
 - Subsidization by non-participating customers..... 39
 - Recommendation to rate structure 41
- Schedule EV-F Tariff 41
 - Adoption and Status of Schedule EV-F 41
 - Summary of Cost and Revenue 44
 - Subsidization by non-participating customers..... 44
 - Recommendation of revisions to rate structures 46
- Summary of on-going pilots..... 46
 - Demand Response on DC fast charging 46
 - Battery Storage with DC fast charging 46
- Customer engagement and outreach (Roadmap Initiative #1) 47
- Appendix A 49
 - Dole Plantation 49
 - Ko’olau Center 51
 - Kapolei Commons 53
 - Hawai’i Kai 7-Eleven..... 55
 - Ward 1..... 57
 - Ward 2..... 59
 - Wai’anae Mall 61
 - 801 Dillingham 63
- Appendix B 65

Hawai'i Electric Light's Hilo Office 65

Hawai'i Electric Light's Kona Office..... 67

Waimea KTA..... 69

The Shops at Mauna Lani 71

Appendix C 73

 Maui Electric's Kahului Office 73

 Kaunakakai 75

Appendix D..... 77

Appendix E 78

Appendix F 79

Executive Summary

2018 built upon the Hawaiian Electric Companies’¹ growing momentum in the electrification of transportation (“EoT”) ecosystem, with the development of programs and actions keeping pace with the growing population of electric vehicle (“EV”) drivers. The Companies’ various efforts align with their *Electrification of Transportation Strategic Roadmap* (“Roadmap”), which² provides key near-term steps, benefit and cost analyses and ten EoT Initiatives in which EoT may contribute to the State’s clean energy vision and create economic benefits for all customers. Executing on the Roadmap initiatives, in 2018, the Companies installed two additional direct current fast charging (“DCFC” or “fast charge”) stations, submitted their proposed E-BUS Program tariffs³ to incentivize bus fleet operators to adopt clean transportation vehicles, and filed an application⁴ to assume ownership of eight of the thirteen sites within the EVohana charging network in order to support Maui’s EV community.

The Companies’ public charging efforts discussed herein align with “Initiative # 7--Expand availability of public charging,” in the Roadmap, which recommends accelerating the buildout of charging infrastructure to provide “a critical backbone of reliable, public utility-owned charge stations as the launching point from which the broader electric transportation and third party charging market in Hawai’i can expand and solidify.”⁵ By the middle of 2019, the Companies will complete their critical backbone study, which will evaluate EV adoption and recommend optimal charging infrastructure and technology at targeted locations on O’ahu, Maui and Hawai’i Island.

In the last two weeks of 2017, the Companies implemented a significant rate design change to the EV-U and EV-F Program.⁶ This rate design change enabled the Companies to assess the market reaction to a change in pricing for energy, providing a full year of data to analyze. Key highlights in 2018 include:

- Expanded the Companies’ DCFC network by two additional charge stations, including the first one on the island of Moloka’i and purchasing one on Hawai’i Island;
- Overall utilization increased from 2017 to 2018, reflecting a 68 percent increase in number of sessions and a 14 percent increase in amount of energy consumed;
- For the first time since the commencement of the pilot program, utilization levels have reached a tipping point for five of the eight charging stations on O’ahu, where the revenues collected exceeded the operating and maintenance expenses. This resulted in an aggregate net positive effect for O’ahu in 2018; and
- One additional customer was added to the EV-F program.

¹ The “Hawaiian Electric Companies” or “Companies” are: Hawaiian Electric Company, Inc. (“Hawaiian Electric”), Hawai’i Electric Light Company, Inc. (“Hawai’i Electric Light”), and Maui Electric Company, Limited (“Maui Electric”).

² Docket No. 2018-0135, Decision & Order No 3452 filed March 29, 2018 and updated November 29, 2018.

³ Transmittal No. 18-06 filed December 19, 2018.

⁴ Application filed on December 21, 2018 in Docket No. 2018-0422.

⁵ Docket No. 2018-0135, Electrification of Transportation Strategic Roadmap filed March 29, 2018 at 7.

⁶ Transmittal No. 18-06 filed December 19, 2018.

⁶ Docket No. 2016-0168 Decision and Order No. 34867 issued on October 13, 2017, approving the Companies’ revised tariff sheets for Schedules EV-F and EV-U, to be implemented within sixty (60) days.

Background

2018 will be the fifth full year of this pilot program,⁷ and this report provides year ending December 31, 2018 information on the status of implementing Schedule EV- U: Commercial Public Electric Vehicle Charging Service and Schedule EV-F: Commercial Public Electric Vehicle Facility Charging Service Pilot.⁸

Initially in 2013, Schedule EV-U was intended to support the EV market by allowing the Companies to install and operate public EV charging facilities in strategic locations to address range anxiety, support the rental EV market, and increase EV acceptance by residents in multi-unit dwellings (“MUDs”). Schedule EV-F was intended to support clean energy goals by encouraging “the development of public EV charging facilities by pricing electricity at levels that are lower than Schedule EV-C⁹ and Schedule J at lower energy consumption levels for start-up EV public charging operators.”¹⁰

In mid-2016, the Companies requested to extend the termination date of the pilot program.¹¹ A year later,¹² the Commission approved a five-year extension of the pilot program, on the condition that the Companies submit revised rate structures for Schedule EV-U and Schedule EV-F within ninety days and comply with applicable requirements.¹³ On December 12, 2017, the Companies implemented the revised rate structure for Schedules EV-U and EV-F for all participating accounts.¹⁴

The revised rate for Schedule EV-U incorporates additional guidance from the Commission. Schedule EV-U is currently a variable rate based on electricity consumption instead of the previous flat fee

⁷ On July 3, 2013, in accordance with Decision and Order No. 31338, the Hawaiian Electric Companies filed their commercial rates Schedule EV-F and Schedule EV-U to be effective July 4, 2013.

⁸ In accordance with Ordering Paragraph 1.C. of Decision and Order No. 31338, filed July 1, 2013 in Transmittal Nos. 13-07 and 13-08 (consolidated), as explicitly modified by Decision and Order No. 34592 (“D&O 34592”), filed June 2, 2017 in Docket No. 2016-0168.

⁹ By Decision and Order No. 33165 issued on September 25, 2015, the Commission approved “the Companies’ request to terminate Schedule EV-C, as of October 1, 2015” and “suspend[ed] the Companies’ request to establish their proposed Schedules TOU EVD, EV-RD, and EV-CD.”⁹ Therefore, as of October 1, 2015 Schedule EV-F is the only commercial EV rate available for EV charging services.

¹⁰ Transmittal No. 13-07 at 22.

¹¹ On June 27, 2016, the Companies filed a request to extend the termination date for Schedule EV-F and Schedule EV-U from June 30, 2018 to June 30, 2028. On July 5, 2016, the Commission issued Order No. 33783 and opened Docket No. 2016-0168 for the purpose of reviewing the Companies’ request. On September 15, 2016, the Commission issued Order No. 33918, establishing the procedural schedule. On November 18, 2016, the Companies filed their Reply Statement of Position thereby completing the procedural schedule.

¹² On June 2, 2017, the Commission issued D&O 34592, approving a five-year extension of the pilot.

¹³ The Commission provided further guidance that the revised rate structures for Schedule EV-F and Schedule EV-U should (1) align Schedule EV-F and Schedule EV-U to TOU rates developed within Docket No. 2014-0192, (2) “incorporate lessons learned from time of use rates and demand response initiatives”¹³ into the revised rate structures, (3) contemplate various business and EV charging models that may be facilitated through various technologies, and (4) be “proactive in proposing revised rate structures and tariffs as research, technology, and market-related changes occur.”¹³ The Commission also required the Companies to include discussion on efforts to forecast anticipated utilization in subsequent EV charging deployments and how costs for EV charging deployments have been and are anticipated to be recovered from customers.¹³ On September 5, 2017, the Companies submitted revised rate structures and accompanying tariff sheets for Schedules EV-F and EV-U. On October 13, 2017, the Commission issued Decision and Order No. 34867, approving the Companies’ revised tariff sheets for Schedules EV-F and EV-U, to be implemented within sixty (60) days.

¹⁴ Rate Schedules EV-F and EV-U currently align to the guidance provided by the Commission in D&O 34592 by providing the lower energy cost during the Mid-Day period. The time of use periods are currently: On-Peak: 5:00 p.m.-10:00 p.m., Daily; Mid-Day: 9:00 a.m.-5:00 p.m., Daily; Off-Peak: 10:00 p.m.-9:00 a.m., Daily.

structure, and includes incremental costs for network fees, non-labor operations and maintenance (“O&M”) and customer surcharges.¹⁵ The intent of the revised rate structure is to equitably charge customers based on their actual electricity consumption, while aligning to a time-of-use (“TOU”) structure that reflects system needs and incorporating additional pilot costs to alleviate some of the cost shift between participating EV customers and all the Companies’ broader customer base as a whole.

Schedule EV-U Tariff

Adoption of EV-U and status of Schedule EV-U Tariff

Electric vehicles experienced significant growth in 2018, with the adoption of passenger EVs increasing by 25 percent in the Companies’ service territory as shown in Figure 1.¹⁶ Despite this growth, EVs only represent approximately one percent of the overall passenger vehicle registered in the State. The EV market remains nascent but is anticipated to experience tremendous growth in the next decades, with the Companies forecasting that one in every two vehicles will be electric by 2045.¹⁷ The Companies plan to support this growth by providing expanded public charging solutions, including the fast charging stations discussed here. In the upcoming months, Hawaiian Electric will be submitting its “critical backbone” study to the Public Utilities Commission, further supporting and informing the development of charging infrastructure to support the adoption of EVs. As stated in the Companies’ Roadmap as part of Initiative #7,¹⁸ the Companies proposed to site, install, own, and operate a reliable, uncongested critical backbone of public charging infrastructure on the islands in their service territory. It is anticipated that this critical backbone will be a network that consists of various charging technologies, such as fast charging as well as strategically sited Level 2 public charge stations, to support the growth of EVs as well as support market growth and third-party infrastructure development.

¹⁵ See Revised Rate Structures for Schedules EV-F and EV-U, filed on September 5, 2017 Attachment 1 at 8-9.

¹⁶ Source <http://dbedt.hawaii.gov/economic/energy-trends-2/>.

¹⁷ Docket No. 2018-0135, Decision & Order No. 34592 filed March 29, 2018 at 34.

¹⁸ Id. at 86-89.

EV adoption increased ~25% in the Companies service territory in 2018

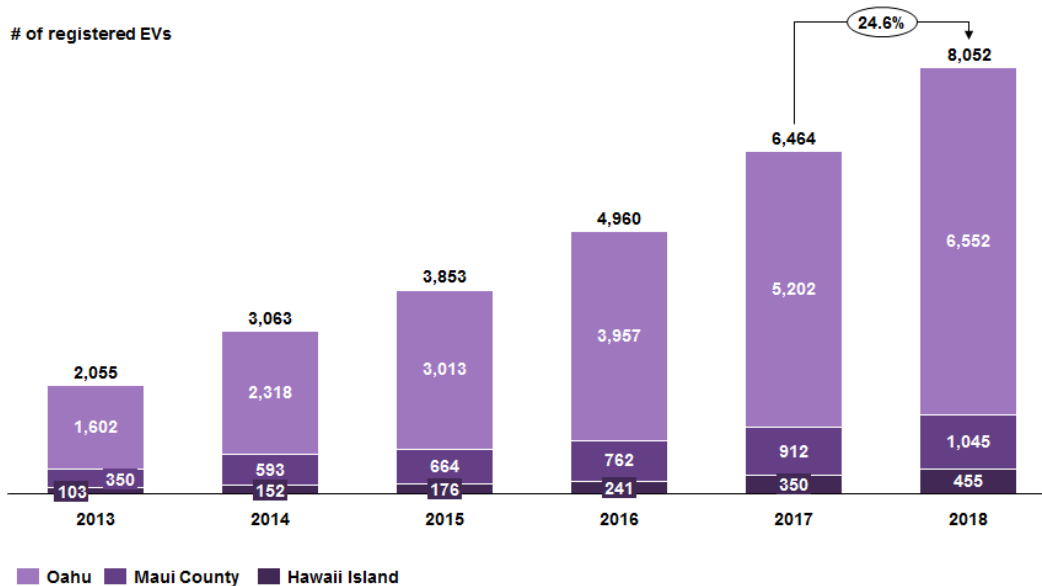


Figure 1 Electric vehicle adoption in the Companies’ service territory since the start of the pilot program.

In 2017 the Commission approved the Companies’ request to extend the EV-U and EV-F pilot program for an additional five years,¹⁹ allowing the Companies additional time to implement the authorized 25 fast charge stations and collect data to evaluate the impact of the program as well as the efficacy of the approved rates. As displayed in Figure 2, the Companies have installed approximately 56 percent of the charging stations allowed in the pilot program to date, including two new additions in 2018 — one on Moloka’i and one on Hawai’i Island. Within the next three years, the Companies expect to install the remaining approved charge stations, thereby allowing time to collect data and analyze different proposed changes during the pilot tenure, as shown in Figure 3.

¹⁹ See id. The original pilot was scheduled to end in 2018.

After five years, the Companies have installed ~56% of the allowed number of charge stations in the pilot program

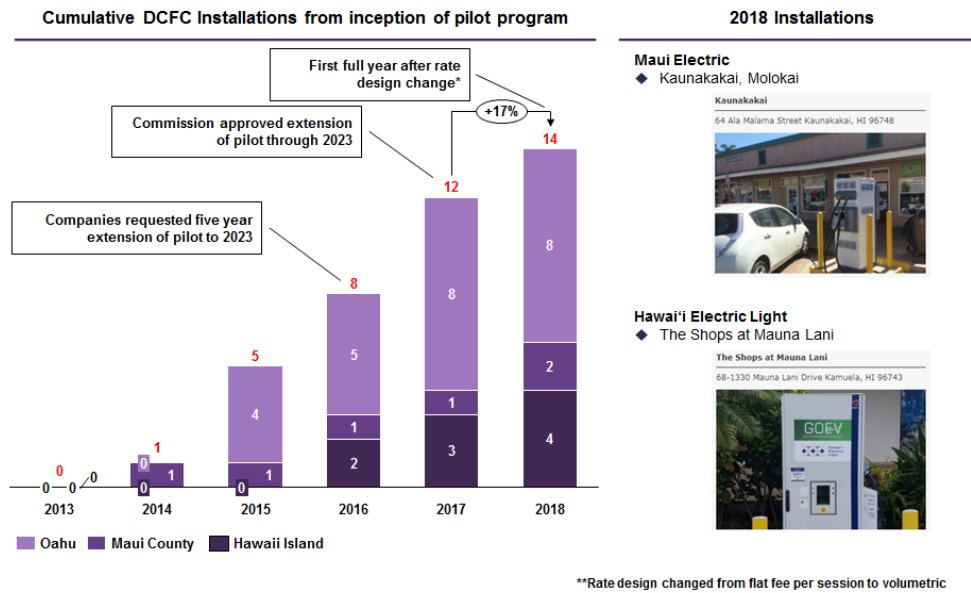


Figure 2 Summary of DCFC stations installed since inception of the pilot program in 2013.

In the next 3 years, the Companies expect to install the allowed number of DCFC in the pilot

Estimated—subject to change

	Initial approval (5 years)						Extension approved in 2017 (+5 years)				
	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
O'ahu	0	0	4	1	3	0	2	2	2	0	0
Maui	0	1	0	0	0	0	0	0	0	0	0
Moloka'i	0	0	0	0	0	1	0	0	0	0	0
Lāna'i	0	0	0	0	0	0	0	1	0	0	0
Hawai'i Island	0	0	0	2	1	1	2	1	1	0	0
Annual Total	0	1	4	3	4	2	4	4	3	0	0
Cumulative Total	0	1	5	8	12	14	18	22	25	25	25

	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
O'ahu			Dole Koolau Kapolei Hawaii-Kai	Ward 1	Ward 2 Waianae Dillingham		Continue to work with site owners to install charge stations as soon as possible, allowing the Companies time to evaluate changes introduced as part of the pilot program				
Maui		MECO Kahului									
Moloka'i						Kaunakakai					
Lāna'i											
Hawai'i Island				HELCO- Hilo HELCO- Kona	Waimea	Shops at Mauna Lani					

Figure 3 Historic and forecasted levels of installation of the twenty five allowed charge stations.

In D&O 34592, the Commission ordered the Companies to include “. . . a description of the analysis that the Companies are undertaking to assess expected utilization for DCFC facilities expected to be deployed during the extension period, including the impacts of geographical location, existing charging infrastructure, population density, and other demographic factors and system needs. . . .”²⁰ Expanding the availability of reliable public charging is one of the key strategies outlined in the Companies’ Roadmap. This initiative states the importance for the Companies to “continue to assess the need for any critical backbone sites beyond these 25 DCFCs as the EV market in Hawai’i grows.”²¹ Accordingly, the Companies have begun to undertake a critical backbone study, which will evaluate the impacts identified by the Commission in its order. However, until the completion of a more rigorous backbone study is complete, the Companies have evaluated available census, traffic, mapping, and EV data to analyze the need for DC fast charge stations at various locations.

Utilization across the Companies

Each Company saw an increase in the year-over-year overall number of sessions and amount of energy consumed (measured in kilowatt-hours (“kWh”)). From 2017 to 2018, there was an approximately 68 percent increase in the number of sessions for all Companies, 62 percent for O’ahu, 800 percent for Maui County and 106 percent for Hawai’i Island (see Figure 4). From 2017 to 2018, there was an approximately 14 percent increase in the amount of energy consumed for all Companies, 9 percent for O’ahu, 200 percent for Maui County and 69 percent for Hawai’i Island (Figure 5).

²⁰ Id. at 68.

²¹ Id. at 86.

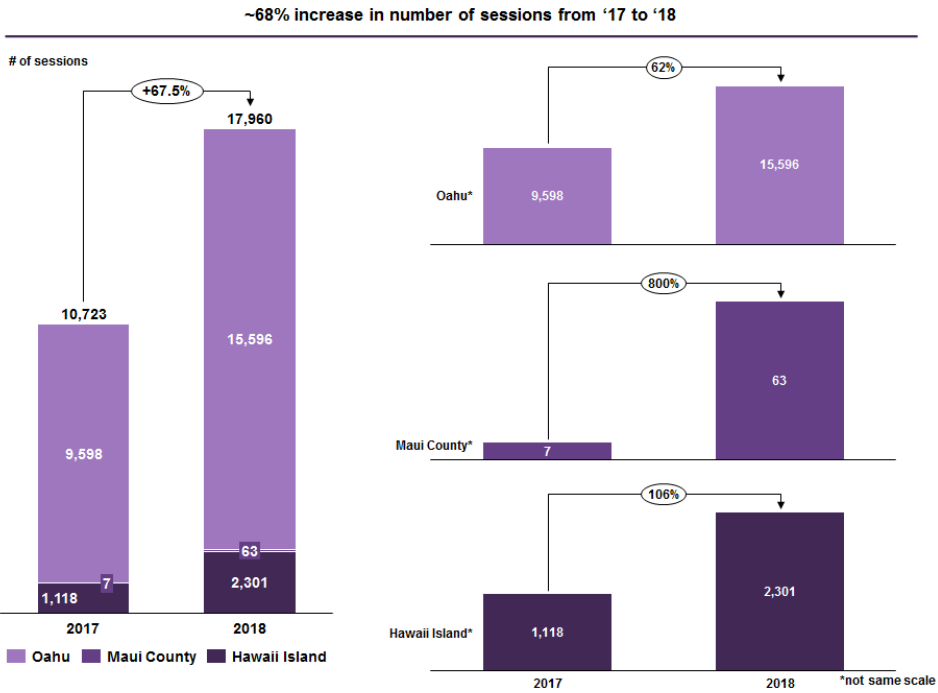


Figure 4 Summary of all three Companies' utilization by number of sessions for 2017 and 2018

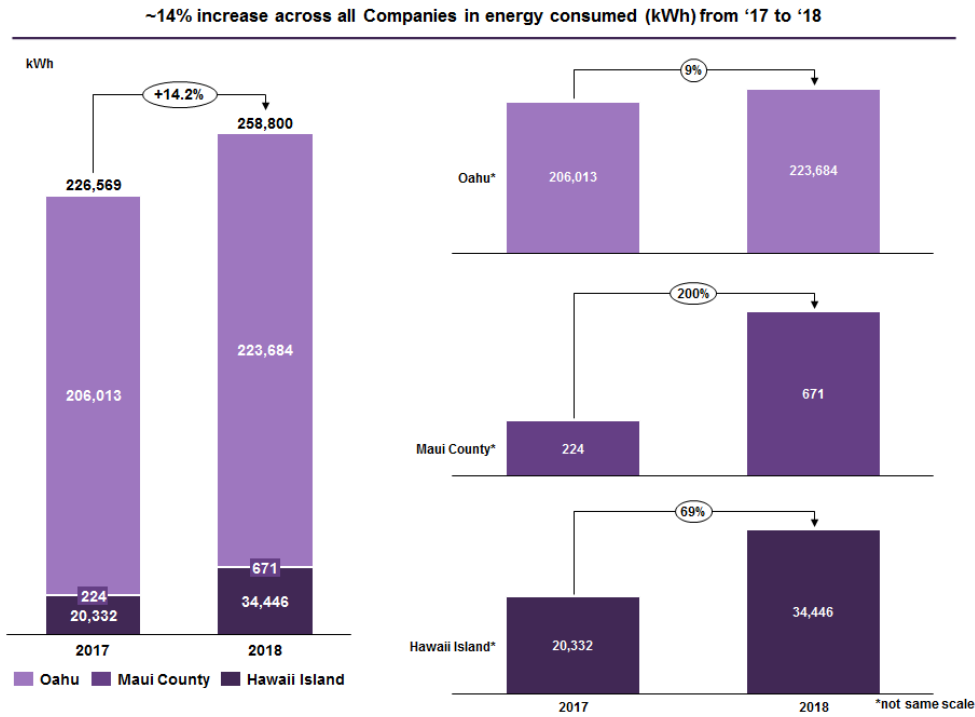


Figure 5 Summary of all three Companies' utilization by energy consumed (kWh) for 2017 and 2018

Utilization at Hawaiian Electric

No additional charge stations were installed on O’ahu in 2018. This created an opportunity to assess the market reaction to the rate change from the utilization data from 2017 to 2018.²² The overall utilization for each month increased from 2017 to 2018, between 33 and 115 percent, as shown in Figure 6.

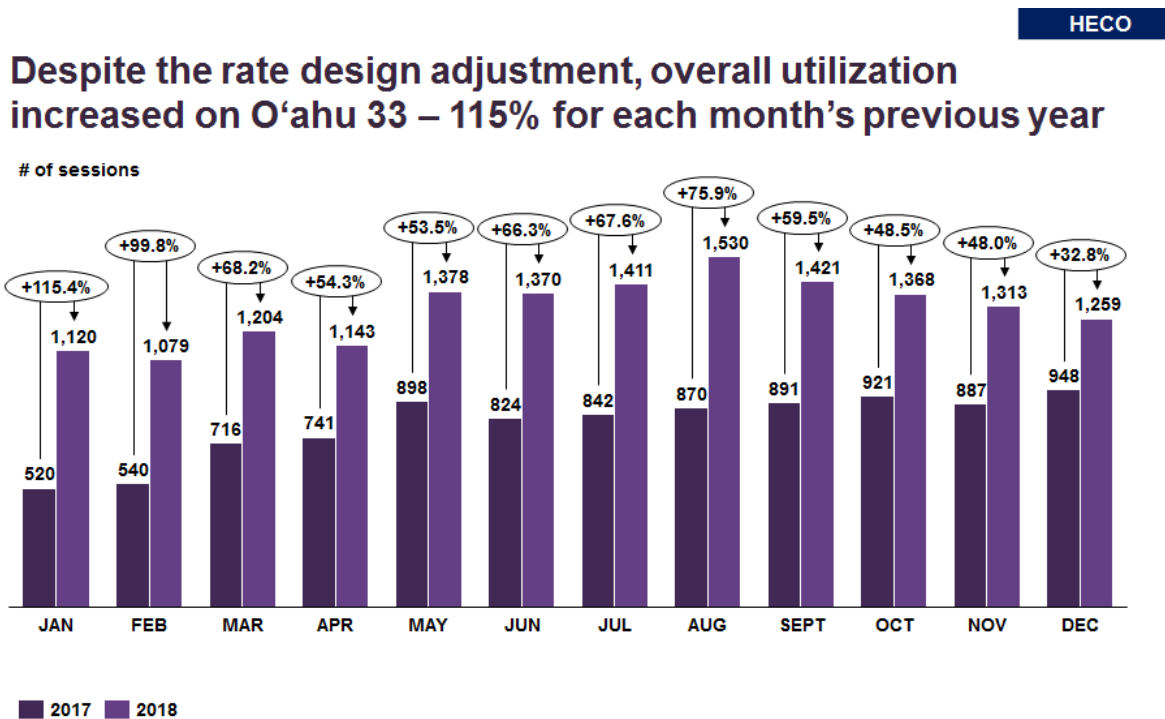


Figure 6 Monthly utilization on O’ahu for 2017 and 2018 for all eight DCFC sites.

In 2018, the O’ahu fast charging stations accounted for 87 percent of all the charge sessions in the pilot, reflecting the preponderance of EVs in the City and County of Honolulu, which comprises 81 percent of all the EVs registered in the Companies’ service territory.

On November 1, 2018, the Companies launched a partnership with Nissan North America and Greenlots, Inc. to host the No Charge to Charge (“NCTC”) program in its service territory. The NCTC program provides buyers of new Nissan Leaf electric vehicles up to two years of complimentary fast charging through the Greenlots charging network, with the qualifying purchase or lease of the EV from LEAF-certified Nissan dealers in Hawai’i.²³ Due to the late launch in 2018, there was only one recorded NCTC session in 2018, however, this program is anticipated to have an increase in utilization of participating chargers on the network. The Companies will track NCTC sessions and will provide an update in future annual reports.

²² On December 12, 2017 the Companies tariff became effective changing the rate from a flat fee for each time period to a volumetric rate for each time period.

²³ The complimentary charging sessions are reconciled by Greenlots Inc. and do not impact Company revenues.

Dole Plantation

While the DCFC station at Dole Plantation is not located near residential neighborhoods, this strategic tourist location is one of the major thoroughfares to the North Shore of O’ahu, which has little availability of public EV charging. While all other DCFC stations experienced increased utilization (total number of charging sessions) in 2018 as compared 2017, Dole Plantation experienced a slight decrease of 4 percent. This decreased utilization may be partially attributed to an intermittent issue with the Combined Charging System (“CCS”)²⁴ cable, which was replaced in December 2018.

Usage period analysis shows that most of the charge sessions at this location continue to be during the Mid-Day period. In 2018, Mid-Day sessions comprised 83 percent of all sessions, which is the highest percentage of any of the Companies’ charge stations. This result may be partially attributed to Dole Plantation’s business hours of 9:30AM – 5:30PM, although access to this charge station is sometimes extended beyond normal business hours.

Compared to 2017, energy consumption and duration of charge sessions were about the same during the 2018 Mid-Day. In 2018, the average charge session duration was 28 minutes during the Mid-Day, 21 minutes during the On-Peak, and 27 minutes during the Off-Peak. This corresponds to 14 kWh, 11 kWh, and 14 kWh of energy consumption during the Mid-Day, On-Peak, and Off-Peak, respectively. Average gross revenue per session was \$6.70, \$6.47, and \$7.33 during the Mid-Day, On-Peak, and Off-Peak, respectively.

Figure 7 summarizes the key statistics collected for the Dole Plantation site in 2017 and 2018. For further details regarding these sites in 2018, see Appendix A.

²⁴ CCS (Combined Charging System) is one of the two fast charging standards supported by most DCFC stations. CCS supports American and European EVs which CHAdeMO supports Japanese and Korean EVs.

Comparison of Dole statistics from 2017 to 2018

	2017	2018	Year/Year trend
% utilization			
Off-Peak	10%	7%	↓
Mid-Day	77%	83%	↑
On-Peak	13%	10%	↓
Energy (kWh) per session			
Off-Peak	12	14	↑
Mid-Day	13	14	↑
On-Peak	13	11	↓
Gross Revenue (\$) per session			
Off-Peak	6.30	7.33	↑
Mid-Day	6.57	6.70	↑
On-Peak	6.76	6.47	↓
Minutes (min) per session			
Off-Peak	25	27	↑
Mid-Day	29	28	↓
On-Peak	28	21	↓

Figure 7 Comparison of Dole Plantation site statistics for 2017 and 2018.

Ko’olau Center

Similar to Dole Plantation, Ko’olau Center is on a thoroughfare that provides access to the north side of O’ahu where there are limited public charging options. However, this location is situated near residential neighborhoods and, as a result, provided twice as many charging sessions in 2018 as Dole Plantation. Also, likely due to its proximity to residential neighborhoods that may lack adequate charging infrastructure, this charge station recorded more charge sessions before and after “working hours” than Dole Plantation. In 2018, 26 percent of all charging sessions started in the Off-Peak, 20 percent started during the On-Peak, and 54 percent started during the Mid-Day.

While there are more sessions during the Mid-Day, energy consumption and duration of charge sessions show little variability across all time periods. Average session lengths are longest during the On-Peak period, which may be attributed to commuters returning home. The average charge session duration was 27 minutes during the On-Peak, 25 minutes during the Mid-Day, and 25 minutes during the Off-Peak. The average energy consumed per session was 12 kWh, 11 kWh, and 12 kWh during the On-Peak, Mid-Day, and Off-Peak, respectively. Average gross revenue per session was \$7.00, \$5.38, and \$6.25 during the On-Peak, Mid-Day, and Off-Peak, respectively.

Figure 8 summarizes the key statistics collected for Ko’olau Center site in 2017 and 2018. For further details regarding these sites in 2018, see Appendix A.

Comparison of Ko‘olau statistics from 2017 to 2018

	2017	2018	Year/Year trend
% utilization			
Off-Peak	24%	26%	↑
Mid-Day	53%	54%	↑
On-Peak	23%	20%	↓
Energy (kWh) per session			
Off-Peak	18	12	↓
Mid-Day	16	11	↓
On-Peak	15	12	↓
Gross Revenue (\$) per session			
Off-Peak	6.23	6.25	↑
Mid-Day	6.42	5.38	↓
On-Peak	6.57	7.00	↑
Minutes (min) per session			
Off-Peak	35	25	↓
Mid-Day	36	25	↓
On-Peak	35	27	↓

Figure 8 Comparison of Ko‘olau Center site statistics for 2017 and 2018

Kapolei Commons

This CHAdEMO-only charge station is situated in a shopping center in proximity to large residential neighborhoods along a major highway thoroughfare. While overall annual utilization at this station increased 7 percent from 2017, the second half of 2018 experienced 174 percent more sessions than the first half of the 2018.

This charging station has one of the highest On-Peak percentage utilization rates as compared to the Companies’ other DCFC stations. In 2018, 30 percent of all sessions were initiated during the On-Peak period, with 54 percent occurring during the Mid-Day, and 15 percent during the Off-Peak periods. The higher On-Peak utilization may be attributed to EV drivers commuting back home and possibly patronizing nearby shopping and restaurants.

Not only was this charge station highly utilized during the On-Peak, its longest average sessions also occurred during the On-Peak period. Average charge session duration was 34 minutes during the On-Peak, 25 minutes during the Mid-Day, and 26 minutes during the Off-Peak. Average energy consumed per session was 12 kWh, 11 kWh, and 11 kWh during the On-Peak, Mid-Day, and Off-Peak, respectively. Average gross revenue per session was \$6.63, \$5.48, and \$6.18 during the On-Peak, Mid-Day, and Off-Peak, respectively. Average session energy consumption and duration decreased in 2018 as compared to 2017.

Figure 9 summarizes the key statistics collected for the Kapolei Commons site in 2017 and 2018. For further details regarding these sites in 2018, see Appendix A.

Comparison of Kapolei Commons statistics from 2017 to 2018

	2017	2018	Year/Year trend
% utilization			
Off-Peak	20%	15%	↓
Mid-Day	50%	54%	↑
On-Peak	31%	30%	↓
Energy (kWh) per session			
Off-Peak	19	11	↓
Mid-Day	17	11	↓
On-Peak	20	12	↓
Gross Revenue (\$) per session			
Off-Peak	6.20	6.18	↓
Mid-Day	6.56	5.48	↑
On-Peak	6.91	6.63	↓
Minutes (min) per session			
Off-Peak	48	26	↓
Mid-Day	45	25	↓
On-Peak	51	34	↓

Figure 9 Comparison of Kapolei Commons site statistics for 2017 and 2018

Hawai'i Kai 7-Eleven

This charge station is located amongst residential houses and condominiums. Its close proximity to condominiums may have contributed to its increased utilization, which was 68 percent higher in 2018 than 2017. EV owners living in condominiums and townhouses without a garage often need to rely on public charging stations, such as this one, for their vehicle charging needs.

Additional evidence supporting this conclusion is the fact that this location recorded higher On-Peak utilization and is among the lowest Mid-Day utilization of any Hawaiian Electric DCFC stations. 53 percent of the sessions started during the Mid-Day, 29 percent started during the On-Peak, and 18 percent started during the Off-Peak. This could be influenced by work and commuter patterns of EV drivers in Hawai'i Kai.

Energy consumption and duration of charge sessions were about the same throughout the day. The average charge session duration was 28 minutes during the Mid-Day, 27 minutes during the On-Peak, and 29 minutes during the Off-Peak. This corresponds to 11 kWh, 12 kWh, and 13 kWh of energy consumption during the Mid-Day, On-Peak, and Off-Peak, respectively. Average gross revenue per session was \$5.60, \$6.61, and \$6.80 during the Mid-Day, On-Peak, and Off-Peak, respectively. Both average session energy consumption and duration decreased in 2018.

Figure 10 summarizes the key statistics collected for the Hawai'i Kai 7-Eleven site in 2017 and 2018. For further details regarding these sites in 2018, see Appendix A.

Comparison of Hawaii Kai 7-Eleven statistics from 2017 to 2018

	2017	2018	Year/Year trend
% utilization			
Off-Peak	17%	18%	↑
Mid-Day	55%	53%	↑
On-Peak	28%	29%	↑
Energy (kWh) per session			
Off-Peak	25	13	↓
Mid-Day	18	11	↓
On-Peak	21	12	↓
Gross Revenue (\$) per session			
Off-Peak	6.26	6.80	↑
Mid-Day	6.57	5.60	↓
On-Peak	6.77	6.61	↓
Minutes (min) per session			
Off-Peak	46	29	↓
Mid-Day	37	28	↓
On-Peak	44	27	↓

Figure 10 Comparison of Hawai'i Kai 7-Eleven site statistics for 2017 and 2018

Ward 1

Both DCFC stations Ward 1 and Ward 2 are co-located at the Hawaiian Electric building on Ward Avenue. It is situated near the growing density of high-rise condominiums and close to many office buildings and the downtown Honolulu district. These two charge stations comprise the only DC fast charging hub on the island of O'ahu, and it is currently the only location that can provide two simultaneous 50 kW DCFC sessions in the State. It is not only the location, but also the reliance on co-located DCFC stations, that accounts for their combined 47 percent of all charge sessions in this DCFC pilot. In 2018, Ward 1 experienced 45 percent more charge sessions than in 2017. This charge station is the highest utilized charge station in the pilot accounting for 25 percent of all charge sessions. This slightly eclipses Ward 2 and is likely due to Ward 1 being the first parking stall when entering from Ward Avenue and its 16-foot wide handicap-accessible size.

Ward 1 also has the lowest percentage of Mid-Day utilization of all the stations in the pilot. The Mid-Day utilization was 48 percent in 2018, while 28 percent of all sessions started during the On-Peak, and 24 percent of all sessions started during the Off-Peak. This lower Mid-Day utilization may be attributed to work hours and it is the only Hawaiian Electric DCFC station not located at a restaurant or shopping area.

Both average energy consumption and session length decreased in 2018 while gross revenue increased. The average energy consumed per session was 17 kWh during the Mid-Day, 17 kWh during the On-Peak, and 15 kWh during the Off-Peak. Average session duration was 27 minutes, 27 minutes, and 25 minutes

during the Mid-Day, On-Peak, and Off-Peak, respectively. Average gross revenue per session was \$8.23, \$9.66, and \$8.16 during the Mid-Day, On-Peak, and Off-Peak, respectively.

Figure 11 summarizes the key statistics collected for Ward 1 site in 2017 and 2018. For further details regarding these sites in 2018, see Appendix A.



Comparison of Ward 1 statistics from 2017 to 2018

	2017	2018	Year/Year trend
% utilization			
Off-Peak	29%	24%	↓
Mid-Day	43%	48%	↑
On-Peak	28%	28%	No change
Energy (kWh) per session			
Off-Peak	23	15	↓
Mid-Day	24	17	↓
On-Peak	24	17	↓
Gross Revenue (\$) per session			
Off-Peak	6.33	8.16	↑
Mid-Day	6.75	8.23	↑
On-Peak	7.09	9.66	↑
Minutes (min) per session			
Off-Peak	44	25	↓
Mid-Day	47	27	↓
On-Peak	46	27	↓

Figure 11 Comparison of Ward 1 site statistics for 2017 and 2018

Ward 2

The Ward 2 DCFC station is co-located with Ward 1 at the Hawaiian Electric office on Ward Avenue. Ward 2 is the second most utilized charge station and accounts for 22 percent of all charge sessions in the pilot. Utilization of Ward 2 increased 46 percent compared to 2017 and exhibits similar utilization patterns as Ward 1.

This charge station has the second-lowest percentage Mid-Day utilization of all the stations in the pilot. The Mid-Day utilization was 50 percent in 2018, while 30 percent of all sessions started during the On-Peak, and 21 percent of all sessions started during the Off-Peak.

Like Ward 1, average energy consumption and session length decreased in 2018 while gross revenue increased. The average energy consumed per session was 17 kWh during the Mid-Day, 16 kWh during the On-Peak, and 15 kWh during the Off-Peak. Average session duration was 28 minutes, 28 minutes, and 26 minutes during the Mid-Day, On-Peak, and Off-Peak, respectively. Average gross revenue per session was \$8.12, \$9.17, and \$8.09 during the Mid-Day, On-Peak, and Off-Peak, respectively.

Figure 12 summarizes the key statistics collected for Ward 2 site in 2017 and 2018. For further details regarding these sites in 2018, see Appendix A.

Comparison of Ward 2 statistics from 2017 to 2018

	2017	2018	Year/Year trend
% utilization			
Off-Peak	25%	21%	↓
Mid-Day	44%	50%	↑
On-Peak	30%	30%	No change
Energy (kWh) per session			
Off-Peak	24	15	↓
Mid-Day	24	17	↓
On-Peak	24	16	↓
Gross Revenue (\$) per session			
Off-Peak	6.41	8.09	↑
Mid-Day	6.68	8.12	↑
On-Peak	7.01	9.17	↑
Minutes (min) per session			
Off-Peak	50	26	↓
Mid-Day	50	28	↓
On-Peak	49	28	↓

Figure 12 Comparison of Ward 2 site statistics for 2017 and 2018

Wai'anae Mall

This charge station is located at a shopping center amongst restaurants, stores, and near residential neighborhoods along a highway thoroughfare. While it has the lowest utilization of all Hawaiian Electric DCFC stations on O’ahu, it is currently the furthest public charging station of any type along Farrington Highway on the west side of the island. This location provides EV drivers assurance they can travel to and from the leeward coast and encourages EV adoption in this important area. This charge station recorded 105 percent more charge sessions in 2018 than in 2017.

This charge station has relatively high Mid-Day utilization, which may in part be due to its convenient shopping center location. In 2018, 63 percent of its charge sessions started during the Mid-Day, 21 percent of all sessions started during the On-Peak, and 17 percent of all sessions started during the Off-Peak.

The average energy consumption, duration, and gross revenue per session decreased in 2018. The average energy consumed per session was 9 kWh during the Mid-Day, 10 kWh during the On-Peak, and 9 kWh during the Off-Peak. Average session duration was 25 minutes, 24 minutes, and 24 minutes during the Mid-Day, On-Peak, and Off-Peak, respectively. Average gross revenue per session was \$4.54, \$5.63, and \$4.70 during the Mid-Day, On-Peak, and Off-Peak, respectively. While the average session lengths at this charge station are slightly shorter than other stations, the energy consumed is much lower. This likely indicates this station is being used by EVs with smaller batteries in 2018.

Figure 13 summarizes the key statistics collected for Wai‘anae Mall site in 2017 and 2018. For further details regarding these sites in 2018, see Appendix A.

Comparison of Wai‘anae Mall statistics from 2017 to 2018

	2017	2018	Year/Year trend
% utilization			
Off-Peak	17%	17%	No change
Mid-Day	51%	63%	↑
On-Peak	32%	21%	↓
Energy (kWh) per session			
Off-Peak	13	9	↓
Mid-Day	11	9	↓
On-Peak	13	10	↓
Gross Revenue (\$) per session			
Off-Peak	6.33	4.70	↓
Mid-Day	6.21	4.54	↓
On-Peak	6.50	5.63	↓
Minutes (min) per session			
Off-Peak	27	24	↓
Mid-Day	26	25	↓
On-Peak	30	24	↓

Figure 13 Comparison of Wai‘anae Mall site statistics for 2017 and 2018

801 Dillingham

Upon commissioning in April 2017, this charge station suffered several equipment malfunctions leading to unreliable performance. With the assistance of the charge station manufacturer, the station was replaced and opened in August 2017. Comparing only the months of August to December 2017 and 2018, utilization increased 167 percent between these two years. This station had the third highest utilization of all DCFC stations in the pilot.

This charge station is located in a large parking lot near several big-box stores and restaurants, which may have contributed to its slightly lower Off-Peak utilization. In 2018, 15 percent of its charge sessions started during the Off-Peak, 59 percent of all sessions started during the Mid-Day, and 26 percent of all sessions started during the On-Peak.

Average energy consumption and duration per session decreased in 2018. The average energy consumed per session was 14 kWh during the Off-Peak, 14 kWh during the Mid-Day, and 11 kWh during the On-Peak. Average gross revenue per session was \$7.57, \$6.65, and \$6.54 during the Off-Peak, Mid-Day, and On-Peak, respectively. Average session duration was 32 minutes, 32 minutes, and 28 minutes during the Off-Peak, Mid-Day, and On-Peak, respectively. This location has some of the highest average session durations, which could be influenced by its location amongst large retail stores.

Figure 14 summarizes the key statistics collected for 801 Dillingham site in 2017 and 2018. For further details regarding these sites in 2018, see Appendix A.

Comparison of 801 Dillingham statistics from 2017 to 2018

	2017	2018	Year/Year trend
% utilization			
Off-Peak	19%	15%	↓
Mid-Day	50%	59%	↑
On-Peak	31%	26%	↓
Energy (kWh) per session			
Off-Peak	28	14	↓
Mid-Day	26	14	↓
On-Peak	19	11	↓
Gross Revenue (\$) per session			
Off-Peak	7.30	7.57	↑
Mid-Day	7.02	6.65	↓
On-Peak	6.85	6.54	↓
Minutes (min) per session			
Off-Peak	61	32	↓
Mid-Day	55	32	↓
On-Peak	44	28	↓

Figure 14 Comparison of 810 Dillingham site statistics for 2017 and 2018

2019 site development

A fast charging station was constructed at Waimalu Times Square Shopping Center and opened to the public on January 2, 2019. While one dual-standard 50 kW DCFC was installed, the underlying electrical infrastructure was designed to support 150 kW. The Companies decided to employ this approach to enable future flexibility if/when technology or customer needs change. Extra capacity wiring enables the Companies to easily install additional fast charge stations or upgrade to a higher powered DCFC station if deemed appropriate in the future.

The Waimalu Times Square Shopping Center location was selected due to its population density, high penetration of MUDs, resident commuters, jobs, and traffic density. The presence of this new DCFC station could immediately support existing commuters, but more importantly foster EV adoption in the area.

Hawaiian Electric also executed an agreement at Hale'iwa Town Center at the end of 2018. While the purchase of materials started last year, construction will not be completed until mid-2019. This strategic location is expected to alleviate range anxiety and support EV adoption. Currently, there is only one public charging station within a 10-mile drive of this location. This new DCFC station is expected to support residents and tourists driving to and through the North Shore community.

Utilization at Hawai'i Electric Light

One charging station was added on Hawai'i Island as part of the pilot in 2018. The Company assumed ownership of the DCFC station at The Shops at Mauna Lani in April of 2018. This addition further enhanced the network of charge stations, which was evident in a healthy increase in utilization from 2017 to 2018, shown in Figure 15.

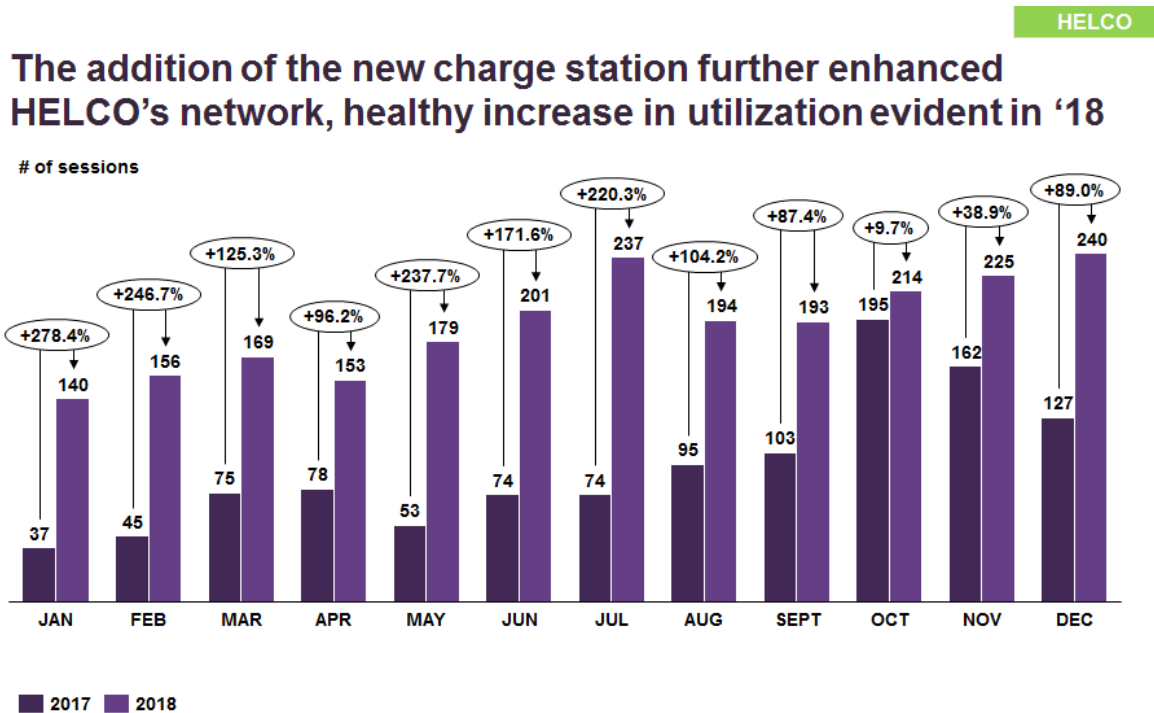


Figure 15 Monthly utilization on Hawai'i Island for 2017 and 2018. There are four DCFC as part of the Companies pilot.

In 2018, the DCFC stations on Hawai'i Island accounted for 13 percent of all sessions in the pilot. Hawai'i Island has 6 percent of all the EVs registered in the Companies' territory. While there are fewer EVs on Hawai'i Island than O'ahu and Maui, the charge stations at the Hawai'i Electric Light's Kona Office, The Shops at Mauna Lani, and the Waimea KTA provided the longest average duration and highest average energy per session. This is likely influenced by the longer driving distances on the island and indicates a need for public DCFCs for these longer commutes.

Hawai'i Electric Light's Hilo Office

This station is located at the Hawai'i Electric Light main office in Hilo. While no retail stores share the parking lot, there are some shops and eateries within a short walking distance. Overall utilization in 2018 increased 5 percent as compared to 2017.

This station was heavily utilized during Mid-Day, compared to a relatively low Off-Peak. In 2018, 73 percent of its charge sessions started during the Mid-Day, 19 percent of all sessions started during the On-Peak, and 8 percent of all session started during the Off-Peak.

The average energy consumption and duration decreased in 2018. The average energy consumed per session was 14 kWh during the Mid-Day, 11 kWh during the On-Peak, and 13 kWh during the Off-Peak. Average session duration was 31 minutes, 30 minutes, and 30 minutes during the Mid-Day, On-Peak, and Off-Peak, respectively. Average gross revenue per session was \$6.89, \$7.07, and \$8.18 during the Mid-Day, On-Peak, and Off-Peak, respectively.

Figure 16 summarizes the key statistics collected for Hawai'i Electric Light's Hilo Office site in 2017 and 2018. For further details regarding these sites in 2018, see Appendix B.

HELCO

Comparison of HELCO's Hilo Office statistics from 2017 to 2018

	2017	2018	Year/Year trend
% utilization			
Off-Peak	16%	8%	↓
Mid-Day	59%	73%	↑
On-Peak	25%	19%	↓
Energy (kWh) per session			
Off-Peak	21	13	↓
Mid-Day	16	14	↓
On-Peak	20	11	↓
Gross Revenue (\$) per session			
Off-Peak	7.18	8.18	↑
Mid-Day	7.51	6.89	↓
On-Peak	7.91	7.07	↓
Minutes (min) per session			
Off-Peak	41	30	↓
Mid-Day	34	31	↓
On-Peak	37	30	↓

Figure 16 Comparison of Hawai'i Electric Light's Hilo Office site statistics for 2017 and 2018

Hawai'i Electric Light's Kona Office

This station is located at the Hawai'i Electric Light office in Kona. The area is near many commercial businesses with some markets and restaurants a few blocks away. While not closer to retail businesses, the Kona location has fewer public Level 2 charging options in its vicinity compared to the Hilo location. Fewer charging alternatives in the area may help explain why the Kona location recorded more utilization than the Hilo location. In 2018, the Kona DCFC station utilization increased by 113 percent as compared to 2017.

This station also has a relatively high Off-Peak utilization, which may be influenced by its location and use by commuters. In 2018, 24 percent of its charge sessions were initiated during the Off-Peak, 58

percent of all sessions began during the Mid-Day, and 18 percent of all sessions started during the On-Peak.

Both average energy consumption and duration decreased in 2018 while gross revenue per session increased. The average energy consumed per session was 17 kWh during the Off-Peak, 17 kWh during the Mid-Day, and 15 kWh during the On-Peak. Average session duration was 28 minutes, 34 minutes, and 29 minutes during the Off-Peak, Mid-Day, and On-Peak, respectively. The relatively longer Mid-Day charge sessions may be impacted by this station’s location to adjacent retail businesses. Average gross revenue per session was \$10.17, \$8.88, and \$9.39 during the Off-Peak, Mid-Day, and On-Peak, respectively.

Figure 17 summarizes the key statistics collected for Hawaii Electric Light’s Kona Office site in 2017 and 2018. For further details regarding these sites in 2018, see Appendix B.

HELCO

Comparison of HELCO’s Kona Office statistics from 2017 to 2018

	2017	2018	Year/Year trend
% utilization			
Off-Peak	21%	24%	↑
Mid-Day	62%	58%	↓
On-Peak	17%	18%	↑
Energy (kWh) per session			
Off-Peak	20	17	↓
Mid-Day	19	17	↓
On-Peak	18	15	↓
Gross Revenue (\$) per session			
Off-Peak	8.13	10.17	↑
Mid-Day	7.62	8.88	↑
On-Peak	8.23	9.39	↑
Minutes (min) per session			
Off-Peak	37	28	↓
Mid-Day	37	34	↓
On-Peak	37	29	↓

Figure 17 Comparison of Hawai’i Electric Light’s Kona Office site statistics for 2017 and 2018

Waimea KTA

This charging station is located at a grocery store in Waimea, which is near other retail businesses. To date, there is only one other public (Level 2) charging station in the vicinity. Overall utilization at this location was the highest of all Hawai’i Island stations and increased 162 percent in 2018 compared to 2017. This location experienced the highest energy consumed per session of any DCFC station in the pilot. This is likely due to the lack of other available public charging stations in the vicinity, the driving distances, and the types of EVs in this location.

This charge station was heavily utilized during Mid-Day. In 2018, 62 percent of its charge sessions started during the Mid-Day, 20 percent of all sessions started during the On-Peak, and 18 percent of all sessions started during the Off-Peak.

While utilization increased, average energy consumption and duration decreased in 2018. The average energy consumed per session was 12 kWh during the Mid-Day, 11 kWh during the On-Peak, and 22 kWh during the Off-Peak. Average session duration was 27 minutes, 22 minutes, and 40 minutes during the Mid-Day, On-Peak, and Off-Peak, respectively. Average gross revenue per session was \$6.33, \$6.96, and \$13.19 during the Mid-Day, On-Peak, and Off-Peak, respectively. While most sessions occurred during the Mid-Day, the longest average session and the most energy consumed per session was during the Off-Peak.

Figure 18 summarizes the key statistics collected for Waimea KTA site in 2017 and 2018. For further details regarding these sites in 2018, see Appendix B.

HELCO

Comparison of Waimea KTA statistics from 2017 to 2018

	2017	2018	Year/Year trend
% utilization			
Off-Peak	23%	18%	↓
Mid-Day	56%	62%	↑
On-Peak	21%	20%	↓
Energy (kWh) per session			
Off-Peak	27	22	↓
Mid-Day	15	12	↓
On-Peak	16	11	↓
Gross Revenue (\$) per session			
Off-Peak	7.55	13.19	↑
Mid-Day	7.68	6.33	↓
On-Peak	7.83	6.96	↓
Minutes (min) per session			
Off-Peak	51	40	↓
Mid-Day	33	27	↓
On-Peak	28	22	↓

Figure 18 Comparison of Waimea KTA site statistics for 2017 and 2018

The Shops at Mauna Lani

This station is located in a shopping area in a resort destination along the Kohala coast. The 2017 Report stated Hawai'i Electric Light had been in discussions with another site host to transfer an existing fast charge station to the Companies' operations. The DFCF station owner and the CEO of Charge Bliss stated, "Charge Bliss Inc. began its foray into the energy marketplace with a plan to contribute to transportation electrification in Hawai'i. Through its pilot DC fast EV charger project at the Shops at

Mauna Lani on the Island of Hawai'i, Charge Bliss determined that charging system ownership and operation is best administered through Utilities, non-profits, or EV manufacturer networks."²⁵ On April 9, 2018 Hawai'i Electric Light executed a contract to take ownership of this charge station with a one-time service to upgrade some hardware components. The capital costs for the pre-existing DCFC stations, one-time service, and upgrades are significantly cheaper than installing a new station at the same or other locations. This existing DCFC station at the Shops at Mauna Lani continues to support EV drivers as there is only one other public charging station within a 10-mile drive.

This charge station was heavily utilized during high Mid-Day. In 2018, 60 percent of its charge sessions started during the Mid-Day, 23 percent of all sessions started during the On-Peak, and 18 percent of all sessions started during the Off-Peak. The average energy consumed per session was 17 kWh during the Mid-Day, 14 kWh during the On-Peak, and 20 kWh during the Off-Peak. Average session duration was 37 minutes, 33 minutes, and 38 minutes during the Mid-Day, On-Peak, and Off-Peak, respectively. Average gross revenue per session was \$8.59, \$8.69, and \$12.43 during the Mid-Day, On-Peak, and Off-Peak, respectively. While the average charge session duration is longer than most during all times of the day, like Waimea KTA, the longest average session and the most energy consumed per session is during the Off-Peak period. Similar to the Waimea station, this is likely due to the lack of other available public charging stations in the vicinity, the driving distances, and the types of EVs in this location.

Figure 19 summarizes the key statistics collected for The Shops at Mauna Lani in 2018. For further details regarding these sites in 2018, see Appendix B.

HELCO

The Shops at Mauna Lani statistics -- 2018

2018	
% utilization	
Off-Peak	18%
Mid-Day	60%
On-Peak	23%
Energy (kWh) per session	
Off-Peak	20
Mid-Day	17
On-Peak	14
Gross Revenue (\$) per session	
Off-Peak	12.43
Mid-Day	8.59
On-Peak	8.69
Minutes (min) per session	
Off-Peak	38
Mid-Day	37
On-Peak	33

Figure 19 The Shops at Mauna Lani statistics – assumed ownership in 2018.

²⁵ Personal communication between David Bliss and Hawaiian Electric’s Director of Transportation via email on March 13, 2018.

2019 site development

In 2018, Hawai'i Electric Light executed a Memorandum of Understanding to move forward with the installation of a DCFC station at the Punalu'u Bake Shop and Visitor Center in Na'ālehu. While traffic density is lower in the south side of Hawai'i Island, data indicates there are no public charging stations within 10 miles of this location. A fast charging station in this area is important to provide residents and tourists the confidence to travel to destinations within and through the southern side of the island.

Utilization at Maui Electric

One charge station was added in Maui County as part of the pilot in 2018 on the island of Moloka'i. The charge station at the Kahului Office was also repaired in late 2018. The Companies anticipate higher utilization in 2019 (Figure 20).

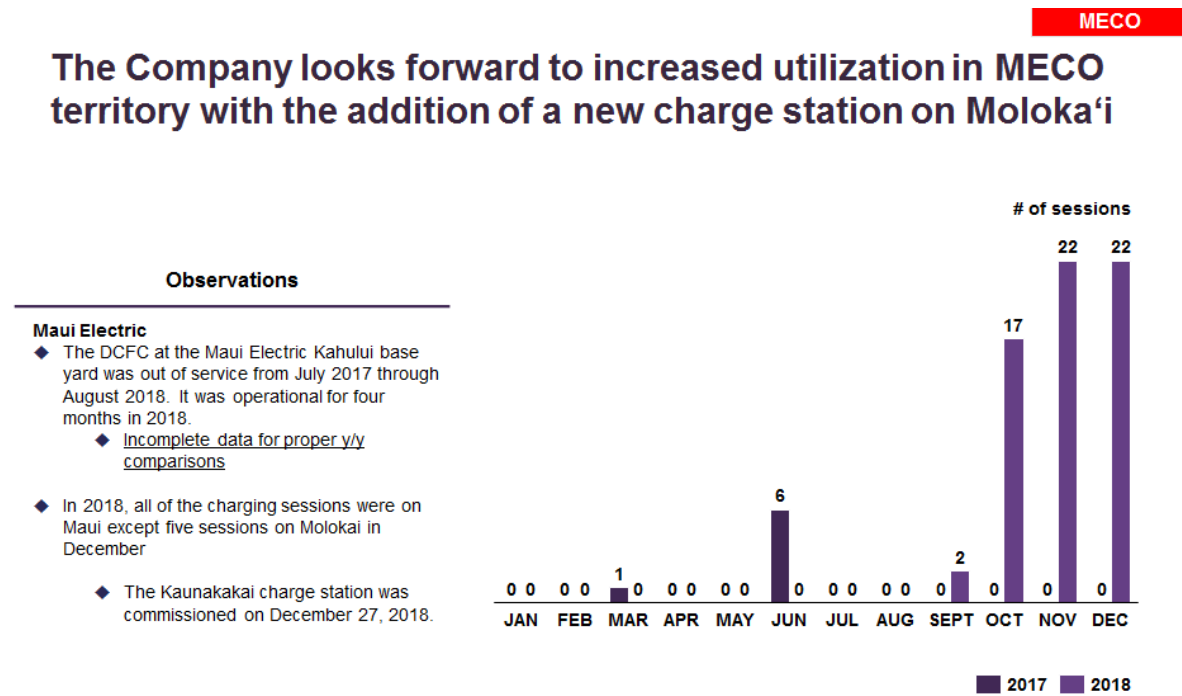


Figure 20 There is limited monthly data for Maui Electric available in 2017 and 2018. There are two DCFC as part of the Companies' pilot

Maui Electric's Kahului Office

The CHAdeMO charge station at the Maui Electric's Kahului office has experienced several technical issues. Previous attempts to have the vendor repair the malfunctions resulted in temporary operation for short periods of time. Discussions with the equipment manufacturer revealed that this equipment was no longer fully supported and it was determined that a replacement unit would be necessary. Under the terms of the warranty, a replacement charge station was provided and installed by the

vendor. Since the terms of the original request for procurement specified the charging system must utilize an open communication protocol, a charge station from a different manufacturer was considered and installed. The new charge station was opened to the public on the last week of August 2018. This replacement charge station supports both CHAdeMO and CCS charging standards, unlike most of the other fast charging stations currently on Maui.

While this charging station is not co-located with retail businesses, shopping centers and restaurants are nearby. Notably, there are a number of public charging stations in the vicinity including a charging site with four CHAdeMO-only DCFC ports operated by EVohana.²⁶

In 2018, 52 percent of its charge sessions started during the Mid-Day, 31 percent of all sessions started during the On-Peak, and 17 percent of all session started during the Off-Peak. The average energy consumed per session was 10 kWh during the Mid-Day, 11 kWh during the On-Peak, and 12 kWh during the Off-Peak. The short average charging durations may be influenced by the EVohana program, which provides charging at a flat subscription rate. Drivers may be choosing the Maui Electric volumetric rate and less energy per session. Average session duration was 29 minutes, 27 minutes, and 22 minutes during the Mid-Day, On-Peak, and Off-Peak, respectively. Average gross revenue per session was \$4.98, \$6.78, and \$7.46 during the Mid-Day, On-Peak, and Off-Peak, respectively.

Figure 21 summarizes the key statistics collected for Maui Electric’s Kahului Office site in 2017 and 2018. For further details regarding these sites in 2018, see Appendix C.

MECO-MAUI

Comparison of MECO’s Kahului Office from 2017 to 2018

	2017 (two months of data)	2018 (four months of data)	Year/Year trend	
% utilization				
Off-Peak	29%	17%	Limited data	
Mid-Day	43%	52%		
On-Peak	29%	31%		
Energy (kWh) per session				
Off-Peak	49	12		
Mid-Day	15	10		
On-Peak	40	11		
Gross Revenue (\$) per session				
Off-Peak	6.50	7.46		
Mid-Day	7.00	4.98		
On-Peak	7.00	6.78		
Minutes (min) per session				
Off-Peak	93	22		
Mid-Day	38	29		
On-Peak	60	27		

Due to the limited data available for MECO charge stations during the 2017 and 2018 time period—drawing conclusions at this time would not be prudent.

Figure 21 Comparison of Maui Electric’s Kahului Office statistics for 2017 and 2018

²⁶ EVohana currently provides DCFC charging at a flat subscription rate.

Kaunakakai

In 2018, Maui Electric installed a new fast charging station on Ala Malama Avenue in Kaunakakai fronting restaurants and retail shops. This is the only public charging station on the island of Moloka'i and is centrally located to provide fast charging service to those driving long distances to and from Kaunakakai.

EV charging is a strategic component to achieving the Companies' 100 percent renewable energy goal for the island of Moloka'i. On Moloka'i, system reliability issues can be caused by excess energy generated from the continued installation of residential and commercial photovoltaic systems. EVs can potentially benefit all customers through additional load during solar peaks and may also offer grid support services. With TOU pricing mechanisms embedded within the rates, incremental EV charging during the middle of the day will help alleviate potential system-wide excess energy and promote utilizing renewable energy for transportation.

This DCFC station was commissioned on December 27, 2018 with only a few days of data available. In its first week, 60 percent of its charge sessions started during the Mid-Day, 40 percent of all sessions started during the On-Peak, and there were no sessions that started during the Off-Peak.

The average energy consumed per session was 8 kWh during the Mid-Day and 11 kWh during the On-Peak. Average session duration was 24 and 17 minutes during the Mid-Day and On-Peak, respectively. Average gross revenue per session was \$4.05 and \$7.38 during the Mid-Day and On-Peak, respectively.

Figure 22 summarizes the key statistics collected for Kaunakakai in 2018. For further details regarding these sites in 2018, see Appendix C.

MECO-Molokai

Kaunakakai statistics -- 2018

2018 (one week of data)	
% utilization	
Off-Peak	0%
Mid-Day	60%
On-Peak	40%
Energy (kWh) per session	
Off-Peak	--
Mid-Day	8
On-Peak	11
Gross Revenue (\$) per session	
Off-Peak	--
Mid-Day	4.05
On-Peak	7.38
Minutes (min) per session	
Off-Peak	--
Mid-Day	24
On-Peak	17

Figure 22 Kaunakakai statistics – installed on December 27, 2018.

2019 site development

In 2019, Maui Electric will continue to evaluate potential sites on Lānaʻi for the first public DCFC station that may serve current and future EV drivers, further encouraging the adoption of EVs on the island. By potentially locating the charging station in Lānaʻi City, residents and visitors would be able to quickly charge their EVs while visiting retail stores and restaurants after driving from Manele and/or Kaumalapau Harbors.

Analysis of EV-U rate

On September 5, 2017, the Companies filed requested rate changes for Schedule EV-U.²⁷ The Companies stated “[u]nder the current EV-U rate structure that charges a flat fee per single charging sessions, an EV driver may consume as much electricity as their on-board battery can store in a single session. As a result, the effective rate paid by each driver will vary based on the initial state of charge when a charging session begins and the battery size of the EV model. As discussed in the Companies’ Electric Vehicle Pilot Rates Report for 2016, the Companies have noted a significant difference in the effective electricity rate paid to charge ‘long-range’ ... EVs in comparison to ‘conventional EVs’. To ensure that a comparable and equitable rate is paid among all EV customers of company-owned DC fast charging locations, the Companies propose to transition Schedule EV-U from a flat fee per charging session to a fee based upon total electricity consumed.”²⁸ As directed in Order No. 34867,²⁹ revised rates Schedule EV-U became effective December 12, 2017. The revised rates provided the lowest volumetric rate during Mid-Day period from 9 AM to 5 PM.

The rate change analysis compares aggregate and average session data³⁰ between the years 2017³¹ and 2018. The comparison reveals the desired effect of more closely aligning energy consumption with the cost of electricity. Overall in 2018, as compared to 2017, there was an aggregate increase in the total energy consumed at each of the three Companies, except for Off-Peak on Oʻahu (Figure 23), and an aggregate increase in the number of charge sessions during all rate periods (Figure 24). In application, this resulted in shorter duration charging sessions (Figure 25 (minutes/session)) and less energy consumption per charge session (Figure 26 (kWh/session)) from a more equitable rate amongst all EV drivers. The shorter charge sessions enabled more EV drivers an opportunity to charge.

²⁷ Docket No. 2016-0168, pursuant to D&O No. 34592, filed September 5, 2017.

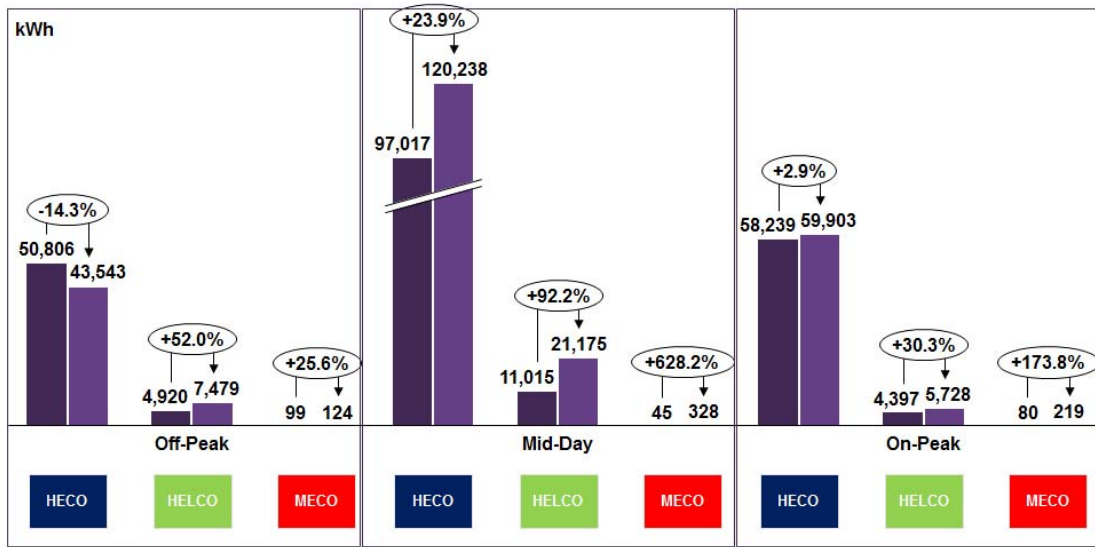
²⁸ Id. at 12.

²⁹ Order No. 34867, filed October 13, 2017.

³⁰ Total energy consumed and number of charge sessions is presented in this section.

³¹ The 2017 data does include session data on and after the December 12 rate change. The data from December 13 to December 31 was determined to be de minimis.

Total energy consumed *increased* in almost all time periods, despite the rate design change from a flat fee to volumetric.



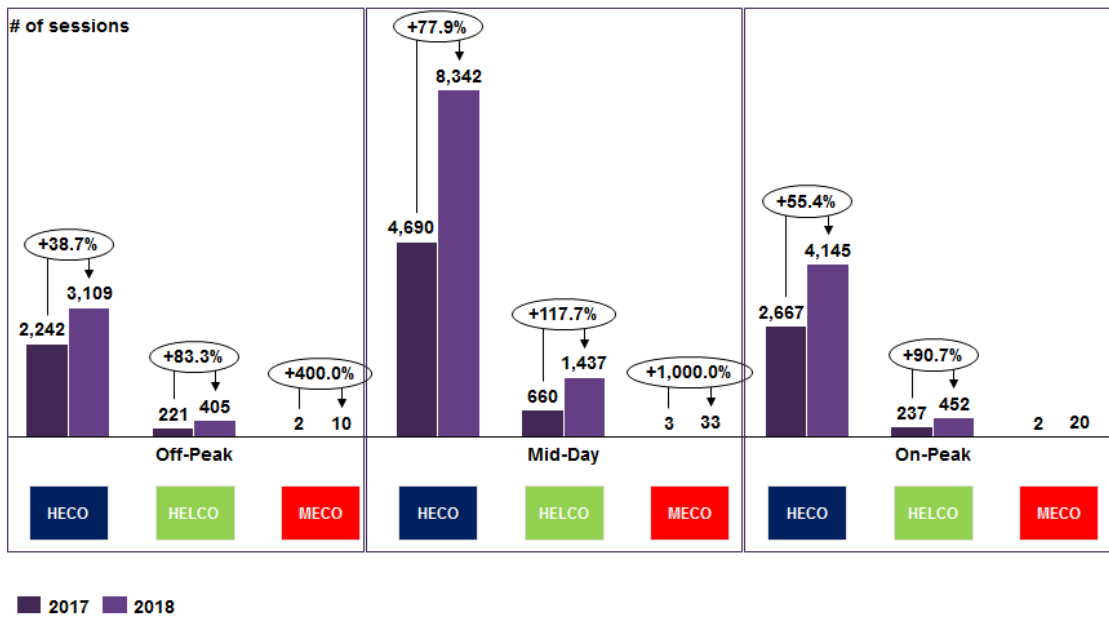
■ 2017 ■ 2018

Due to the limited data available for MECO charge stations during the 2017 and 2018 time period—drawing conclusions at this time would not be prudent. Data displayed for continuity purposes.

Figure 23 In all three Companies, the energy consumed in aggregate increased overall, except for on O’ahu during the Off-Peak from 2017 to 2018. Off-Peak occurs from 10 PM-9 AM, Mid-Day occurs from 9 AM-5 PM, and On-Peak occurs from 5 PM-10 PM.

Figure 24 provides aggregate number of sessions (utilization data) by Company and TOU period. The number of charge sessions increased for each Company and during each rate period, with the largest increase for Hawaiian Electric and Hawai'i Electric Light occurring during the Mid-Day period of 9 AM – 5 PM.

Utilization *increased* in all time periods, despite the rate design change from a flat fee to volumetric.

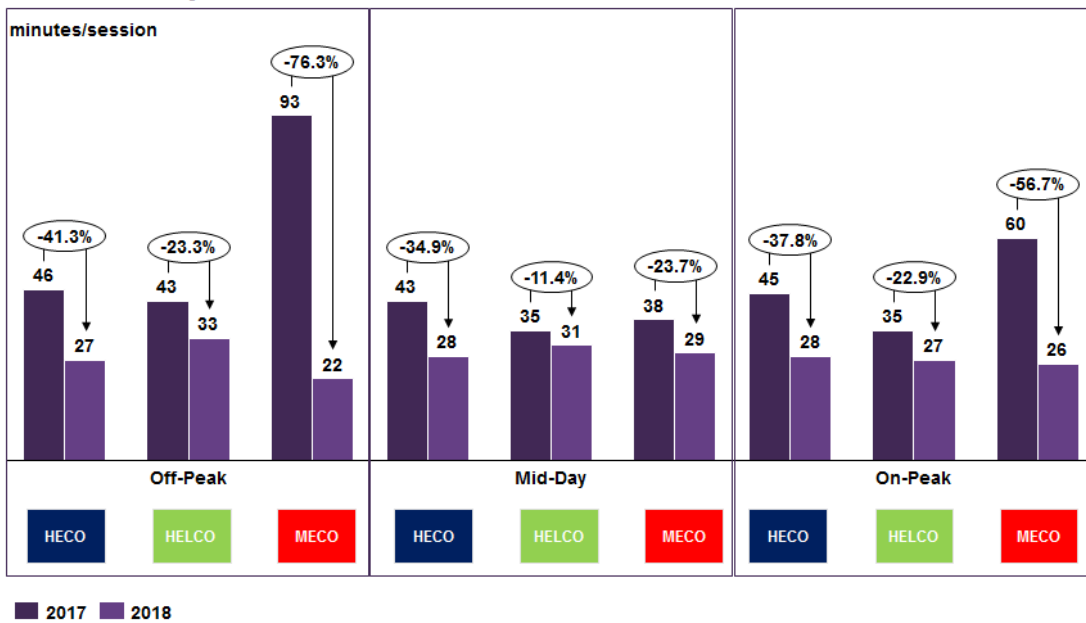


Due to the limited data available for MECO charge stations during the 2017 and 2018 time period—drawing conclusions at this time would not be prudent. Data displayed for continuity purposes.

Figure 24 Utilization (number of sessions) increased in aggregate in all time periods from 2017 to 2018. Off-Peak occurs from 10 PM-9 AM, Mid-Day occurs from 9 AM-5 PM, and On-Peak occurs from 5 PM-10 PM.

Figure 25 shows the time duration per session decreased for all time periods across each of the Companies' territories from 2017 to 2018. The shorter session durations increased station availability, enabling increased opportunities to charge. For example, Figure 25 shows the average session for Hawaiian Electric's Mid-Day period was 43 minutes in 2017. Theoretically, a maximum of 12 EVs could charge during the nine-hour Mid-Day period. In 2018, the average session during the Mid-Day period was 28 minutes, which could allow 19 EVs to charge. For comparison, Level 2 charging could only provide approximately two EVs the same amount of range compared to 12 during the same time period.

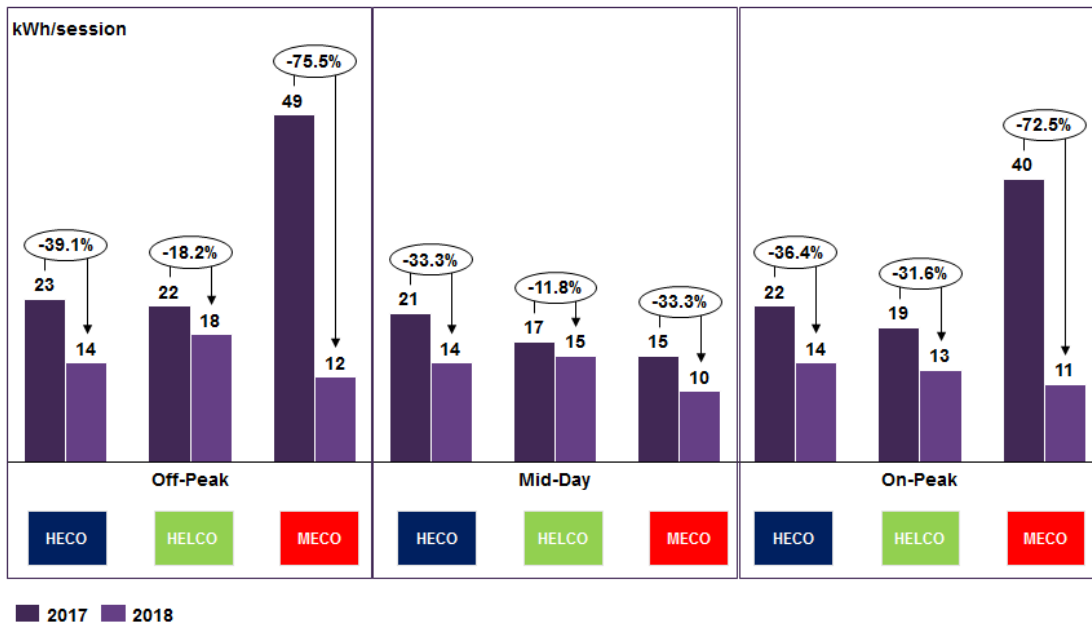
The time duration per session decreased from 2017 to 2018 for each time period



Due to the limited data available for MECO charge stations during the 2017 and 2018 time period—drawing conclusions at this time would not be prudent. Data displayed for continuity purposes.

Figure 25 The time duration per session decreased for all Companies from 2017 to 2018 for each time period. Off-Peak occurs from 10 PM-9 AM, Mid-Day occurs from 9 AM-5 PM, and On-Peak occurs from 5 PM-10 PM.

The energy consumed per session decreased from 2017 to 2018 for each time period



Due to the limited data available for MECO charge stations during the 2017 and 2018 time period—drawing conclusions at this time would not be prudent. Data displayed for continuity purposes.

Figure 26 The energy consumed per session decreased for all Companies from 2017 to 2018. Off-Peak occurs from 10 PM-9 AM, Mid-Day occurs from 9 AM-5 PM, and On-Peak occurs from 5 PM-10 PM.

Summary of Cost and Revenue³²

In D&O 34592, the Commission ordered the Companies to provide “a discussion of how and to what extent the costs for each DCFC facility have been and/or are proposed to be recovered from ratepayers.”³³ The recovery of capital and O&M costs for company-owned and operated DCFC stations are discussed herein.

Revenue and Operating and Maintenance (“O&M”) Expenses

In October 2017, the Commission approved the proposed Schedule EV-U rate change “to provide greater alignment with charging session costs (moving Schedule EV-U rates from a fixed charging session rate to volumetric rate), system costs (incorporating certain program costs into Schedule EV-U rates), and system needs by adopting the Schedule TOU-RI time periods and structuring rates so that they are directionally consistent with the availability of photovoltaic generation and difference in generation

³² Details of Labor, Capital and O&M from inception of the program can be found in Appendix D.

³³ D&O 34592 at 68.

costs.”³⁴ These new rates became effective December 12, 2017. Figure 27, Figure 29, and Figure 31 summarize the revenue and O&M expense³⁵ for each DCFC site in 2017 and 2018 for Hawaiian Electric, Hawai’i Electric Light, and Maui Electric, respectively. Figure 28, Figure 30, and Figure 32 summarize the revenue and O&M expense on aggregate in 2017 and 2018 for Hawaiian Electric, Hawai’i Electric Light, and Maui Electric, respectively.

Figure 27 illustrates the net values (revenue less expenses)³⁶ for 2017 and 2018 for Hawaiian Electric’s DCFC sites on O’ahu. In 2018, the O&M expense decreased at every site except at 801 Dillingham, which was not placed into service until mid-2017. In 2018, revenue increased at six of the eight stations, compared to 2017. The five highest utilized charge stations in the pilot, Ward 1, Ward 2, 801 Dillingham, Hawai’i Kai and Ko’olau Center, yielded a net positive effect in 2018 compared to 2017, due to the rate change from a flat fee to volumetric rate. For the first time since the inception of the pilot, in 2018 on aggregate, across all charging stations there was a net positive result for O’ahu of \$9,678 (Figure 28).

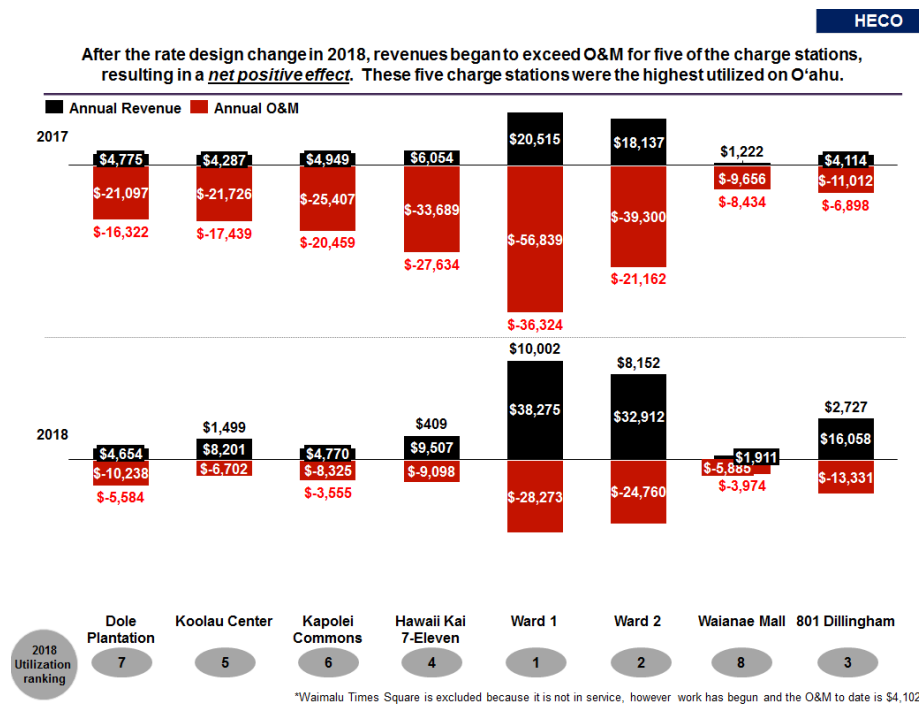


Figure 27 Annual revenue, O&M, net values for 2017 and 2018 (post rate design change), and utilization rank for 2018 for O’ahu.

³⁴ Order No. 34867, filed Oct 13, 2017, at 11.

³⁵ In this section of the report, site operating expenses include the underlying cost of electrical service, as it would for any third-party operator. While the cost of electrical service is included as a cost of operation in this section, it is not included as a cost to the overall program or as part of the Companies’ electrical sales.

³⁶ A net positive effect occurs when revenues exceed O&M. A net negative effect occurs when revenues are less than O&M.

On aggregate, O'ahu moved from a net negative result in 2017 to a net positive result in 2018 after the rate design change and continued increase in utilization

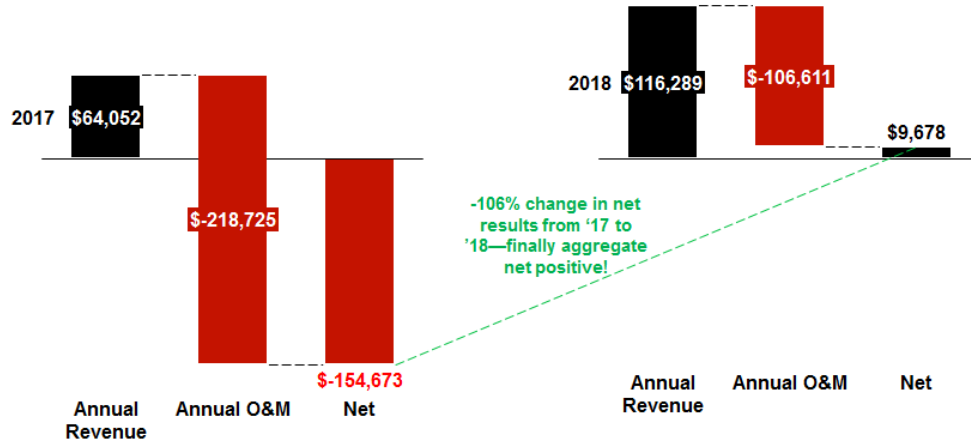


Figure 28 O'ahu aggregate annual results for 2017 and 2018.

Figure 29 illustrates the net values (revenue less expenses) for 2017 and 2018 for Hawai'i Electric Light's DCFC sites on Hawai'i Island. Despite being net negative in 2018 and 2017, 2018 ended in a less net negative result compared to 2017 for each charging station, representing approximately a 60 percent decrease (Figure 30).

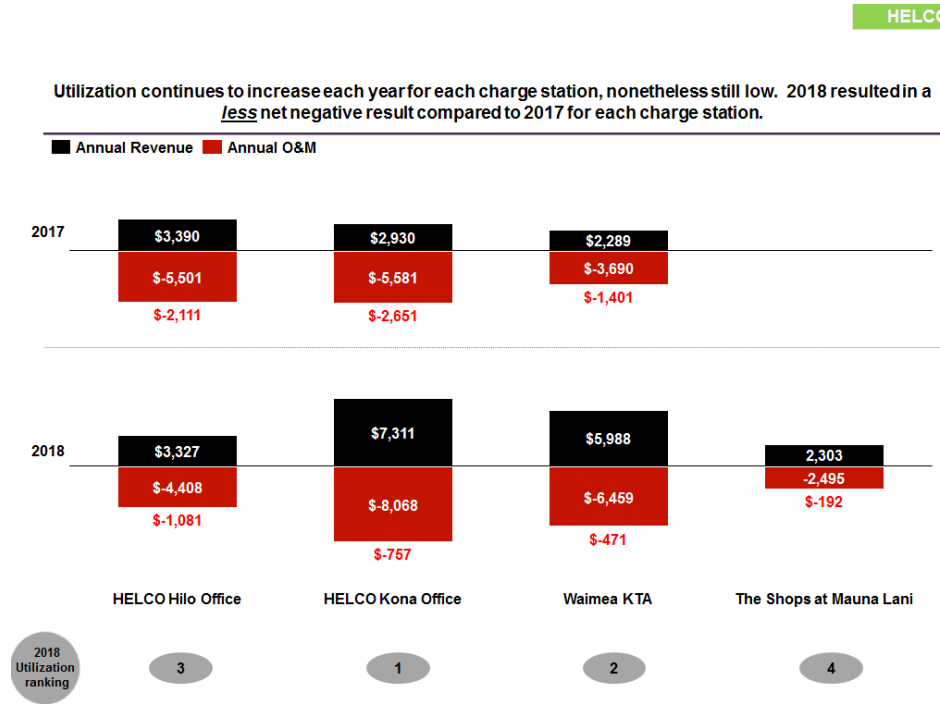


Figure 29 Annual revenue, O&M, net values for 2017 and 2018 (post rate design change), and utilization rank for 2018 for Hawai'i Island.

On aggregate, Hawai'i Island continues to have a net negative result for 2017 and 2018, nonetheless the net negative result has decreased by ~ 60% after the rate design change and continued increase in utilization

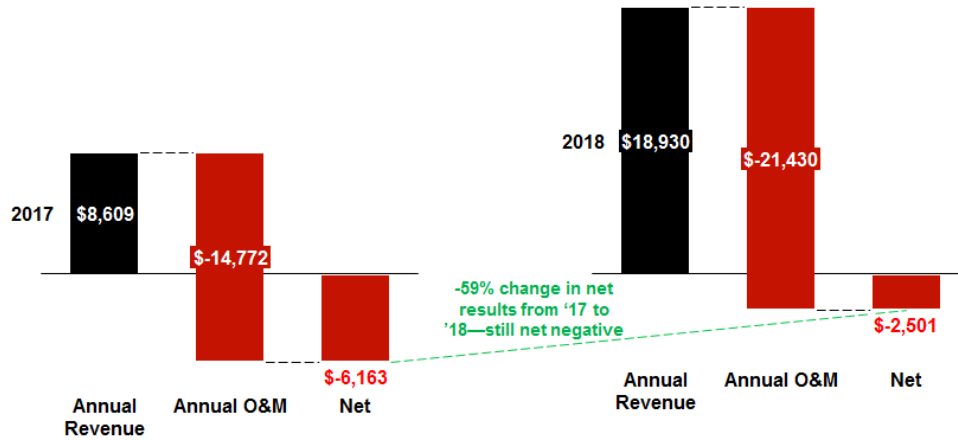


Figure 30 Hawai'i Island aggregate annual results for 2017 and 2018.

Figure 31 illustrates the net values (revenue less expenses) for 2017 and 2018 for Maui Electric's DCFC sites in Maui County. Due to limited data, this figure is displayed for continuity purposes only. Figure 32 illustrates the net values in aggregate for Maui County.

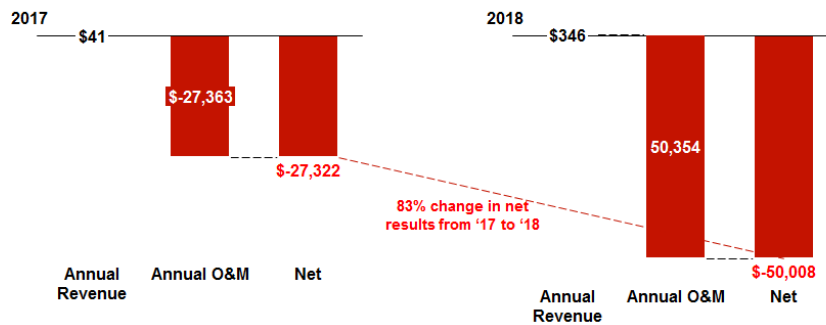
The Companies look forward to increased utilization in 2019 with the new Moloka'i charge station and repaired Maui charge station and will continue to monitor annual revenue, O&M, and net results.



Due to the limited data available for MECO charge stations during the 2017 and 2018 time period—drawing conclusions at this time would not be prudent. Data displayed for continuity purposes.

Figure 31 Annual revenue, O&M, and net values for 2017 and 2018 (post rate design change) for Maui County.

On aggregate, Maui County continues to have a net negative result for 2017 and 2018. The Companies look forward to increased utilization to decrease this net negative effect.



Due to the limited data available for MECO charge stations during the 2017 and 2018 time period—drawing conclusions at this time would not be prudent. Data displayed for continuity purposes.

Figure 32 Maui County aggregate annual results for 2017 and 2018.

Capital Costs

Figure 33 provides the capital costs of each DCFC station as they were chronologically installed. The average capital cost for the Companies is \$161,683 per site. While the Companies identify locations at a particular site to minimize construction costs, the overall development costs largely vary based upon its location, the availability of existing electrical infrastructure, condition of the existing parking space, and the site host's desired location on their property. Also of note, construction costs generally tend to vary by island as well

On O'ahu, the charge station at Kapolei Commons includes the extra cost of an integrated battery storage system. As part of an Electric Research Power Institute ("EPRI") project to determine the effect of a DCFC with battery storage, the cost reflected in Figure 33 does not include the offset of a \$163,486 Contribution in Aid of Construction ("CIAC"). The capital cost was higher at 801 Dillingham due to the extra procedures and monitoring required in this area, which is environmentally sensitive.

On Hawai'i Island, the Hawai'i Electric Light stations at their Hilo and Kona offices had higher capital costs because they included the additional cost to support the service for a second 50 kW charging station in the future, if necessary. As the charging industry matures, "charging hub" locations with more than one fast charging station have been found valuable to EV drivers. The value of charging hubs has also been supported by the high utilization of Ward 1 and Ward 2, co-located at Hawaiian Electric's Ward office. The capital cost at the Waimea KTA site was lower than the Hilo and Kona sites because this site did not accommodate the potential expanded service for a second charging station in the future. The capital cost of the charge station for The Shops at Mauna Lani included the acquisition costs of an existing DC charge station and a one-time service upgrade.

The first charge station was installed at the Maui Electric office, which reduced the complexity and development time at this site. This original charge station had several issues and was out of service most of 2017 and 2018. Under the terms of the original warranty, a replacement charging unit was installed free of charge in August 2018. The capital cost for the project in Kaunakakai does not include the purchase of a charge station, which was provided as a contribution to Maui Electric.

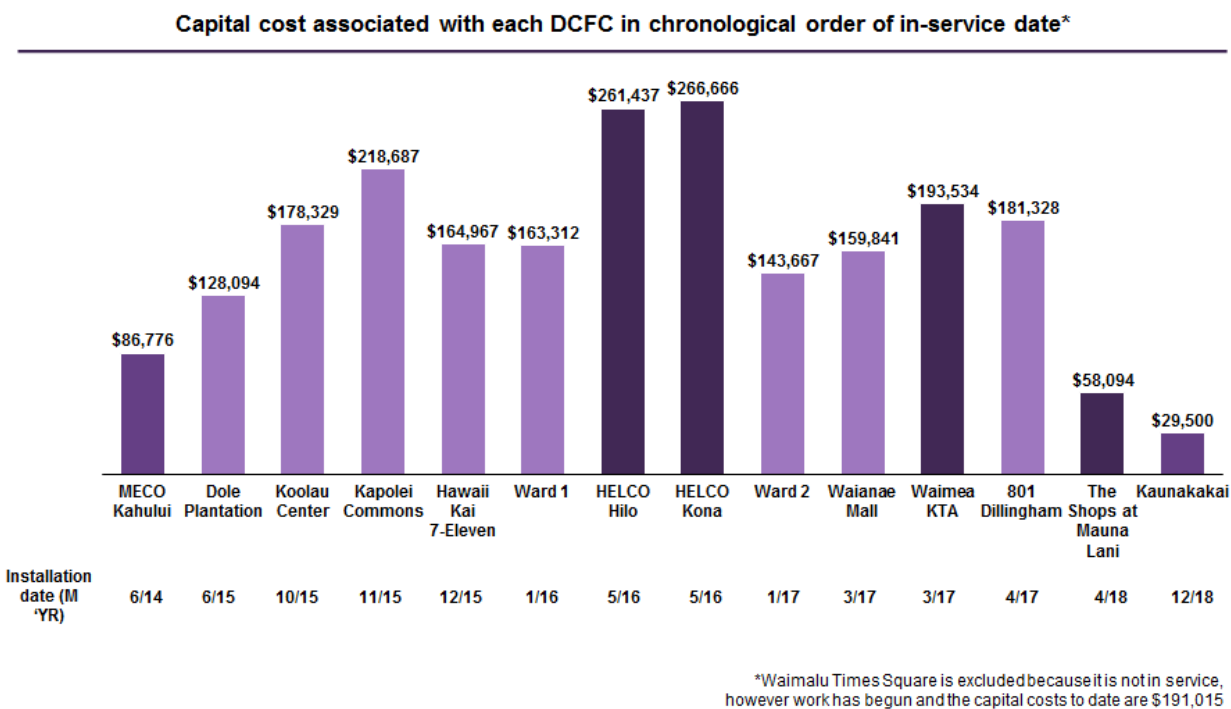


Figure 33 Capital cost associated with each DCFC in chronological order of in-service date

Subsidization by non-participating customers

As indicated herein, half of the charge stations on O’ahu have shown net positive (revenues exceed expenses) results for the first time since the inception of the pilot. This result confirms that increased utilization may eventually support the program and eliminate the concerns over subsidization by non-participating customers. Until the Companies reach that point, it is important to reflect that a key consideration in developing EV rates and programs is to reduce barriers to the adoption of EVs for customers. Because the EV market is still nascent in Hawai’i and EV proliferation is regarded as a State policy goal, it is prudent to provide a rate that will support the development of public EV charging infrastructure. The Companies contend that EV customers using charge stations in the EV-U pilot should not necessarily be characterized as benefitting from a subsidy in isolation, when that customer’s EV load is incremental discretionary load that would not otherwise exist on the system. Therefore, Schedule EV-F and EV-U rates that support this incremental load should not entirely be characterized as being

subsidized by other customers. Further, the revenues collected by the incremental discretionary load of EV charging would not contribute to overall Company profits, but instead would constitute contributions to fixed costs and support the State's transition to a cleaner transportation. With continued EV growth, the long-term impact of aggregate growth of EVs in the State will also serve to eliminate any subsidization by non-EV drivers. As identified in the *Roadmap*, the Companies anticipate that the electrification of transportation will impose long-term economic benefits for the Companies' customers, because increased energy demanded by EV drivers to charge their vehicles creates net benefits for all the Companies' customers, not just for EV drivers. This is because as EV drivers demand more energy, the utility's fixed costs for generating and distributing energy are spread across more kWh units, thereby creating net benefits for all customers.

As stated in the Companies' request to revise Schedule EV-U, the proposed rates are intended to "include an incremental amount of operations and maintenance ("O&M") expenses associated with the DCFC pilot in the composition of Schedule EV-U rates."³⁷ As such the increased rates implemented at the end of 2017 decreased the difference between potential revenues from Schedule J and EV-U by approximately \$45,000 between 2017 and 2018. Figure 34 summarizes the total annual revenue from Schedule EV-U compared to the potential revenue generated if the charging facility were billed under each Company's respective Schedule J. Figure 34 illustrates that the total EV-U revenues is 85 percent of the potential Schedule J³⁸ revenues for 2018, an increase compared to the total EV-U revenues in 2017 being 51 percent of the potential Schedule J in 2017.

³⁷ Docket No. 2016-0168, pursuant to D&O No. 34592, filed September 5, 2017, at 8.

³⁸ The potential Schedule J revenues were based upon the reported monthly kWh energy provided to charge EVs under Schedule EV-U and 47.5 kW billing demand.

Revenues from EV-U and potential Schedule J for 2017 and 2018

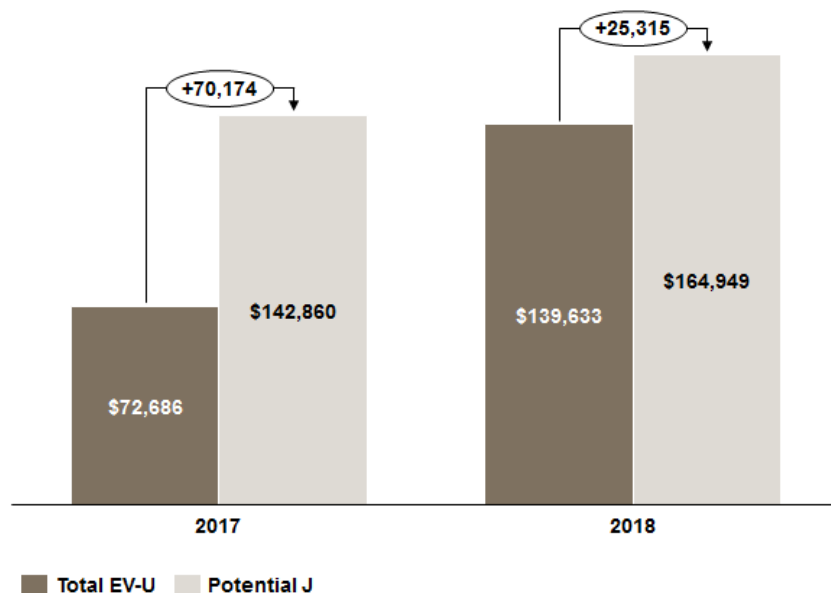


Figure 34 Comparison of the difference between potential schedule J and EV-U for 2017 and 2018

Recommendation to rate structure

As the Companies are in the initial stages of gathering consumption data under the revised rate structure,³⁹ there are no recommendations for revisions at this time. However, as mentioned in their tariff filing for Schedules EV-F and EV-U, the Companies will continue to monitor both adoption and utilization under the current rate structures and provide recommendations, as appropriate.⁴⁰

Schedule EV-F Tariff

Adoption and Status of Schedule EV-F

Schedule EV-F was implemented as an economic development rate whereby “the absence of a demand charge and the inclusion of TOU rates serve to encourage the development of public EV charging facilities by keeping electricity costs low for new, start-up public EV charging facilities.”⁴¹ Globally, public EV charging facilities continue to show increasing signs of technology maturity. Companies such as

³⁹ On September 5, 2017, the Companies submitted a revised rate structure for Schedule EV-U, which was approved by the Commission on October 13, 2017. On December 12, 2017, the Companies implemented the revised rate structure for all accounts under Schedules EV-U.

⁴⁰ Docket No. 2016-0168, EV-F and EV-U Pilot Extension, filed September 5, 2018, at 11.

⁴¹ Transmittal No. 12-05 at 23.

Electrify America are installing DCFC facilities with “charging speeds of up to 150kW” and are now locating “charging power levels up to 350kW”⁴² on the mainland. However, profit margins are still relatively slim due to the higher installation, equipment, and maintenance costs.

The difficult business prospects discussed above have limited the development of non-utility fast charging facilities in the State, with the notable exception of the JUMPSmart Maui program (branded as the “EVohana” Program as of September 1, 2017), which was funded by the New Energy and Industrial Technology Development Organization (“NEDO”) of Japan.⁴³ Unfortunately, the EVohana DCFC network on Maui, which is currently operated and maintained by Hitachi Advanced Clean Energy Corporation (“HIACE”) under an agreement between Maui Economic Development Board (“MEDB”) and HIACE, will expire on March 31, 2019 and will not be extended. Maui Electric has proposed to assume control over certain EVohana charging locations to support continued EV adoption on Maui and is the subject of an open docket before the Commission in Docket No. 2018-0422. The potential loss of a significant amount of charging infrastructure may slow the growth of the Maui EV market and will likely require additional new investments to maintain EV growth.

On O’ahu, no customers were added to Schedule EV-F in 2018. On Hawai’i Island, one customer account was discontinued and ownership of that charging station was transferred to Hawai’i Electric Light.⁴⁴ Two new customer accounts were added on Hawai’i Island in 2018. The termination of Maui’s EVohana program will further affect third-party fast charging operations; however the availability of this rate may ultimately influence future third-party investment of charging infrastructure in the Companies’ territory. Figure 35 illustrates the adoption of the EV-F rate from inception through 2018. Further details of the 2018 statistics for EV-F adoption and comparison to 2017 statistics can be found in Appendix F.

As noted last year, the U.S. Department of Energy identified the existence of a “utilization gap” at low levels of EV adoption, where the need for an initial level of infrastructure is required to provide basic charging coverage but exceeds market demand for such services. This utilization gap may help explain the low level of third-party investment in high capacity public charging facilities as a general market trend. As EV adoption increases, market demand for charging services are expected to fill the “utilization gap,” eventually leading to the development of new infrastructure from third parties to meet

⁴² <https://www.electrifyamerica.com/our-plan>

⁴³ The EVohana Program is currently administered by the Maui Economic Development Board (“MEDB”), which serves as the largest public charging network on Maui. The EVohana Program currently supports approximately 300 of the 1,000 EV owners on the island. MEDB currently owns charging stations at 13 of the 15 DCFC sites on Maui. The remaining two sites are owned individually by Maui Electric and Greenlots. The EVohana DCFC network on Maui is currently operated and maintained by Hitachi Advanced Clean Energy Corporation (“HIACE”) under an agreement between MEDB and HIACE that will expire on March 31, 2019 and will not be extended. Upon discontinuation of HIACE’s service, MEDB will have limited options to continue offering EV charging service on Maui – potentially resulting in the charging stations going offline for an extended period of time, or possibly a permanent dissolution of the program on Maui, leaving many EV drivers without sufficient public charging resources. As the EV community relies on the existing charge stations to meet their transportation needs, removing the charge stations would undermine EV adoption efforts and cause existing EV owners on Maui uncertainty with their existing EV investments.

⁴⁴ The Shops at Mauna Lani’s charge station was sold to Hawaii Electric Light. Previously this charging station was provided service under EV-F.

the incremental demand.⁴⁵ While EV adoption continues to increase in Hawai'i, overall ownership is approximately one percent of total passenger cars registered.⁴⁶ Continued growth in EV ownership can improve market demand for EV charging and pave the way for increased participation by third-party developers. Importantly, additional charging infrastructure investments have slowly found their way to Hawai'i, in partnership with Greenlots and the Nissan No Charge to Charge program. In addition, the Electrify America has committed funding to provide new, albeit limited, opportunities for infrastructure development.⁴⁷

At the same time, as charging and battery technology advances, greater emphasis is placed on higher capacity charging, with speeds upwards of 200-300 kW under development. Because, the Companies' current EV-F tariff is limited to 100 kW capacity, future technology may dictate a new or revised charging rate to be developed to accommodate higher charging capacities. Such a rate would necessitate an increased evaluation of the demand implications of higher capacities, and the opportunity to offset increased point-in-time demands through demand response and/or batteries.

As of December '18, eleven customers participate in the EV-F pilot program, most are part of EV-Ohana on Maui

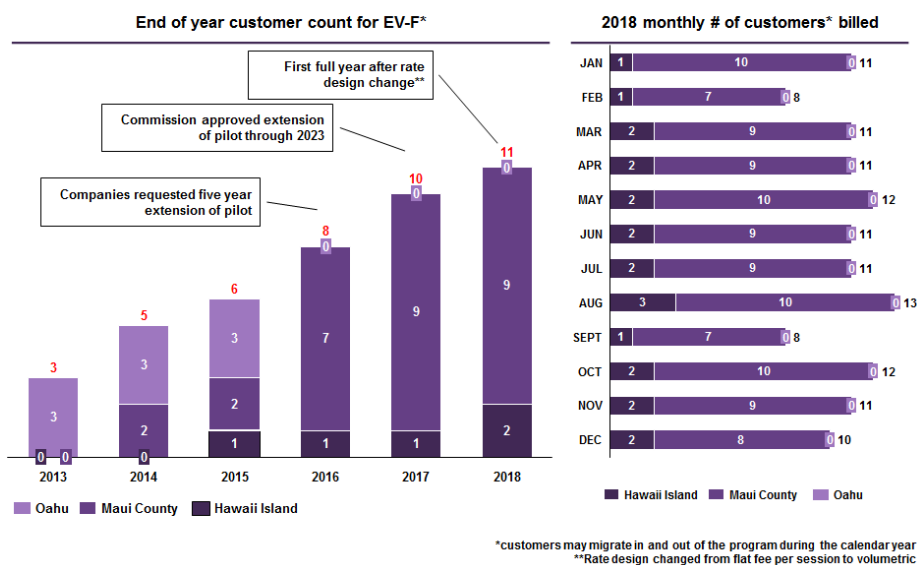


Figure 35 Adoption of EV-F pilot from inception of the program (2013) through 2018.

⁴⁵ National Plug-In Electric Vehicle Infrastructure Analysis. U.S. Department of Energy. September 2017 at 4.

⁴⁶ Statewide EV Ownership ranged from 0.51% in January, 2017 to 0.65% in December, 2017. Per DBEDT Datawarehouse: Available at <http://dbedt.hawaii.gov/economic/datawarehouse/>.

⁴⁷ <https://insideevs.com/electrify-america-ev-investment-plan-released/>.

Summary of Cost and Revenue

In Figure 36, the revenue generated each month from Schedule EV-F for the three Companies and the percent change from 2017 is illustrated. In 2018, \$95,526 in revenue was generated from customers under the Schedule EV-F program, which represents an 8.5 percent increase in revenues collected under this tariff in 2017. Incremental costs to support the Schedule EV-F program, including the cost to enroll and bill customers, are minimal.

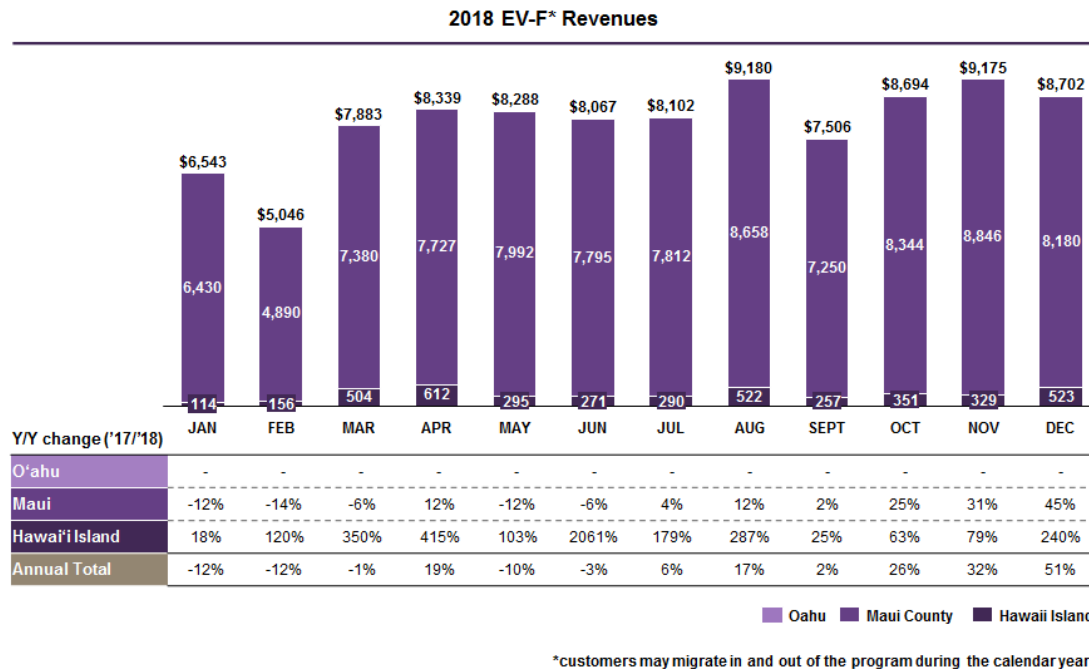


Figure 36 Revenues collected from EV-F customers in 2018 and percent change from 2017

Subsidization by non-participating customers

Schedule EV F is an economic development rate intended to reduce the financial risk for startup EV charging providers, which may otherwise be confronted with significant demand charges combined with low utilization. A report prepared by Idaho National Laboratory (“INL”) supports the need to provide an economic development rate for third-party EV charging facilities, stating that “[d]emand charges associated with 50 to 60-kW high power charging . . . can have a significant impact on a business’ monthly electric utility bill.”⁴⁸ The Companies maintain that Schedule EV-F can help to reduce initial cost barriers for prospective third-party infrastructure providers and incentivize greater investment in infrastructure.

⁴⁸ Idaho National Laboratory, “What is the Impact of Utility Demand Charges on a DCFC Host?” June 2015. Available at <http://avt.inl.gov/pdf/EVProj/EffectOfDemandChargesOnDCFCHosts.pdf>.

Figure 37 summarizes the total annual revenue from Schedule EV-F compared to the potential revenue generated if the charging facility were billed under each Company’s respective Schedule J.^{49 50} The potential revenue under Schedule J⁵¹ for the year 2018 was \$51,598 higher than revenues from Schedule EV-F.

Schedule EV-F is a TOU rate with the lowest rate during the Mid-Day to incentivize charging during the peak solar generation hours of 9 AM to 5 PM. As this Mid-Day utilization increase in comparison to the On-Peak and Off-Peak hours, the difference between total Schedule EV-F revenue and the potential Schedule EV-U rate will increase. In 2018, 65 percent of all energy provided by Schedule EV-F was consumed during the Mid-Day.

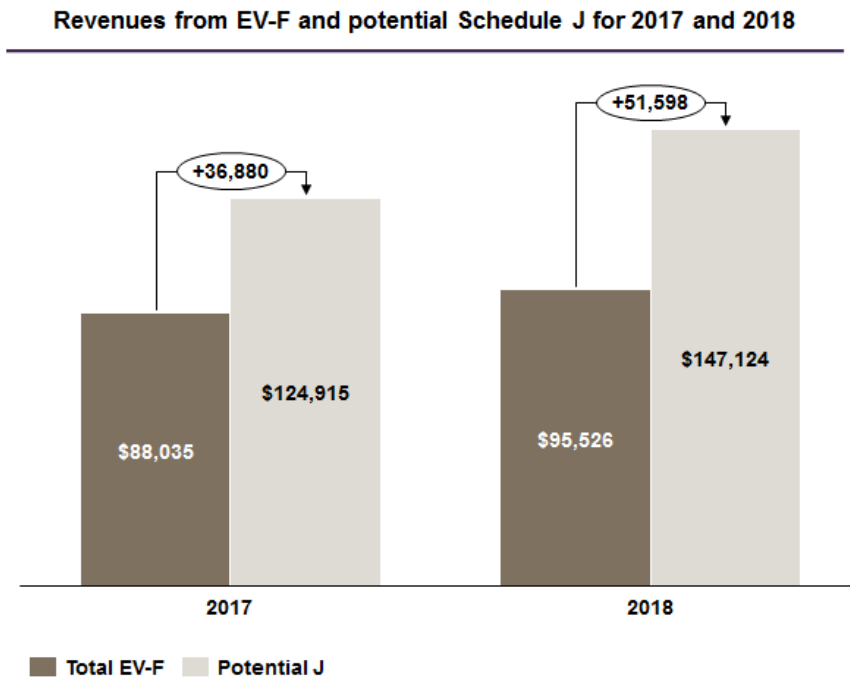


Figure 37 Difference between the total EV revenue collected and potential revenues under Schedule J for 2017 and 2018

⁴⁹ General Service Demand rate applicable to general light and/or power loads that exceed 5,000 kWh per month or exceed 25 kW three times within a twelve month period but are less than 300 kW per month, and supplied through a single meter.

⁵⁰ In response to CA-IR-13, filed on October 14, 2016, the Companies provided an analysis of projected revenues under Schedule EV-F and Schedule EV-U compared to Schedule J, and committed to providing an updated analysis as revised EV forecasts are made available. The Companies have published a revised EV forecast for the island of O’ahu, Maui, and Hawai’i Island, in its Strategic Roadmap Addendum filed in November 2018. See Appendix E for an updated analysis of CA-IR-13.

⁵¹ The potential Schedule J revenue provided in Figure 37 is calculated based on an assumed monthly billing demand of 47.5 kW. A typical EV will fast charge at power up to 50 kW, but will reduce power as the battery state of charge increases.

Recommendation of revisions to rate structures

As the Companies are in the initial stages of gathering data under the revised rate structure,⁵² there are no recommendations for revisions at this time. However, as mentioned in their September 5, 2017 tariff filing for Schedules EV-F and EV-U, the Companies will continue to monitor both adoption and utilization under the current rate structures and provide recommendations, as appropriate.⁵³

Summary of on-going pilots

Demand Response on DC fast charging

In 2013, Hawaiian Electric started a project with EPRI to research, develop, and demonstrate potential demand response (“DR”) capabilities on a DCFC station. The DR technology investigated in this pilot could allow the Companies to initiate a curtailment event, thereby restricting the maximum power output of a CHAdeMO DCFC session from 50 kW to 25 kW. Hawaiian Electric and EPRI developed four use cases that could demonstrate the potential DR capabilities. In 2015, Hawaiian Electric opened a Request For Proposal (“RFP”) and selected a vendor to provide a DCFC station as well as develop the software to demonstrate the four defined use cases. Due to the research efforts, there were some software modifications that were integrated into this charge station before commencing the pilot at Hawaiian Electric. The public charge station completed construction in early 2016 at the Ward Avenue location. In 2017, the project team began demonstration of the four use cases. At the same time, the utilization of the Ward DCFC stations (Ward 1 and Ward 2) increased and the volume of data processed by the charge station caused the equipment to periodically go out of service. After troubleshooting the issue, the DCFC station manufacturer implemented a software change to resolve this issue. The pilot continued, however other operational issues hampered progress and were later identified and attributed to the DCFC stations’ 3G cellular modem. As a result, the Companies have upgraded most of their stations to 4G cellular. Hawaiian Electric is targeting to restart this demonstration in Q2 of 2019 and anticipates completing the pilot demonstration of all use cases by Q4 of 2019.

Battery Storage with DC fast charging

In late 2012, Hawaiian Electric initiated an investigation of battery storage with DC fast charging and commenced a project with EPRI to evaluate potential benefits of such systems. The Companies requested approval of Schedule EV-U, in part, to enable opportunities “to conduct research, development, and demonstration activities to ... address load control and other technologies and collect data for analyses.”⁵⁴ After approval of Schedule EV-U, Hawaiian Electric requested proposals for a DCFC

⁵² On September 5, 2017, the Companies submitted a revised rate structure for Schedule EV-F, which was approved by the Commission on October 13, 2017. On December 12, 2017, the Companies implemented the revised rate structure for all accounts under Schedules EV-F.

⁵³ Docket No. 2016-0168, EV-F and EV-U Pilot Extension, filed September 5, 2018, at 11.

⁵⁴ Transmittal No. 13-07, filed July 4, 2013, at 23.

system with an integrated battery storage system. An equipment vendor was selected in late 2013, however due to the vendor's inability to satisfy the scope of the project, negotiations ended and selection terminated. Hawaiian Electric issued a second RFP that resulted in a new equipment purchase in mid-2015. The research objective is to determine the viability of a battery energy storage system ("BESS") fast charging system to alleviate customer billing demand charges and potential utility system upgrades.

The Kapolei Commons site was selected for this pilot demonstration project. Hawaiian Electric installed a DCFC system with an integrated 12 kWh BESS. The system was configured to draw up to 23 kW from the grid, while the BESS would provide the incremental power to charge an EV at up to 50 kW.

The BESS charge system was opened to the public at the end of 2015. In late 2016, the BESS began to exhibit issues. It was determined that the BESS struggled to provide the incremental power to charge newer model EVs with larger batteries. Under certain conditions the charge session terminated before the EV battery was fully recharged. The vendor implemented a software change in early 2017 to address this issue. The functionality was later validated and the charging and battery data collection for the pilot commenced in August of 2017 and continued for one year. An interim report, which summarized data collected over the first two months, was published by EPRI. The interim report noted, "[t]his system is reducing the peak load drawing from the grid" and "there is room for storage to reduce their demand charges which would have to be weighed in a full cost-benefit analysis." This cost-benefit analysis will be based on one year of data and summarized in the final report, which is anticipated to be completed by mid-2019.

Customer engagement and outreach (Roadmap Initiative #1)

As part of the Companies' Roadmap, Initiative #1 is foundational and paramount to the success of the electrification of transportation in Hawai'i. The Companies identified that there is limited awareness, understanding, and enthusiasm for EVs among fleet operators, auto dealerships, and the public.⁵⁵ By working with partners⁵⁶ who share clean transportation objectives and who are willing to contribute their knowledge and expertise, the Companies have leveraged the unique abilities of each partner and is hopeful that partners will continue to contribute financial and/or in-kind resources to this effort. Ultimately, the extent of the Companies action needed on outreach and education will depend on the ability of partners to assist.

In 2018, the Companies have contributed to the EV-U and EV-F program education and outreach effort in the following ways:

- Launched a new landing page on the Companies' website, providing a go-to resource for many customers seeking information about the Companies DCFC charge stations, including location, operation status (i.e., in-service or out-of-service), and applicable rates;
- Distributed the Companies brochure at five University of Hawai'i Warriors Football home games, the 2018 First Hawaiian Bank Auto Show, and the Clean Energy Fair at the Kāhala Mall;

⁵⁵ Docket No. 2018-0135, Electrification of Transportation Strategic Roadmap filed March 29, 2018 at 69.

⁵⁶ Potential partners identified in the Roadmap: Drive Electric Hawai'i, Hawai'i Energy, NGOs, Automakers, Electrify America, and Dealerships and Hawai'i Automotive Dealer Association.

- Press and social media alerts announcing the opening of the two additional DCFC stations;
- Participated with dealerships and Drive Electric Hawai'i members at two Ride and Drive events at SALT at our Kaka'ako;
- Participated with partners identified in the Roadmap in an EV event at Kāne'ohe Bay Shopping Center during National Drive Electric Week; and
- Engaged with Transportation Network Companies ("TNCs") and EV car clubs, discussing opportunities to leverage the public fast charging stations as well as other potential strategic initiatives;
- Contributed experiences and lessons learned by employees during Company sponsored community events, which engage and educate the broader public.

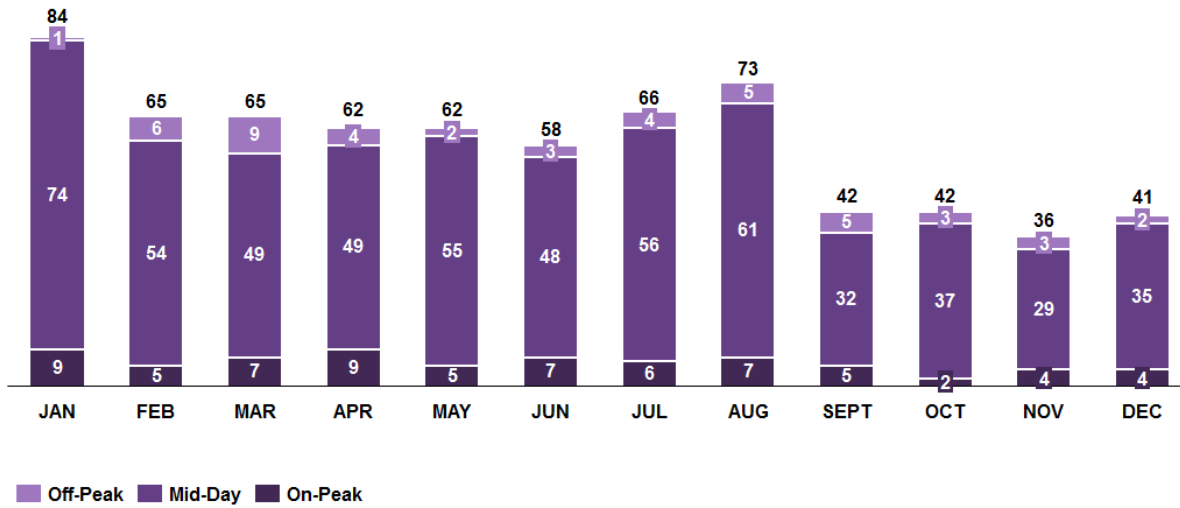
Appendix A

Details of Hawaiian Electric Charging Locations by Site

Dole Plantation

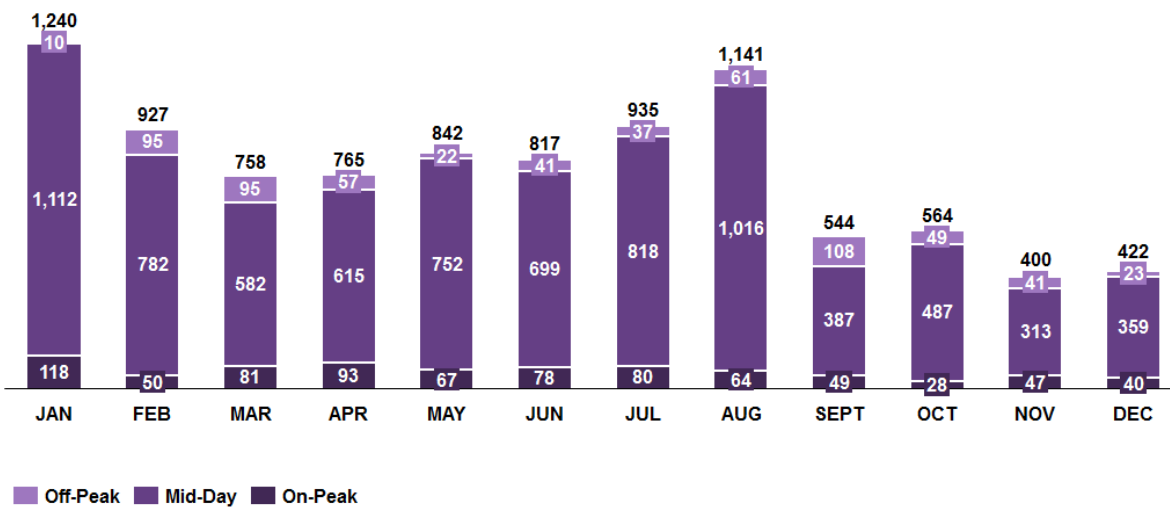
HECO

Dole Plantation 2018-- # of sessions by time of day

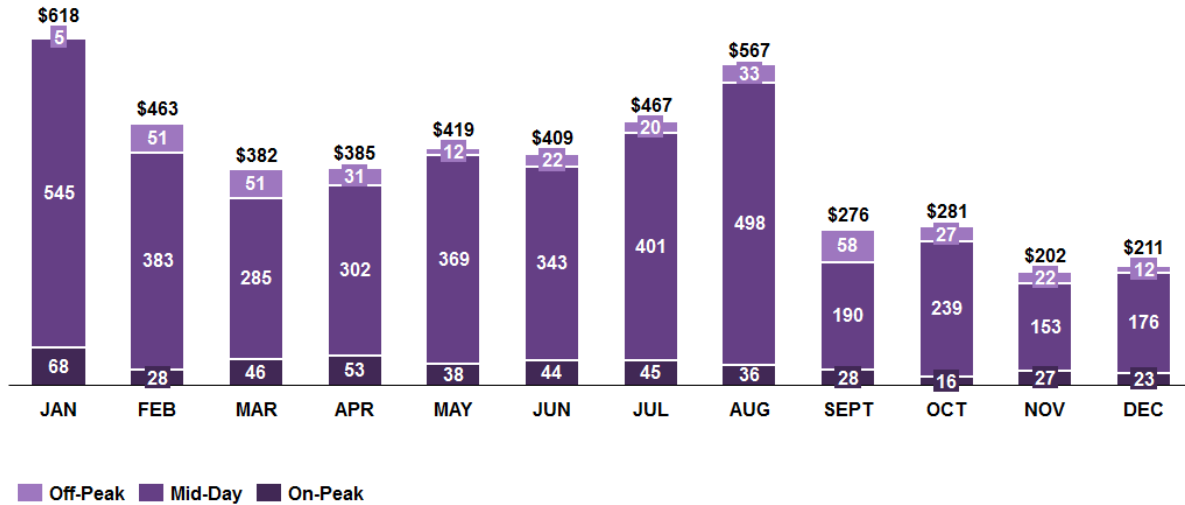


HECO

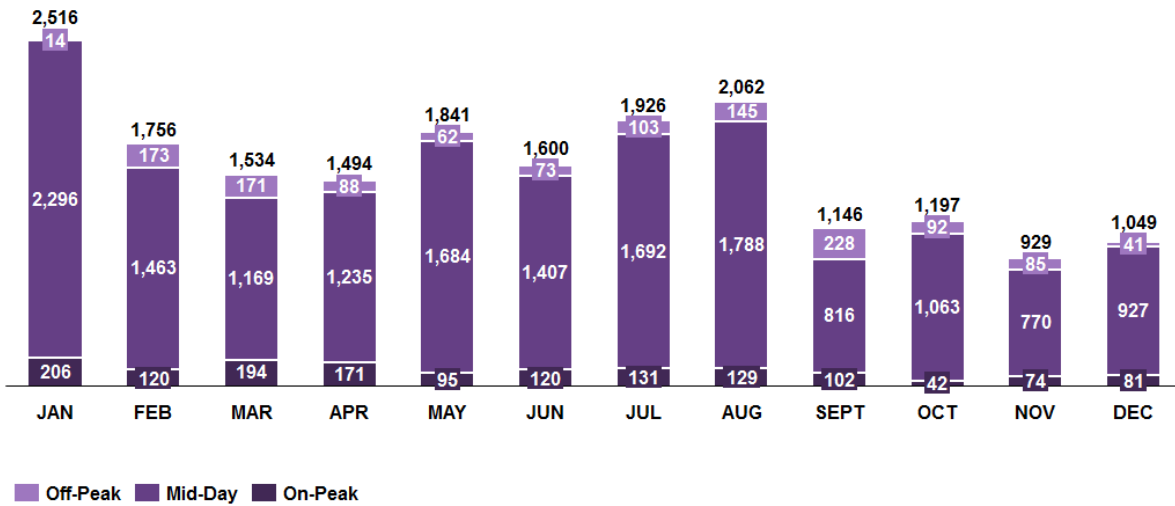
Dole Plantation 2018– Energy (kWh) by time of day



Dole Plantation 2018– Gross Revenue (\$) by time of day



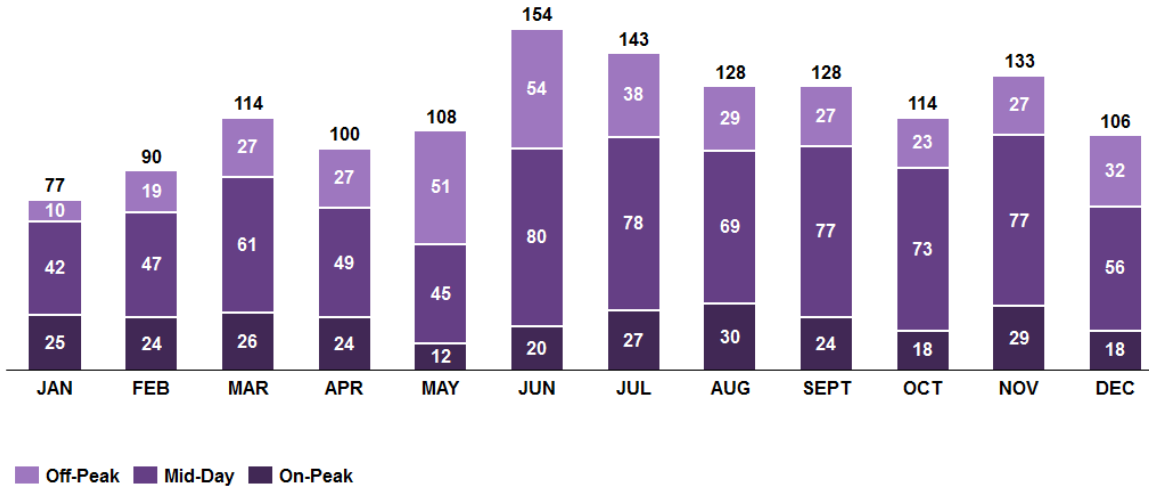
Dole Plantation 2018– # minutes by time of day



Ko'olau Center

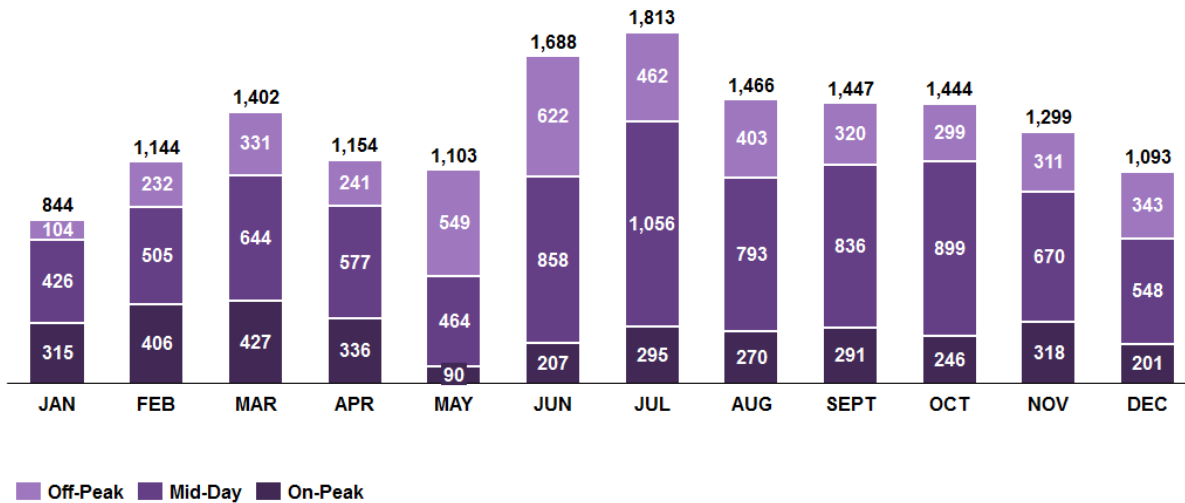
HECO

Ko'olau Center 2018-- # of sessions by time of day

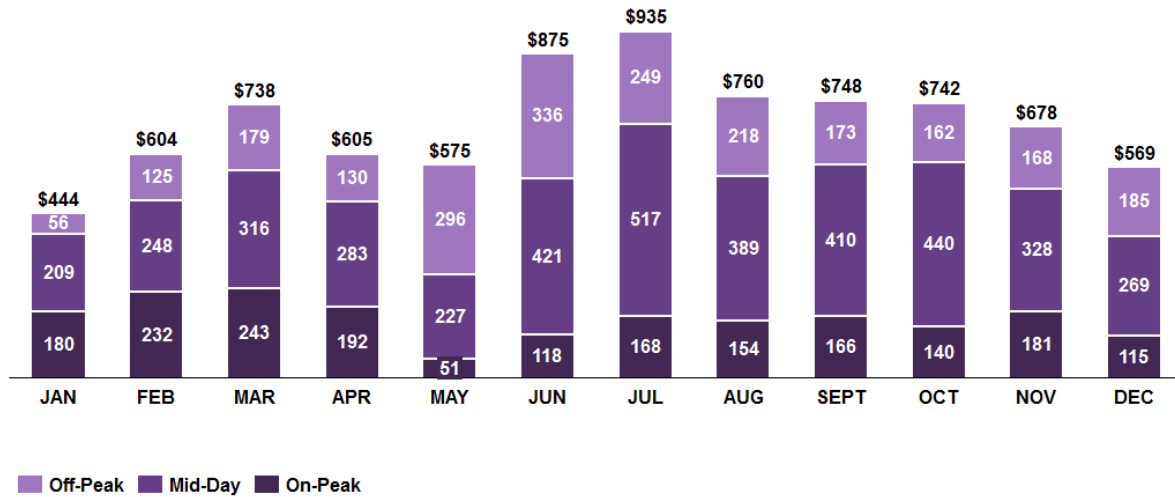


HECO

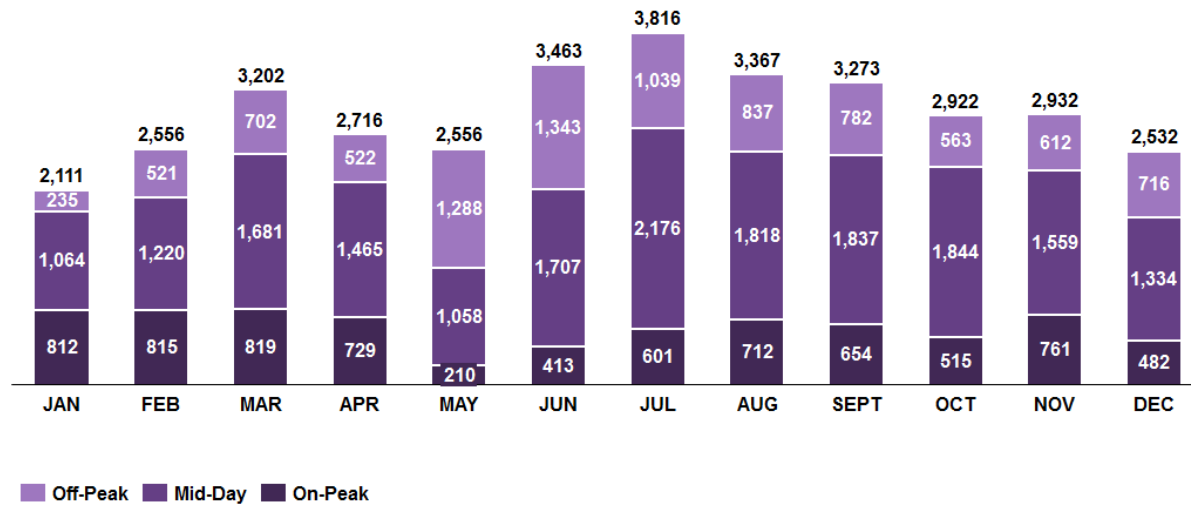
Ko'olau Center 2018– Energy (kWh) by time of day



Ko‘olau Center 2018– Gross Revenue (\$) by time of day



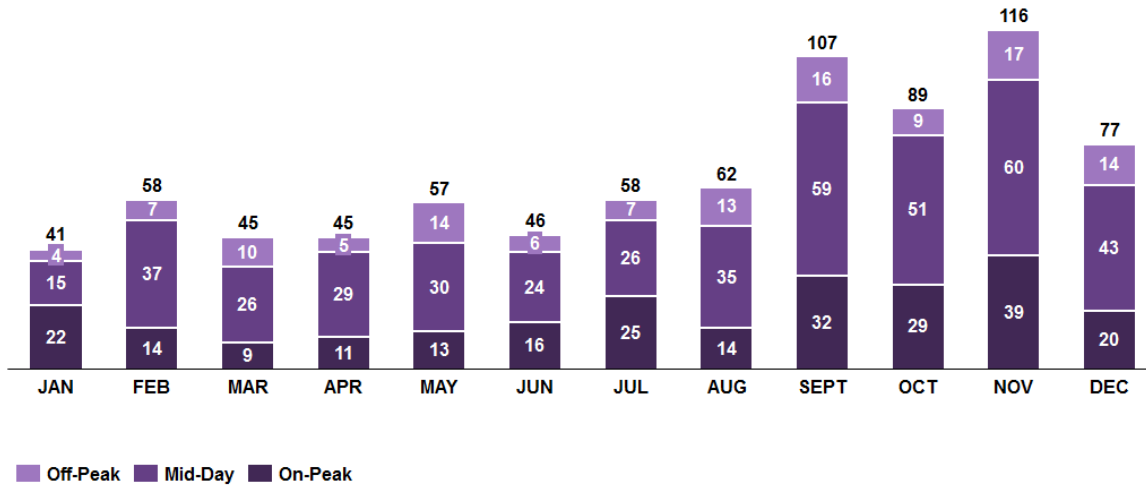
Ko‘olau Center 2018– # of minutes by time of day



Kapolei Commons

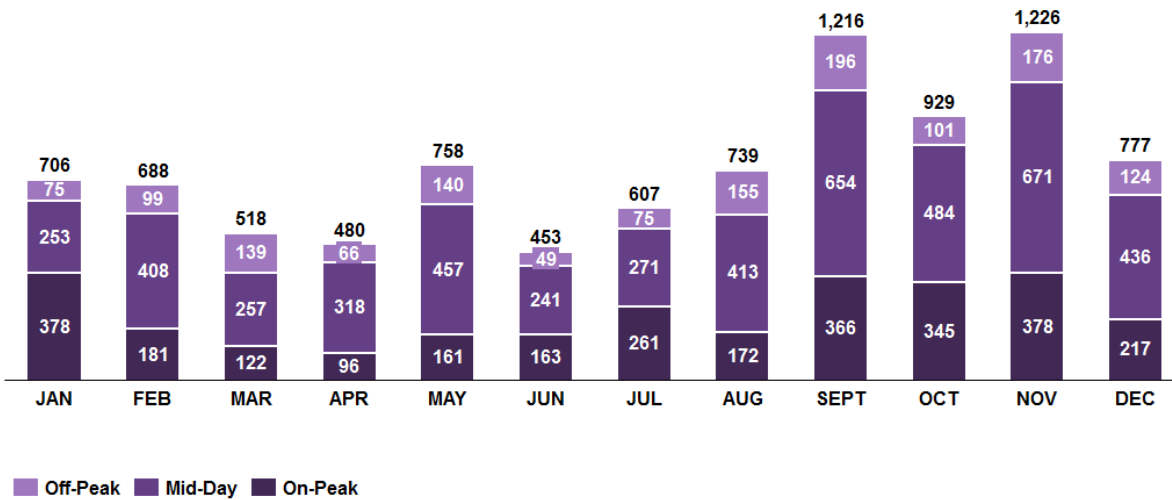
HECO

Kapolei Commons 2018-- # of sessions by time of day

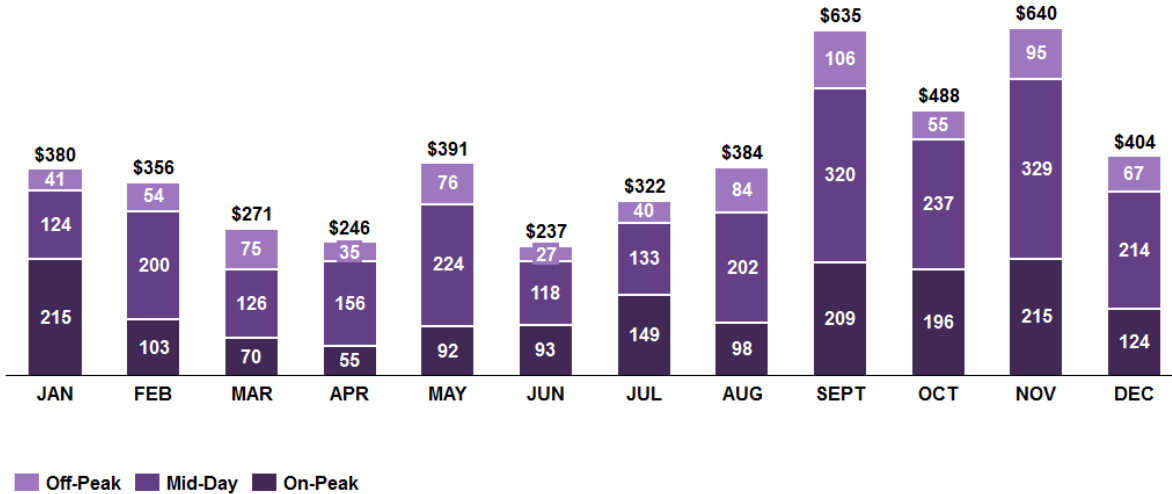


HECO

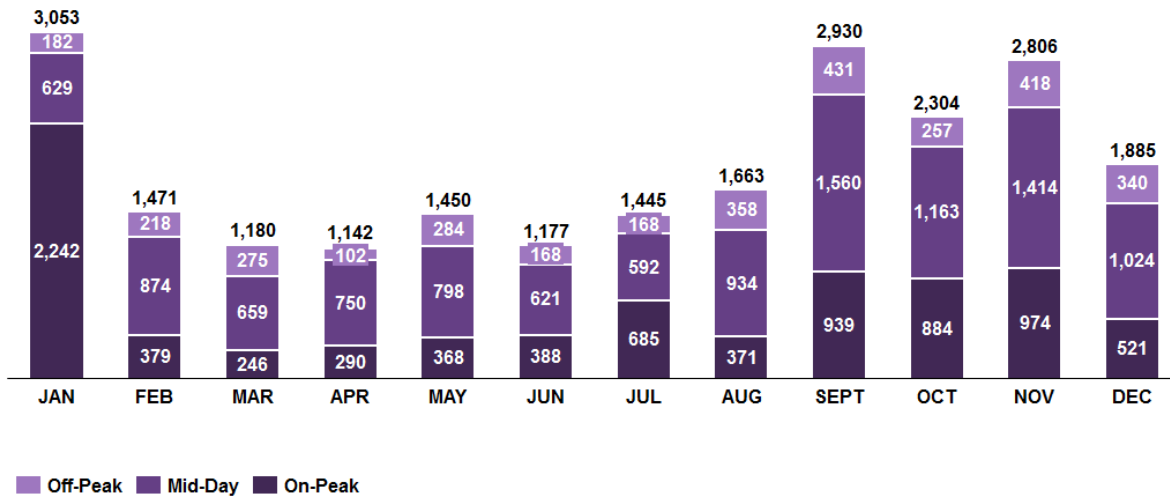
Kapolei Commons 2018– Energy (kWh) by time of day



Kapolei Commons 2018– Gross Revenue (\$) by time of day



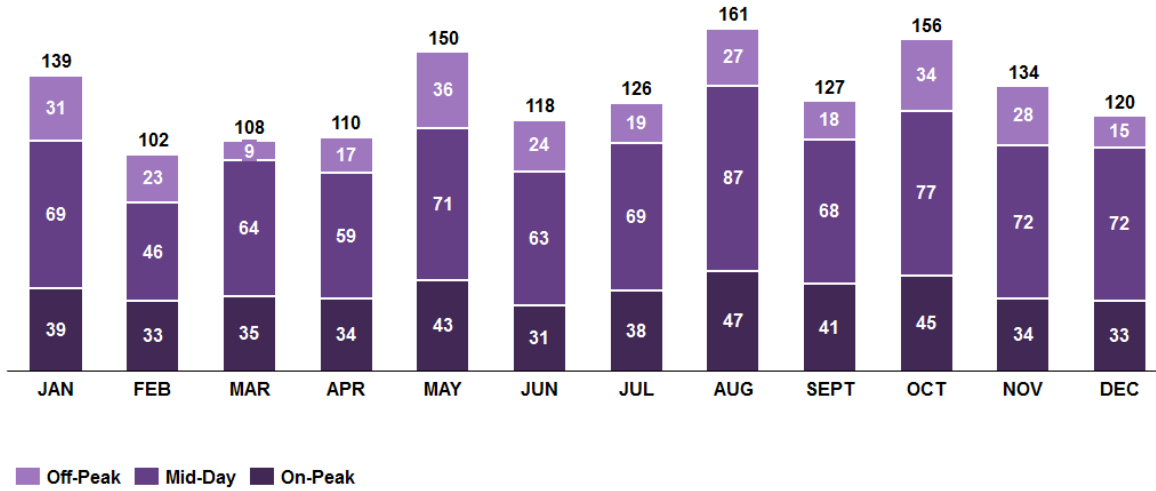
Kapolei Commons 2018– # of minutes by time of day



Hawai'i Kai 7-Eleven

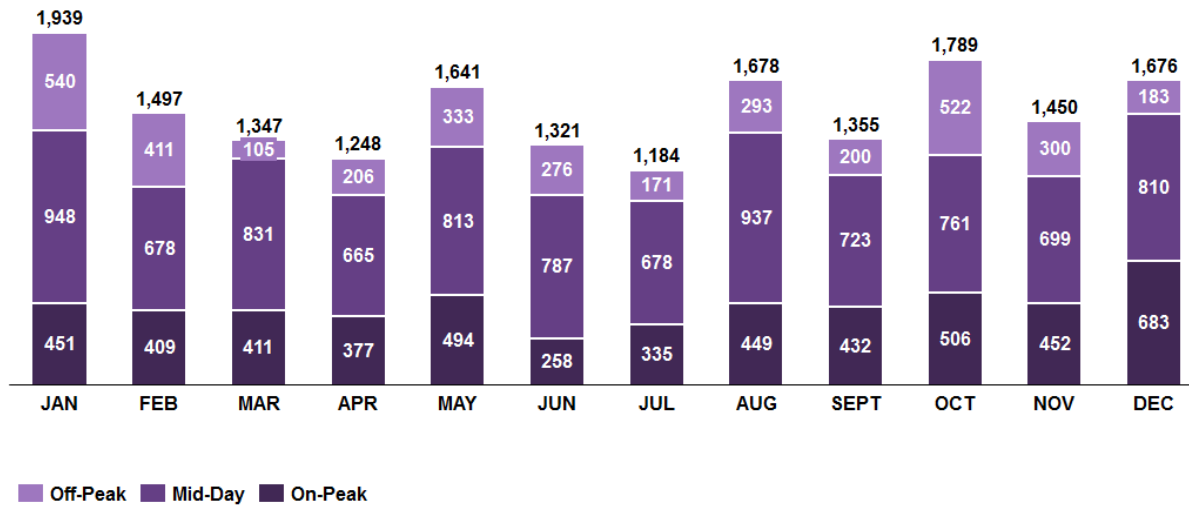
HECO

Hawaii Kai 7-Eleven 2018-- # of sessions by time of day

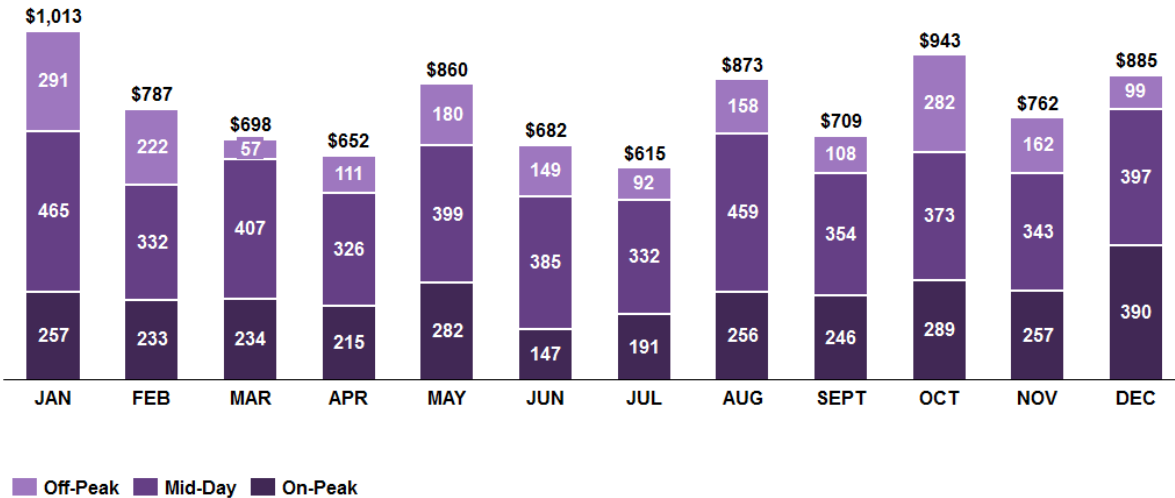


HECO

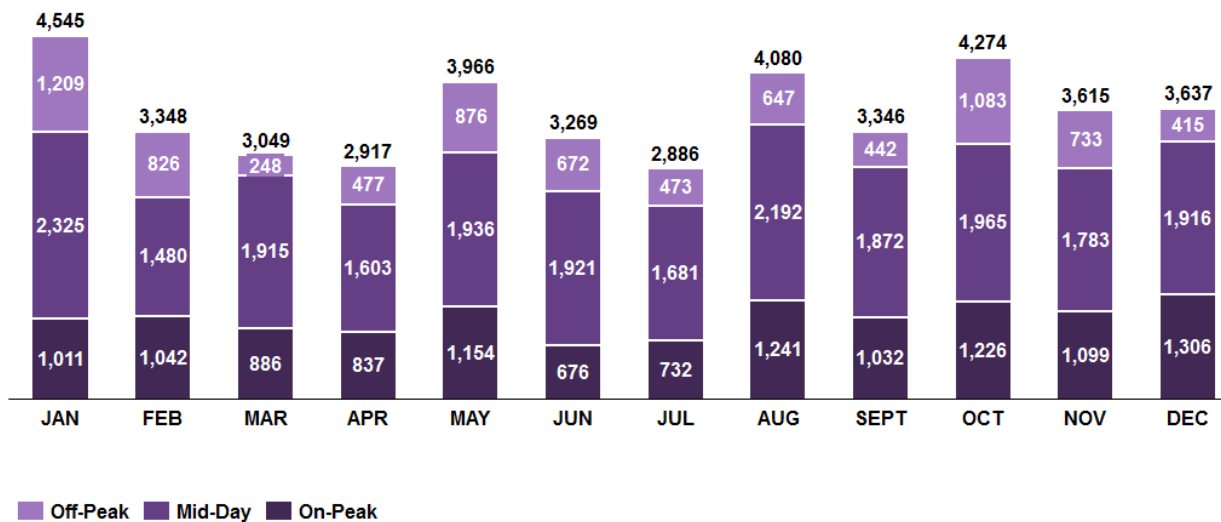
Hawaii Kai 7-Eleven 2018– Energy (kWh) by time of day



Hawaii Kai 7-Eleven 2018– Gross Revenue (\$) by time of day



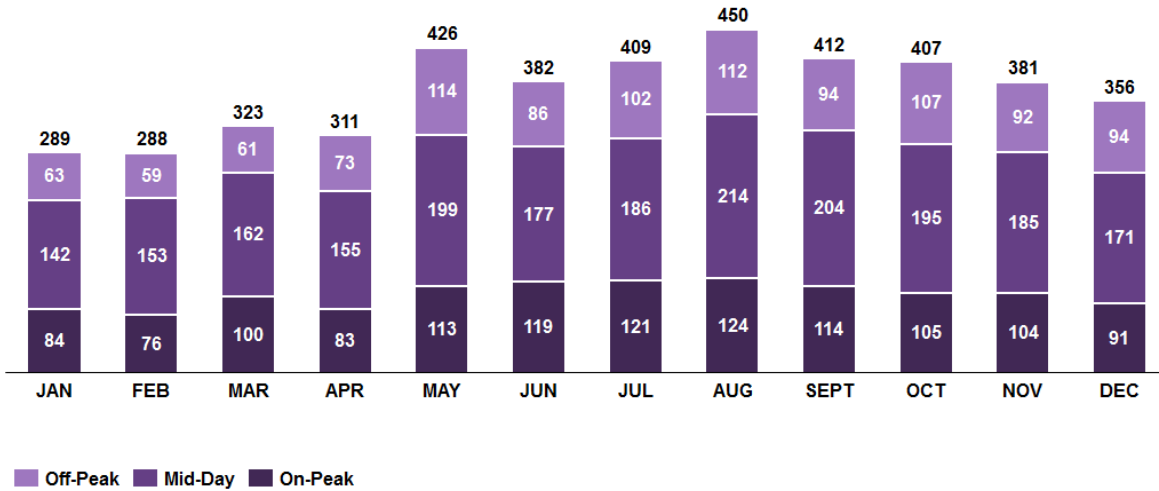
Hawaii Kai 7-Eleven 2018– # minutes by time of day



Ward 1

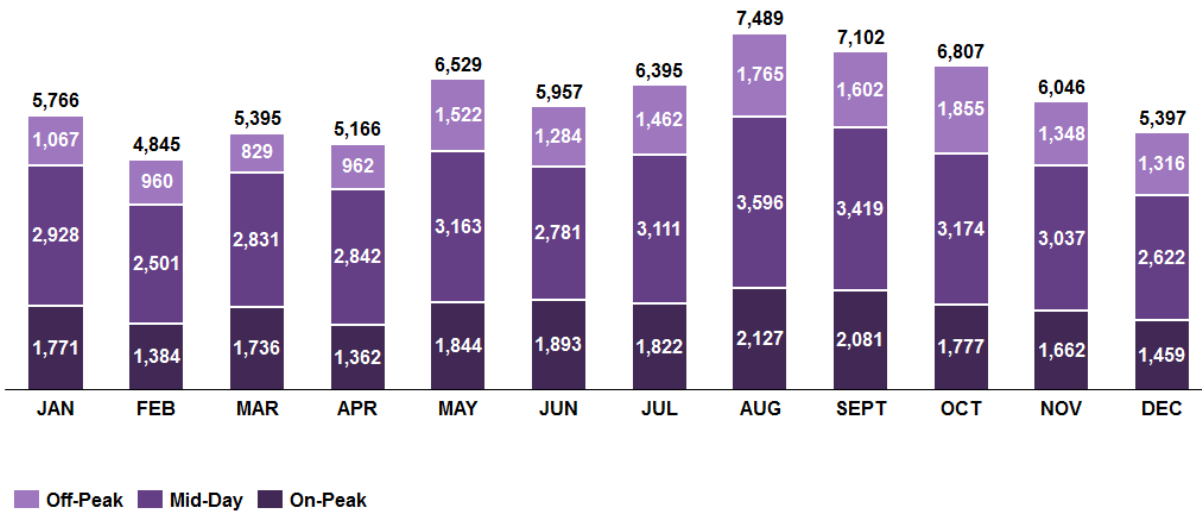
HECO

Ward 1 2018-- # of sessions by time of day

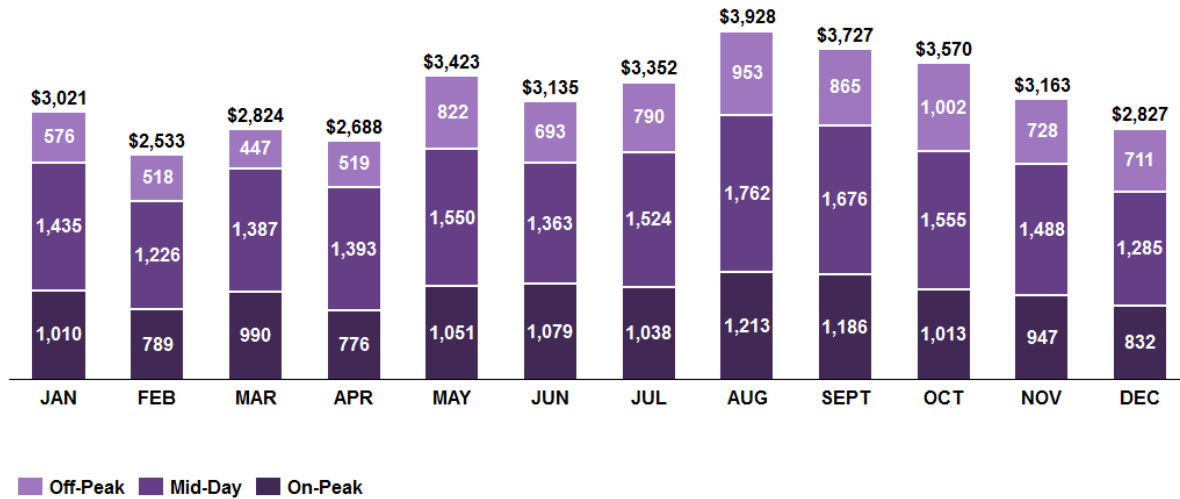


HECO

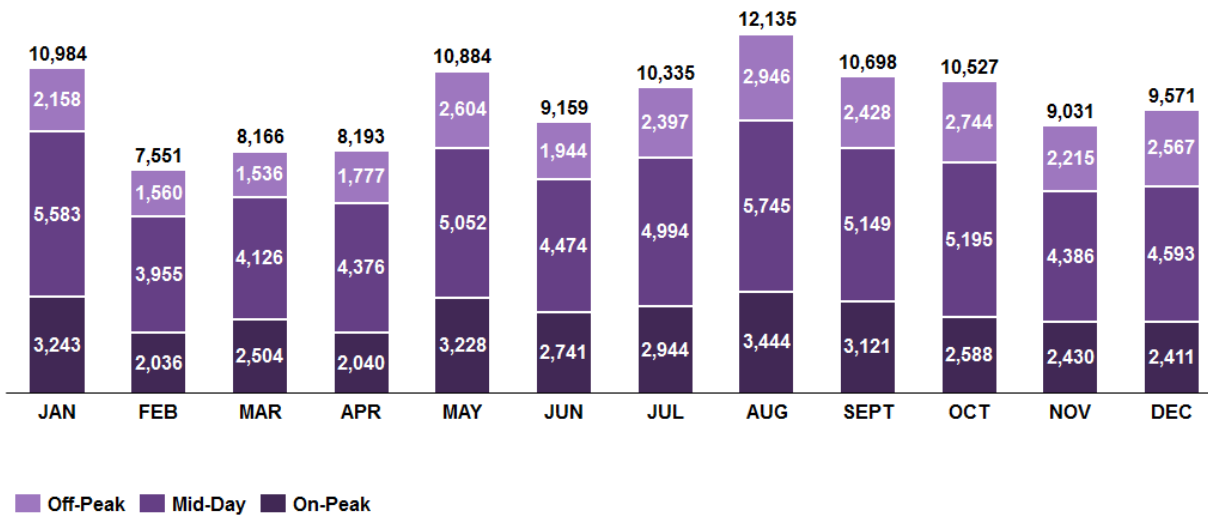
Ward 1 2018– Energy (kWh) by time of day



Ward 1 2018– Gross Revenue (\$) by time of day



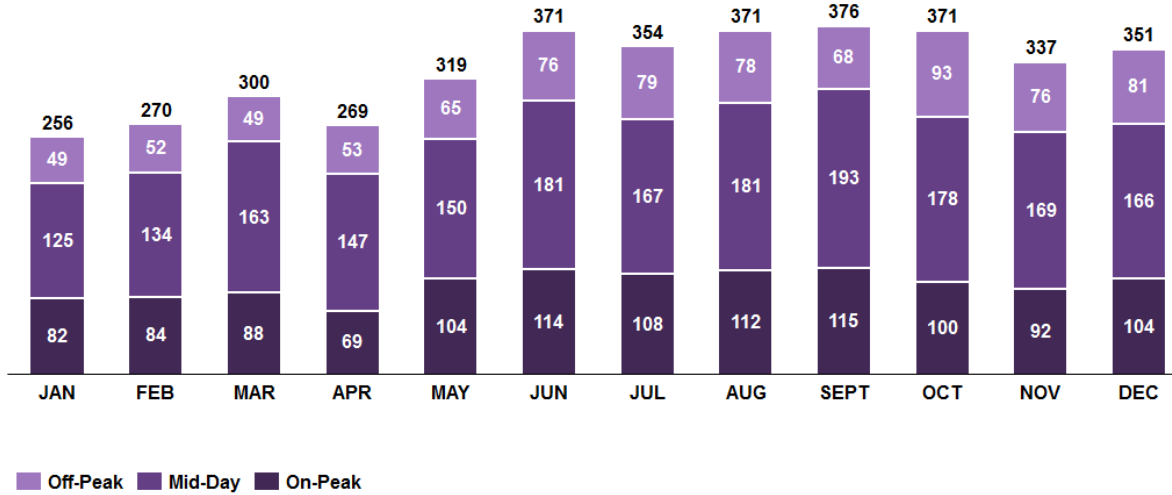
Ward 1 2018– # minutes by time of day



Ward 2

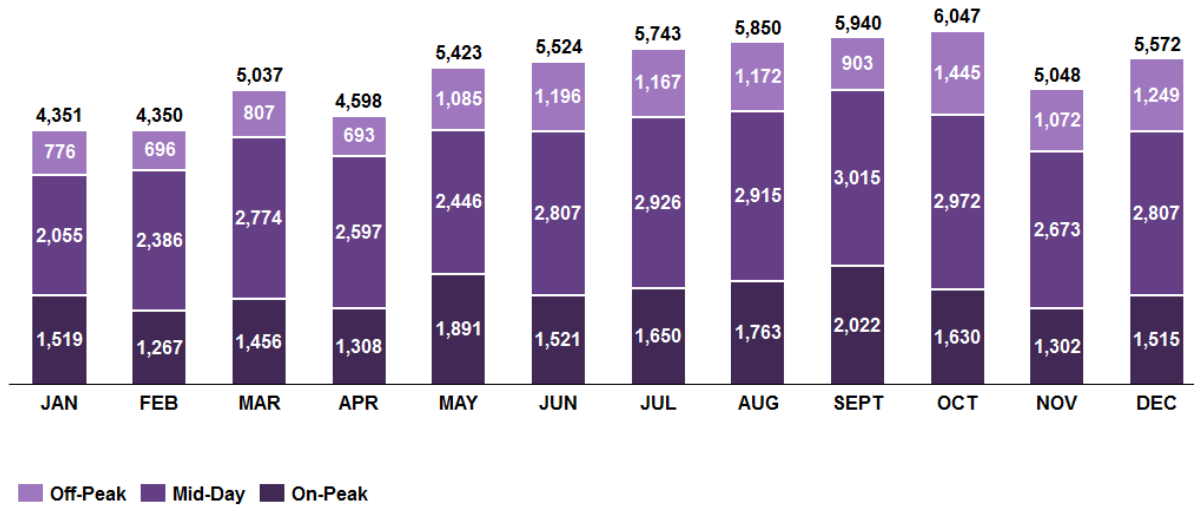
HECO

Ward 2 2018-- # of sessions by time of day

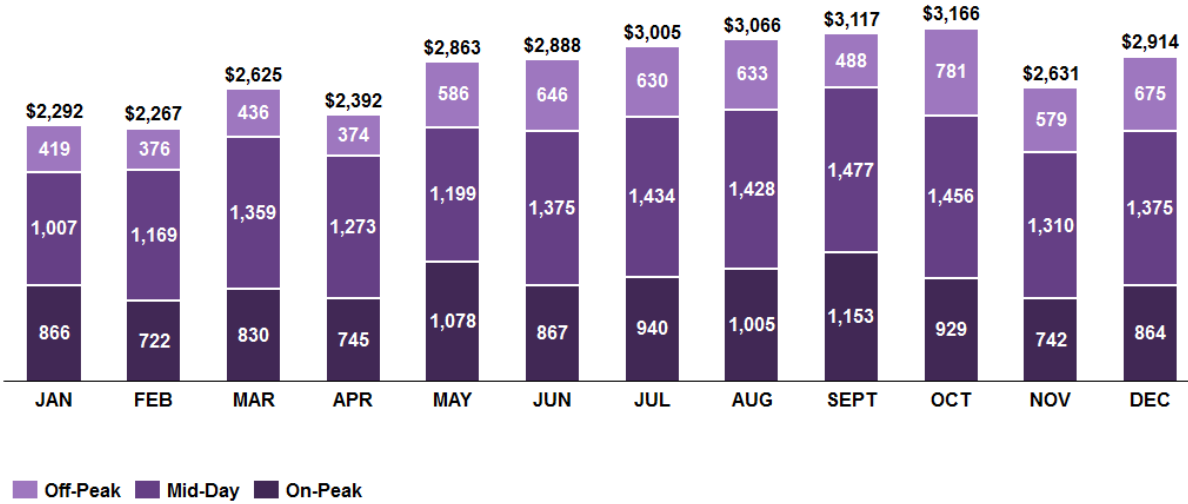


HECO

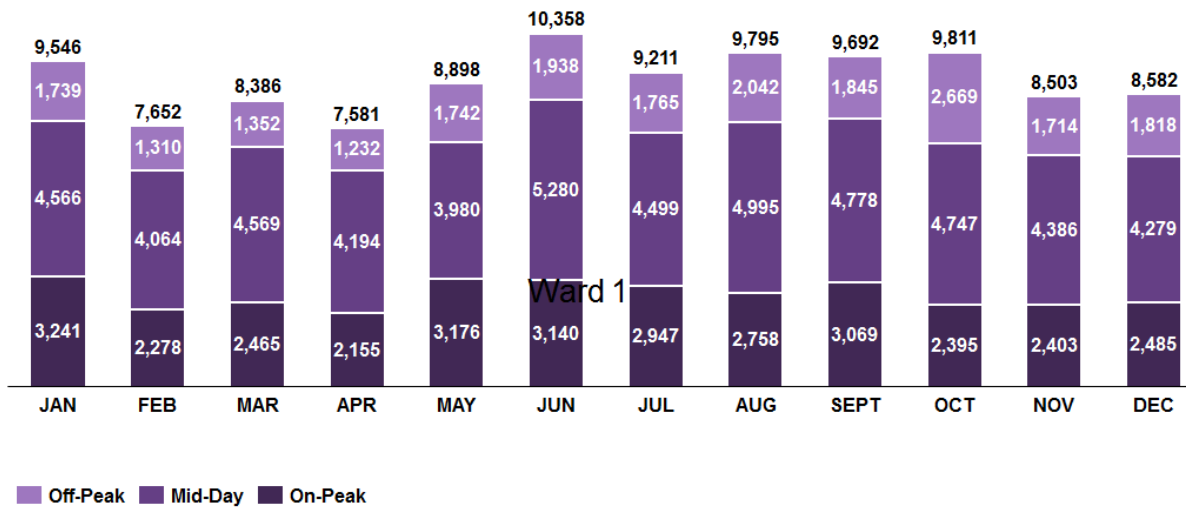
Ward 2 2018– Energy (kWh) by time of day



Ward 2 2018– Gross Revenue (\$) by time of day



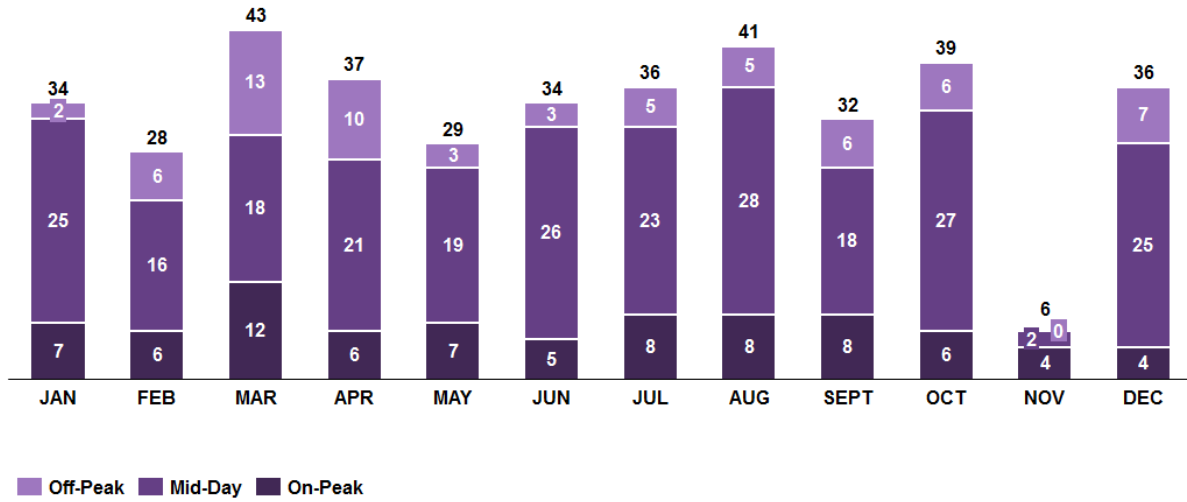
Ward 2 2018– # minutes by time of day



Wai'anae Mall

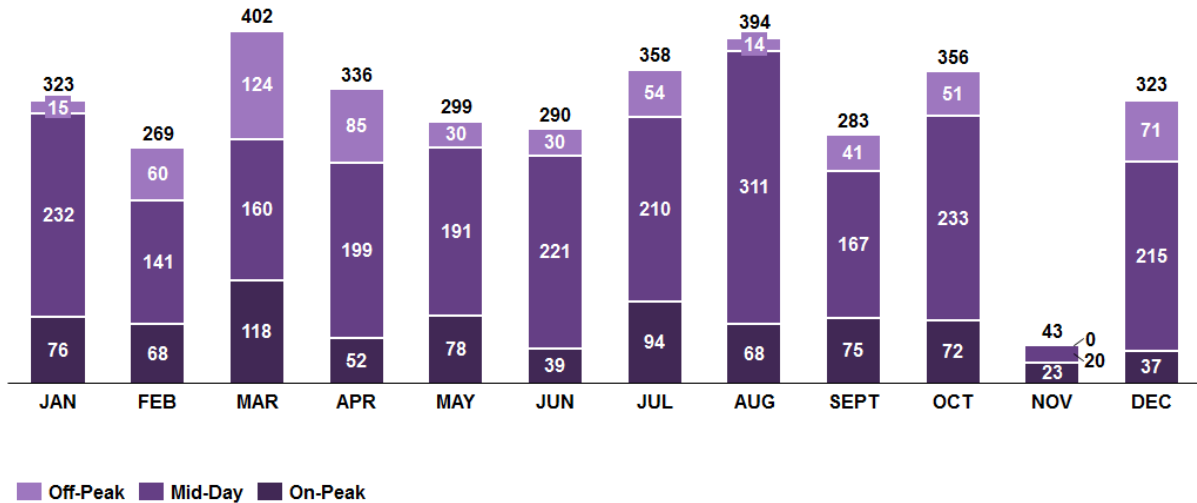
HECO

Wai'anae Mall--# of sessions by time of day

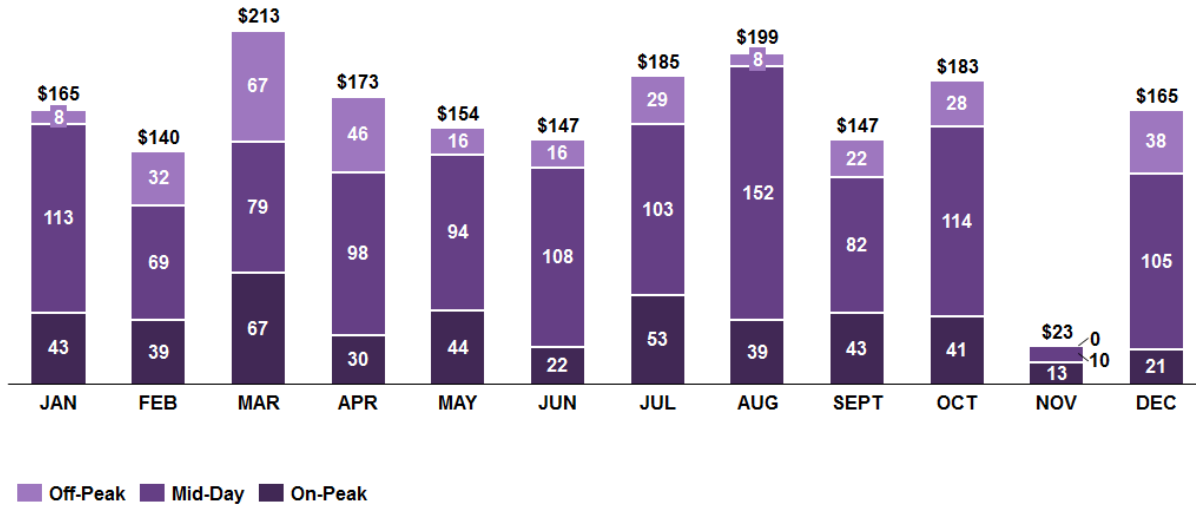


HECO

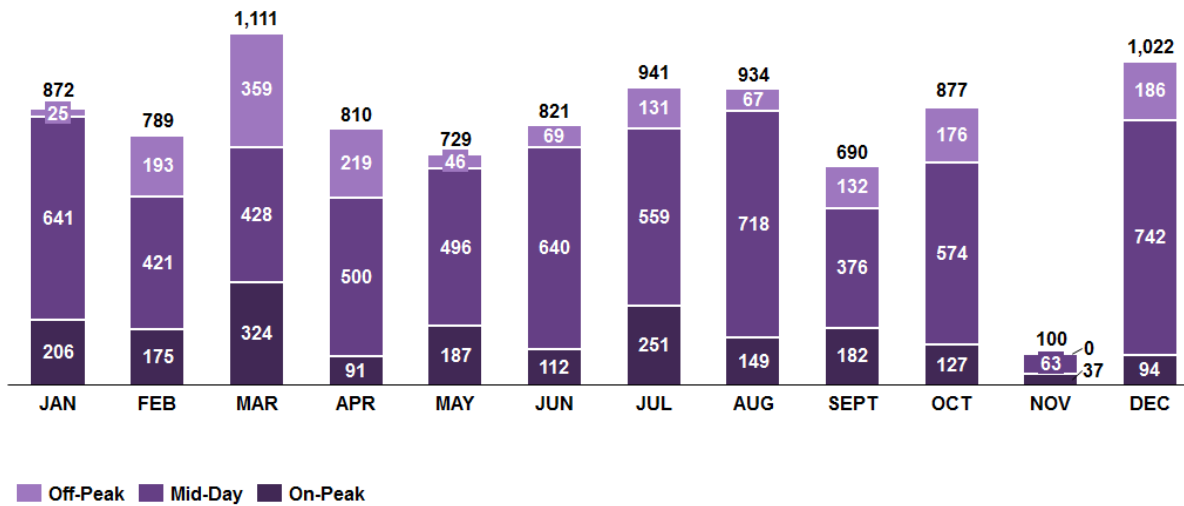
Wai'anae Mall–Energy (kWh) by time of day



Wai'anae Mall– Gross Revenue (\$) by time of day



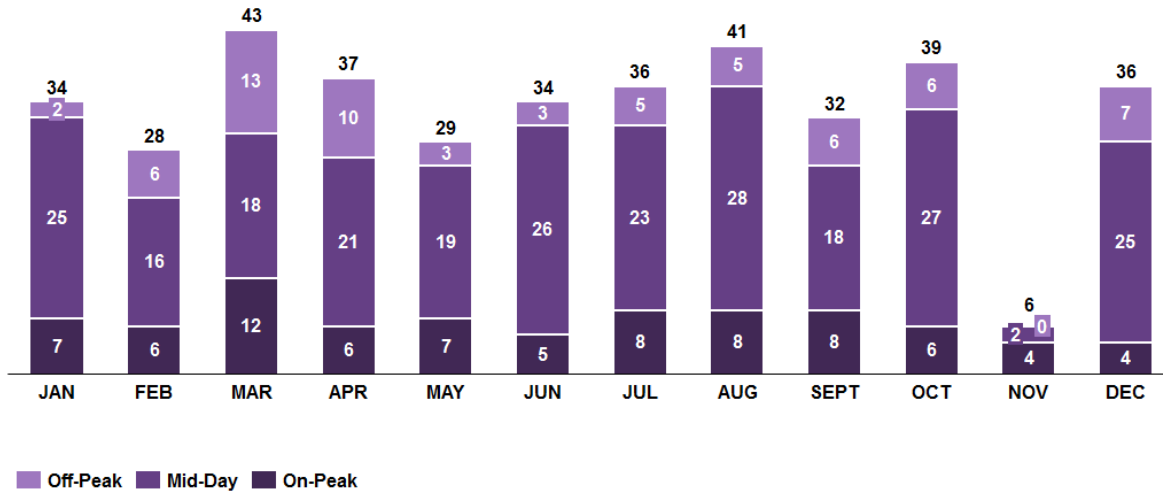
Wai'anae Mall– # minutes by time of day



801 Dillingham

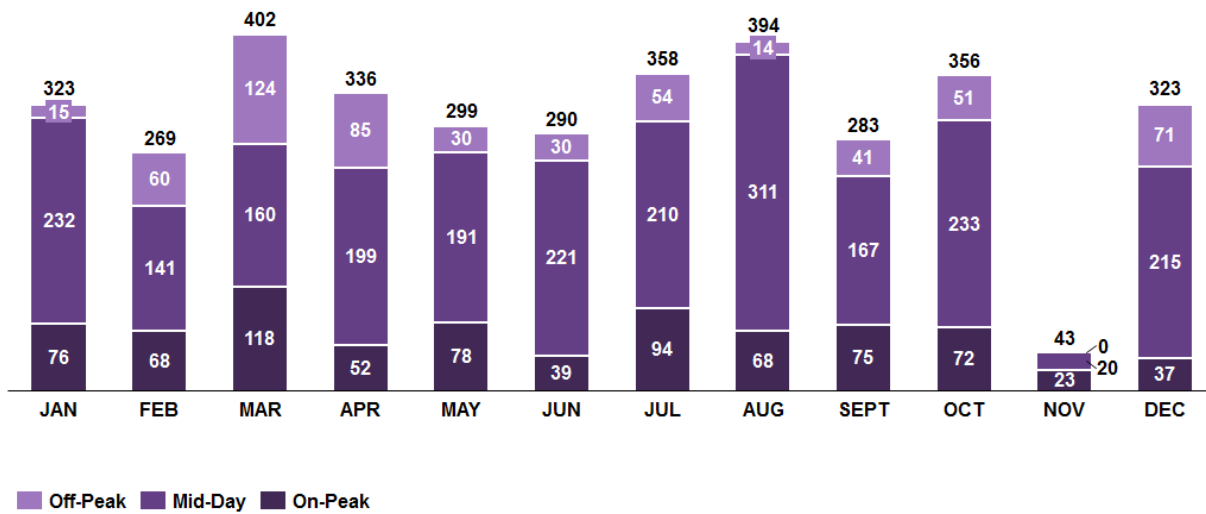
HECO

801 Dillingham-- # of sessions by time of day

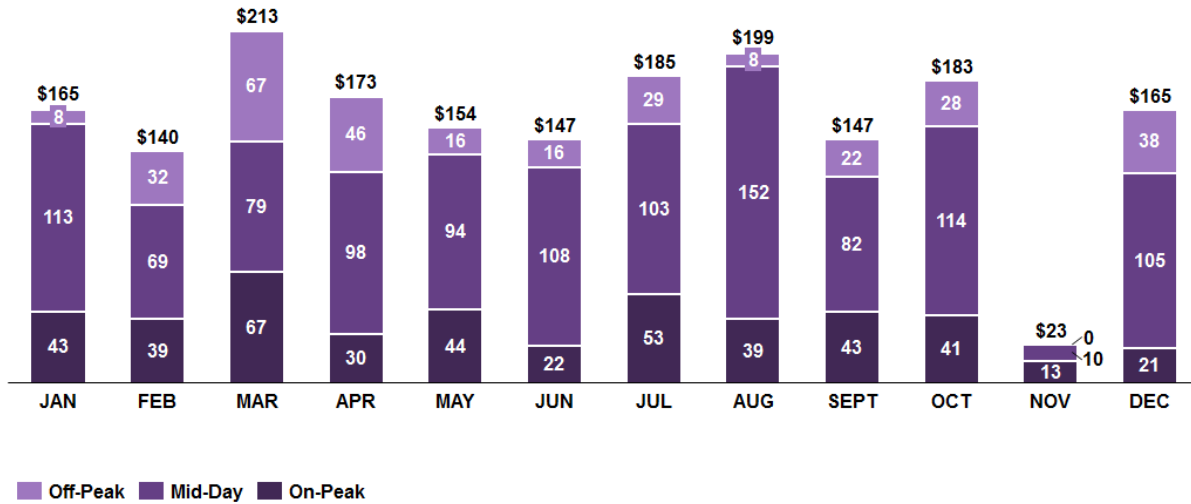


HECO

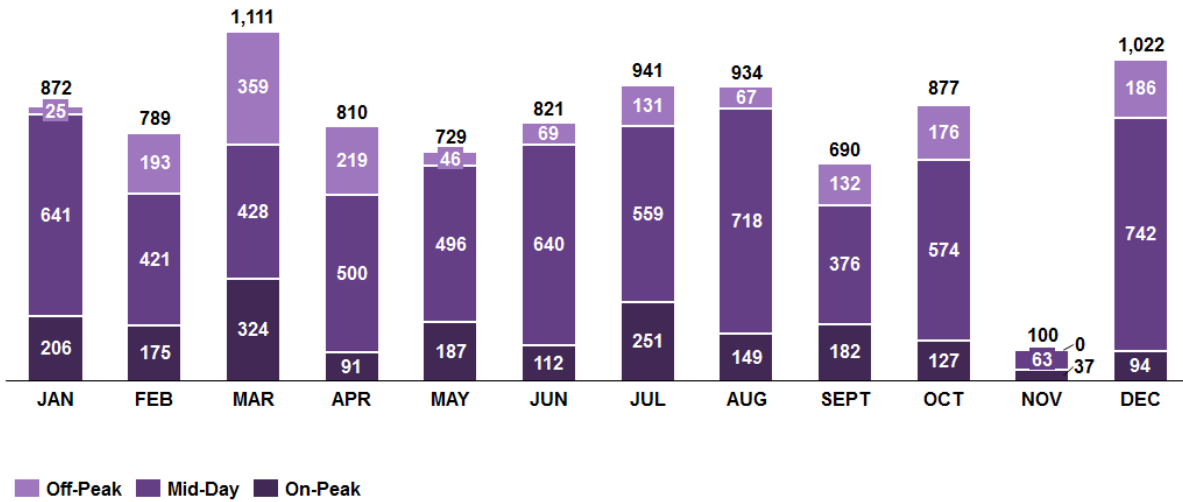
801 Dillingham– Energy (kWh) by time of day



801 Dillingham– Gross Revenue (\$) by time of day



801 Dillingham– # minutes by time of day



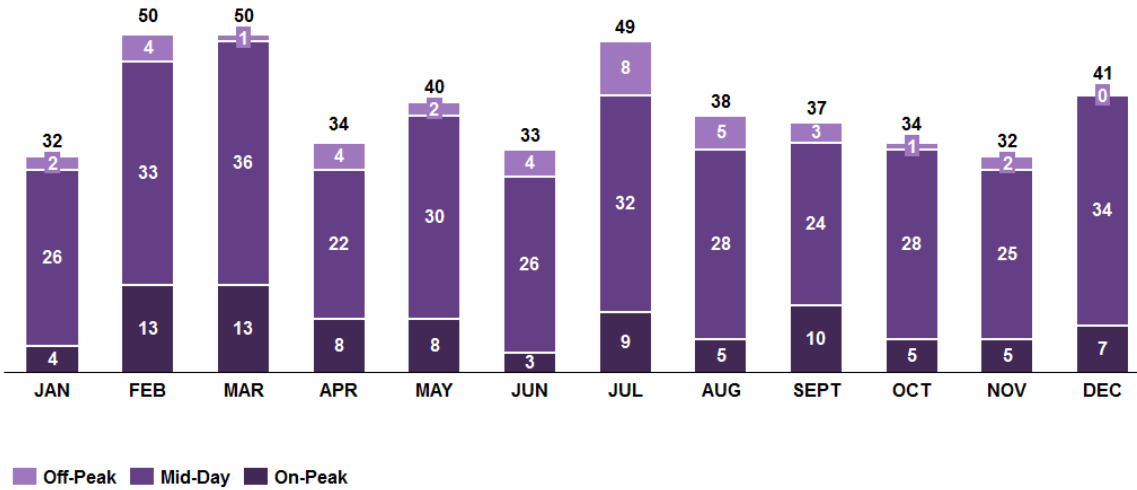
Appendix B

Details of Hawaiian Electric Charging Locations by Site

Hawai'i Electric Light's Hilo Office

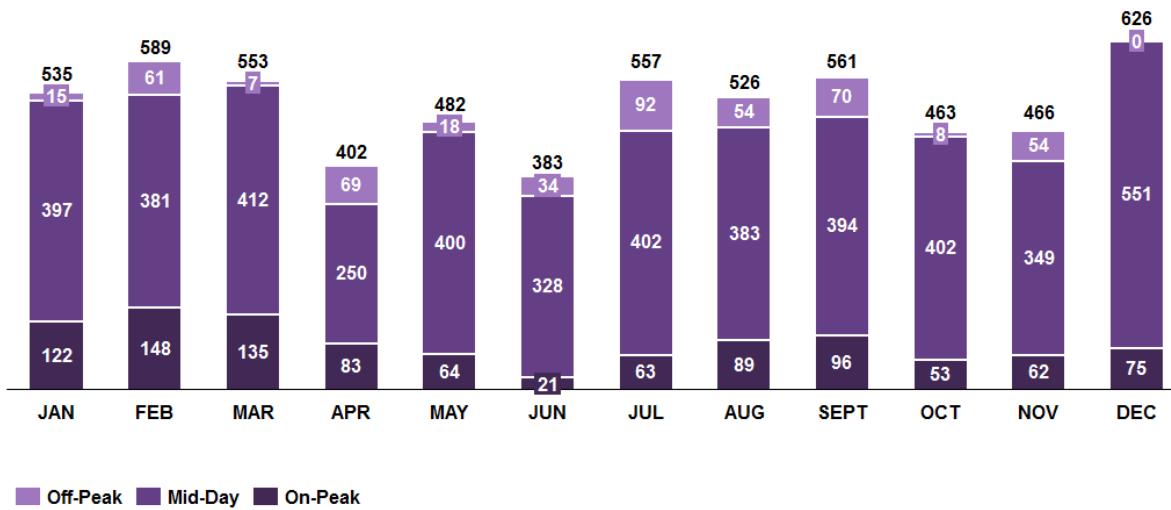
HELCO

HELCO's Hilo Office -- # of sessions by time of day

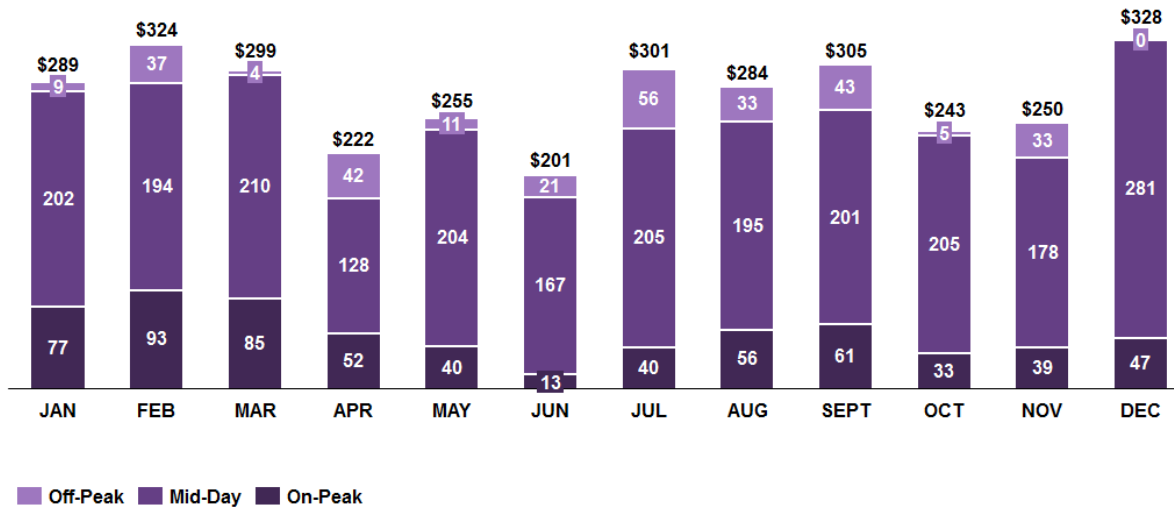


HELCO

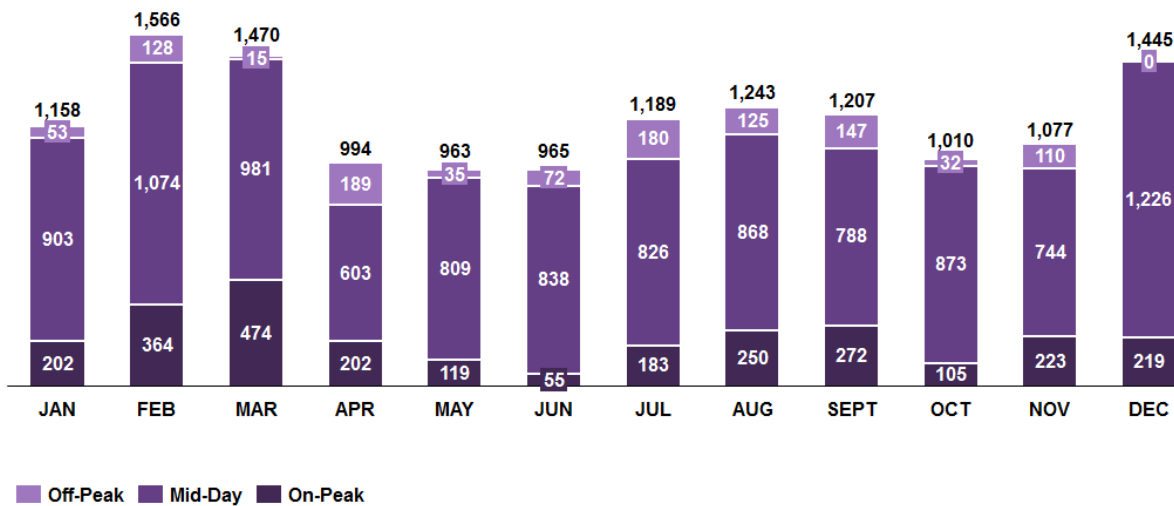
HELCO's Hilo Office— Energy (kWh) by time of day



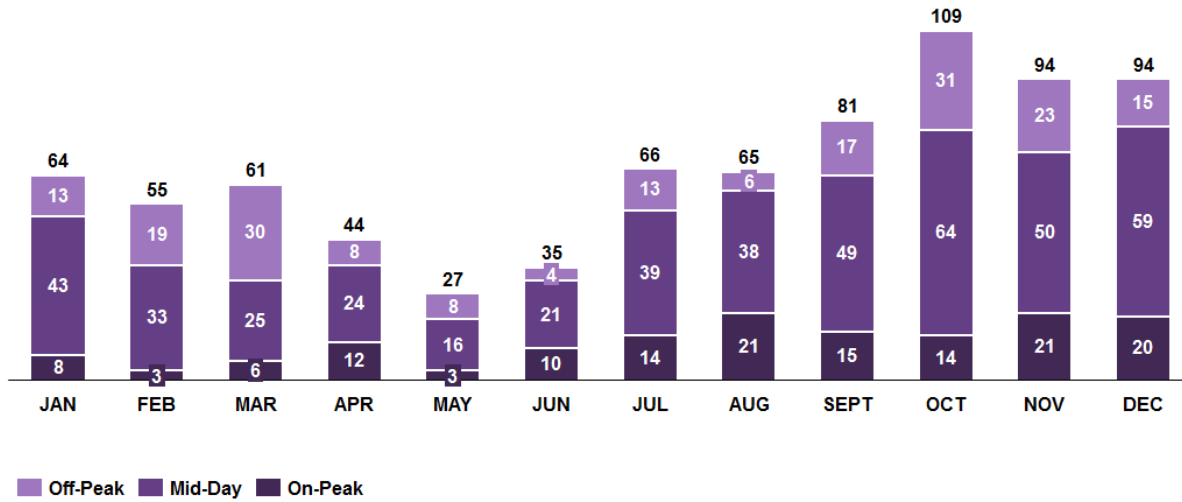
HELCO's Hilo Office– Gross Revenue (\$) by time of day



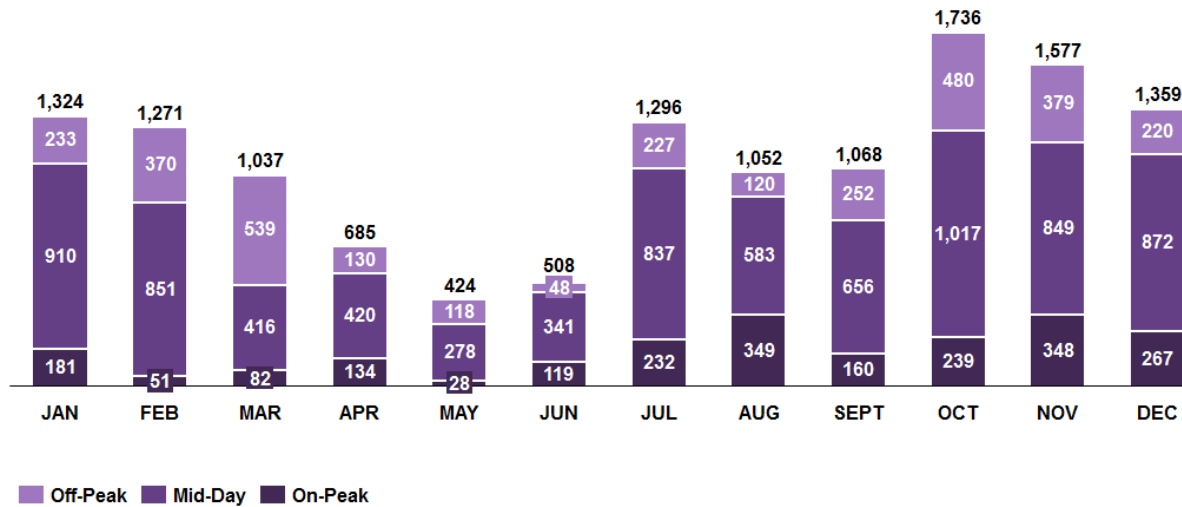
HELCO's Hilo Office– # minutes by time of day



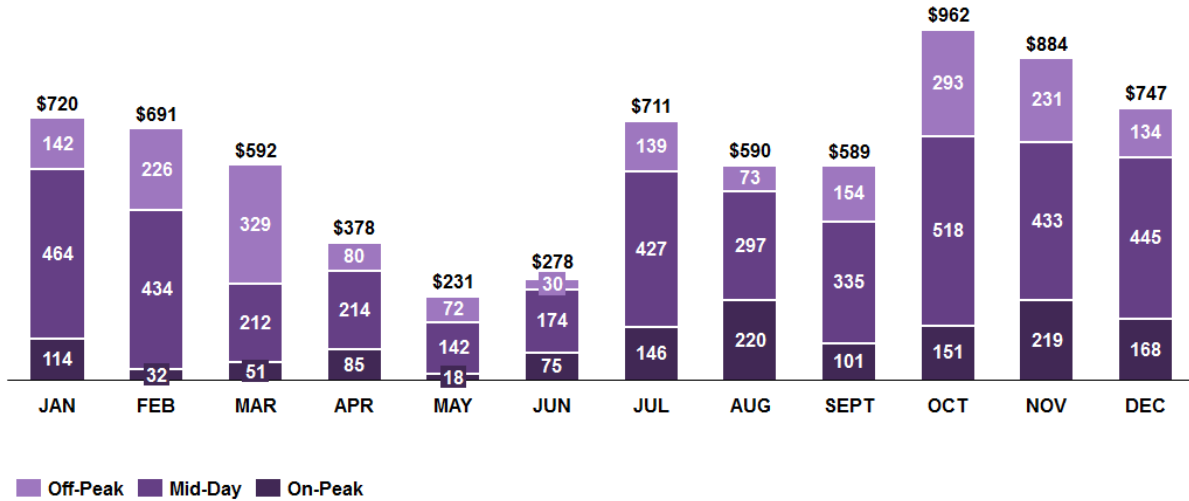
HELCO's Kona Office -- # of sessions by time of day



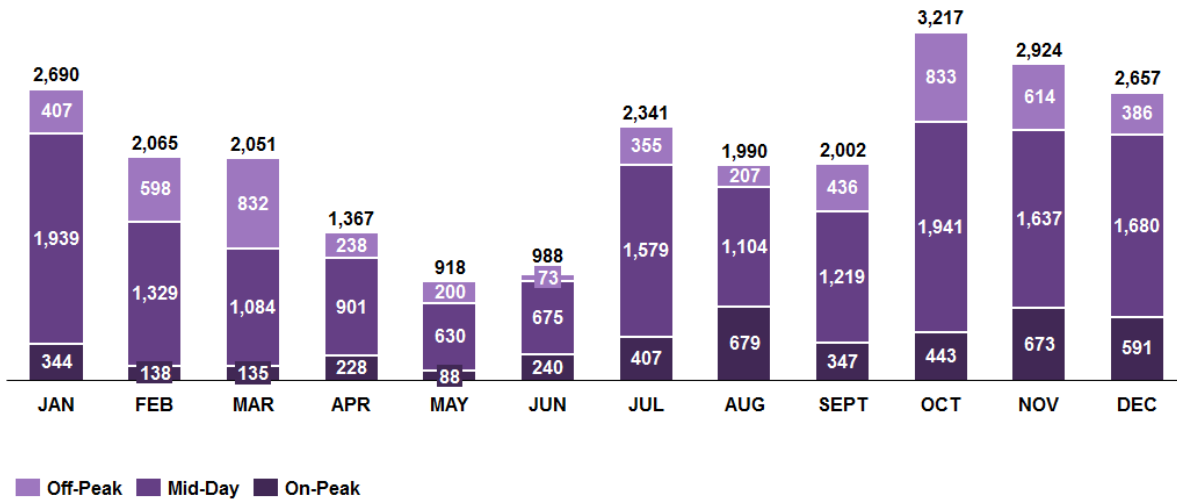
HELCO's Kona Office-- Energy (kWh) by time of day



HELCO's Kona Office– Gross Revenue (\$) by time of day



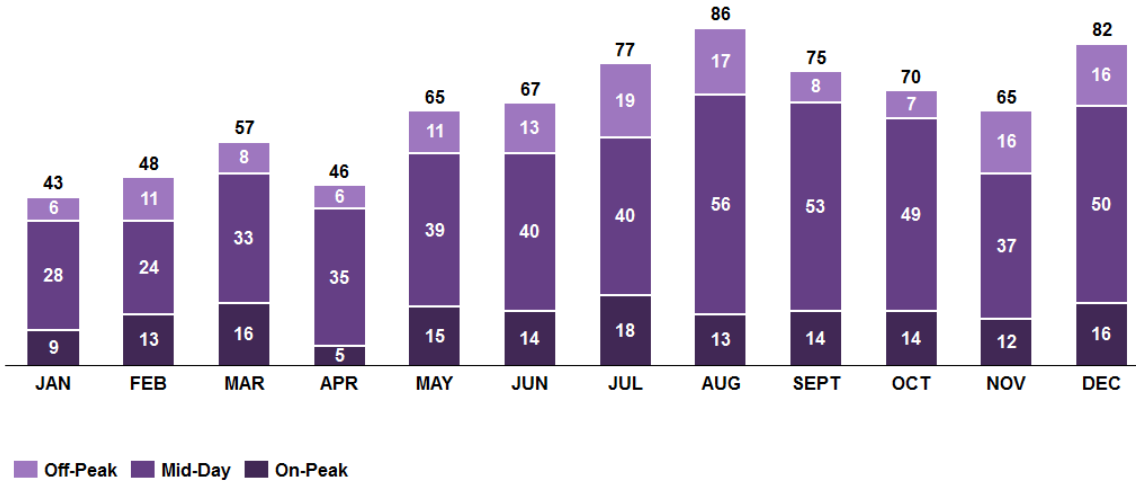
HELCO's Kona Office– # minutes by time of day



Waimea KTA

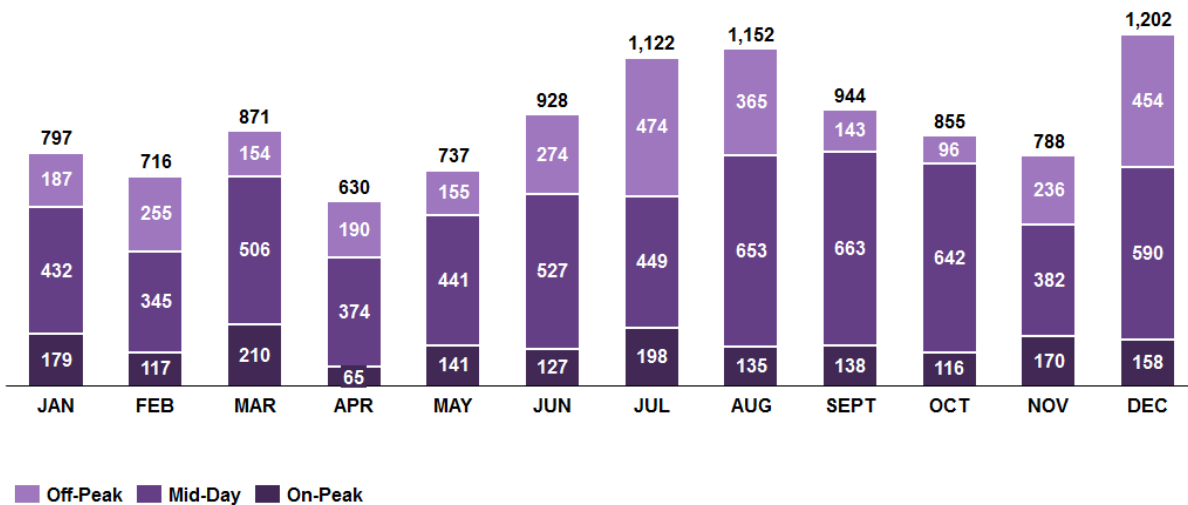
HELCO

Waimea KTA-- # of sessions by time of day

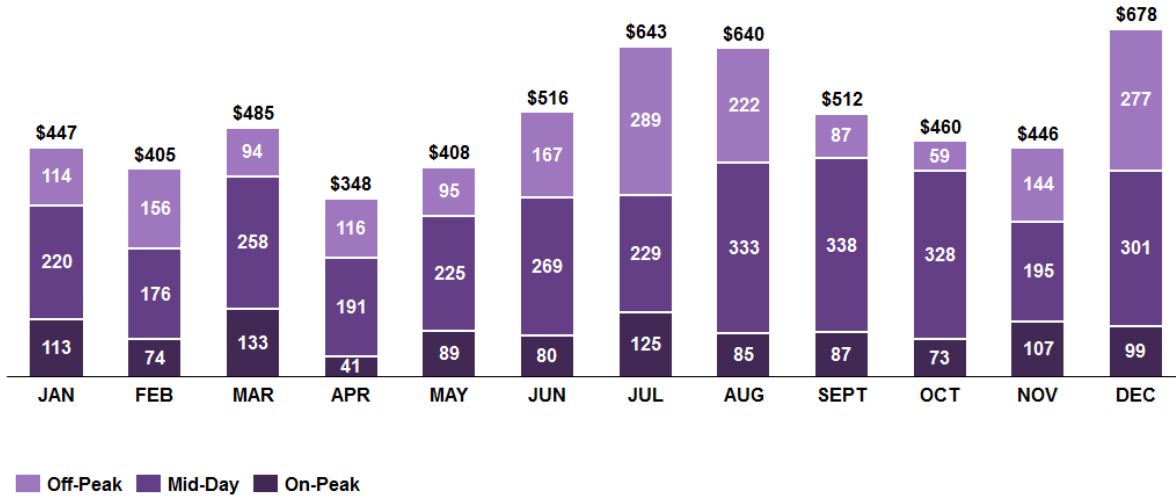


HELCO

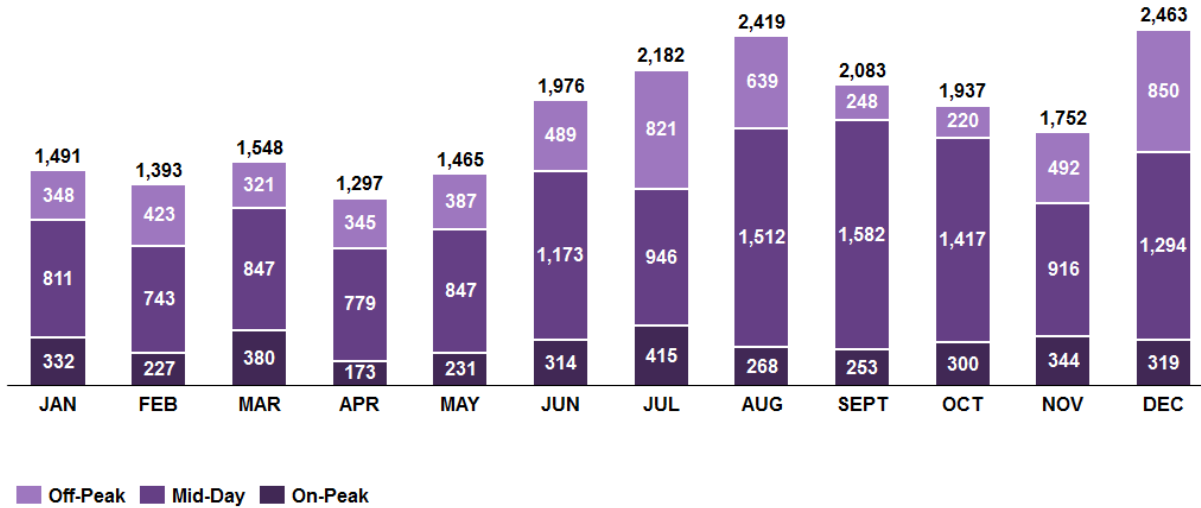
Waimea KTA– Energy (kWh) by time of day



Waimea KTA– Gross Revenue (\$) by time of day



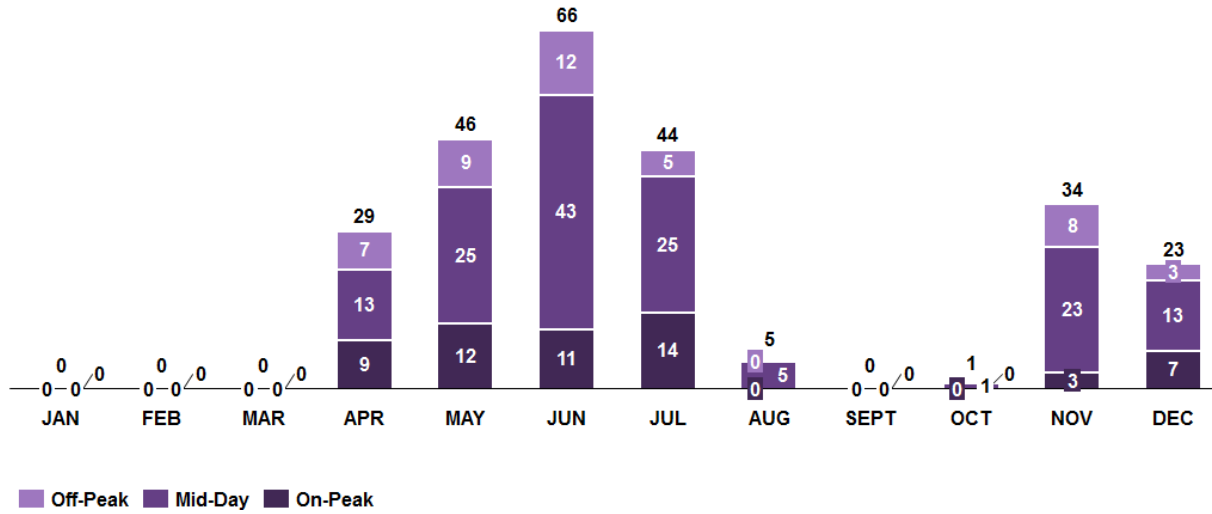
Waimea KTA– # minutes by time of day



The Shops at Mauna Lani

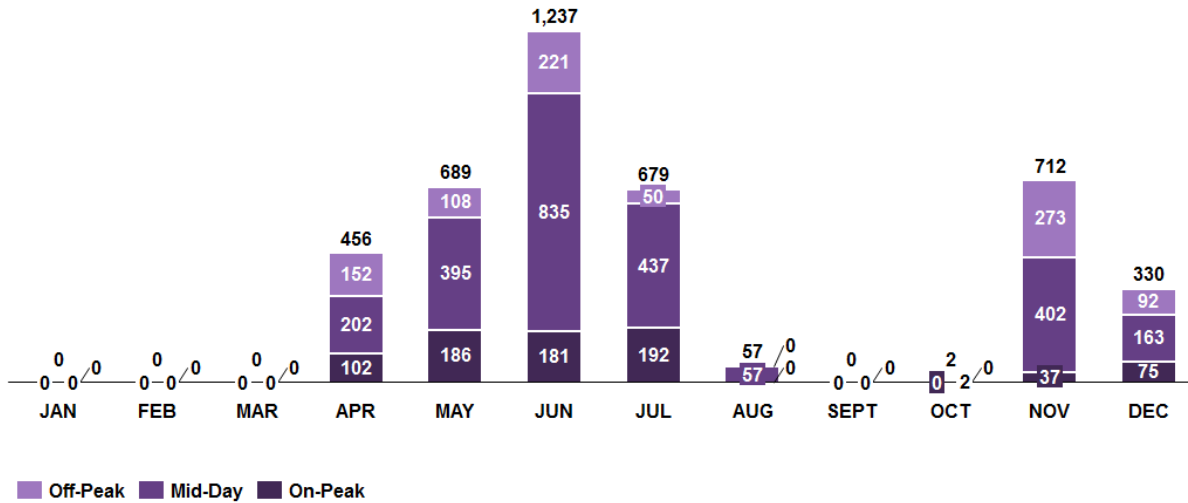
HELCO

The Shops at Mauna Lani--# of sessions by time of day

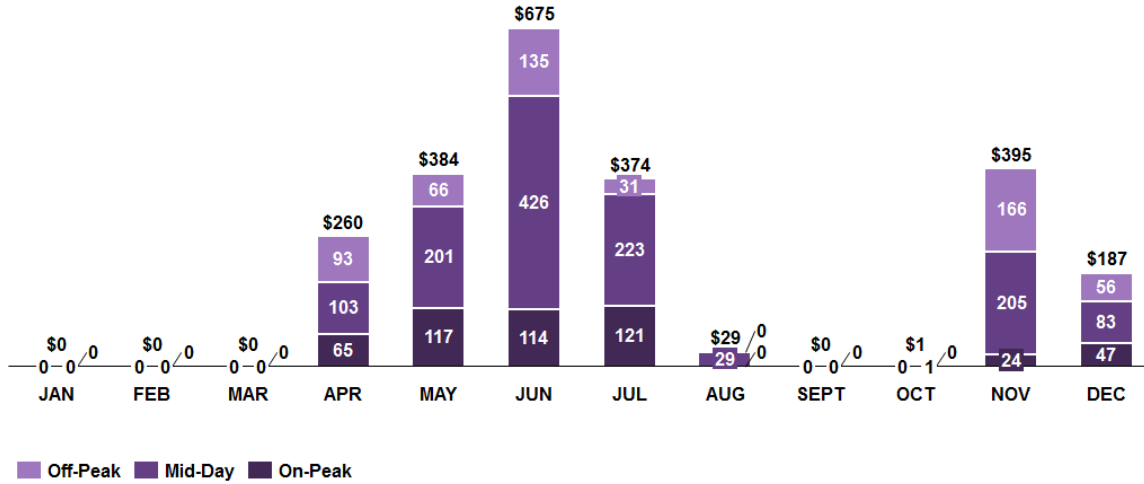


HELCO

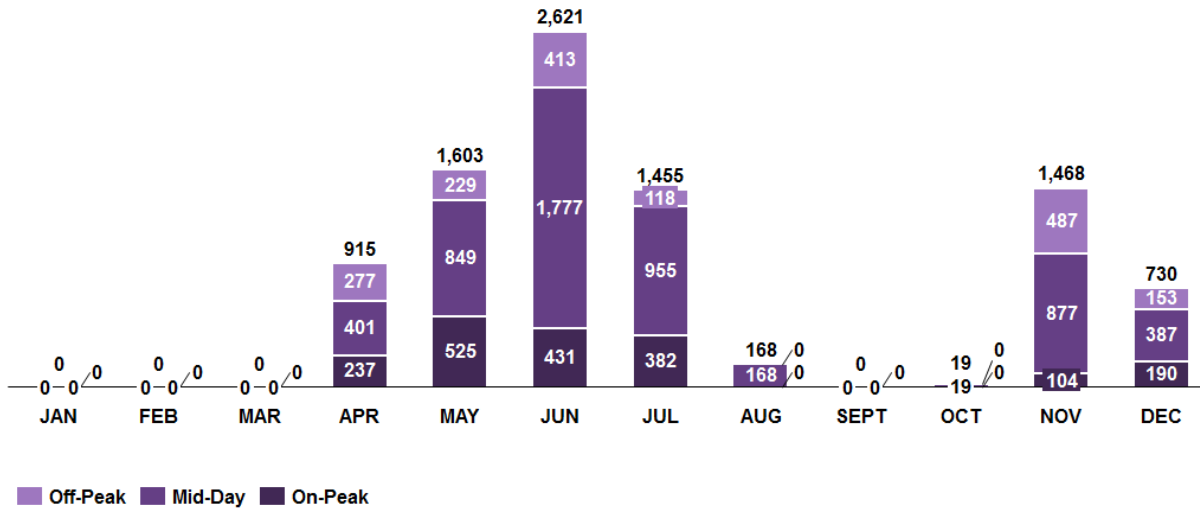
The Shops at Mauna Lani– Energy (kWh) by time of day



The Shops at Mauna Lani– Gross Revenue (\$) by time of day



The Shops at Mauna Lani– # minutes by time of day



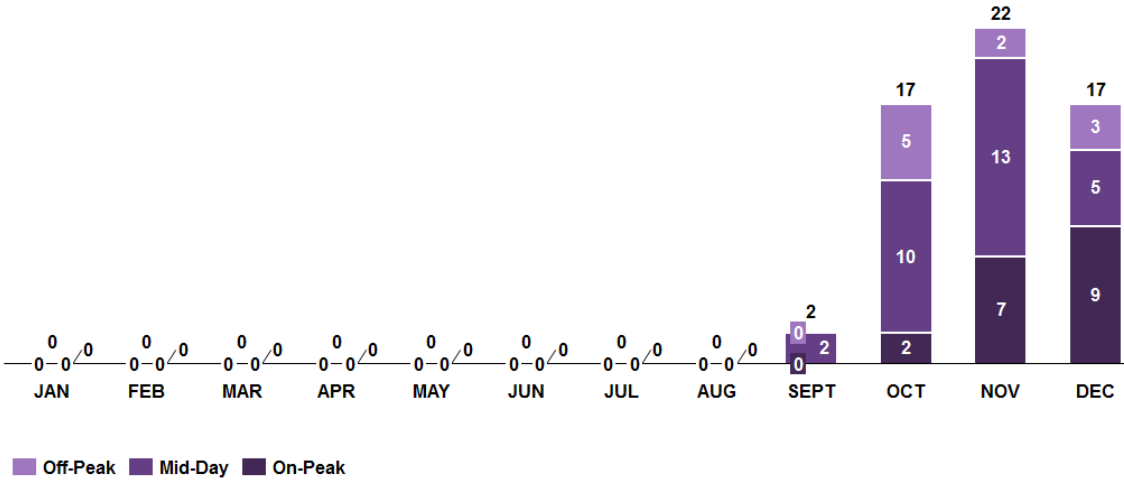
Appendix C

Details of Maui Electric Company Charging Locations by Site

Maui Electric's Kahului Office

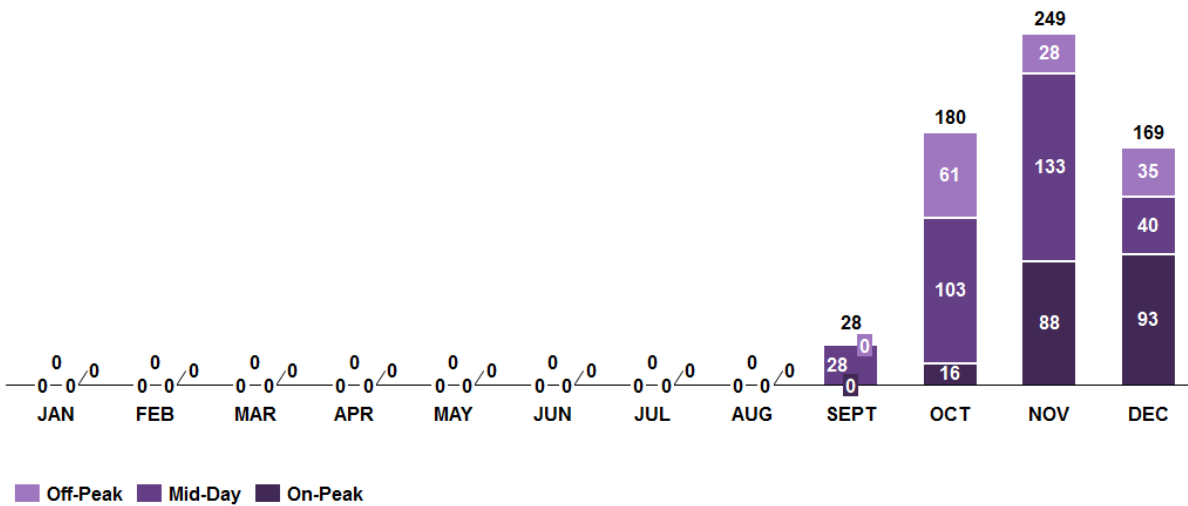
MECO-MAUI

MECO Kahului Office -- # of sessions by time of day

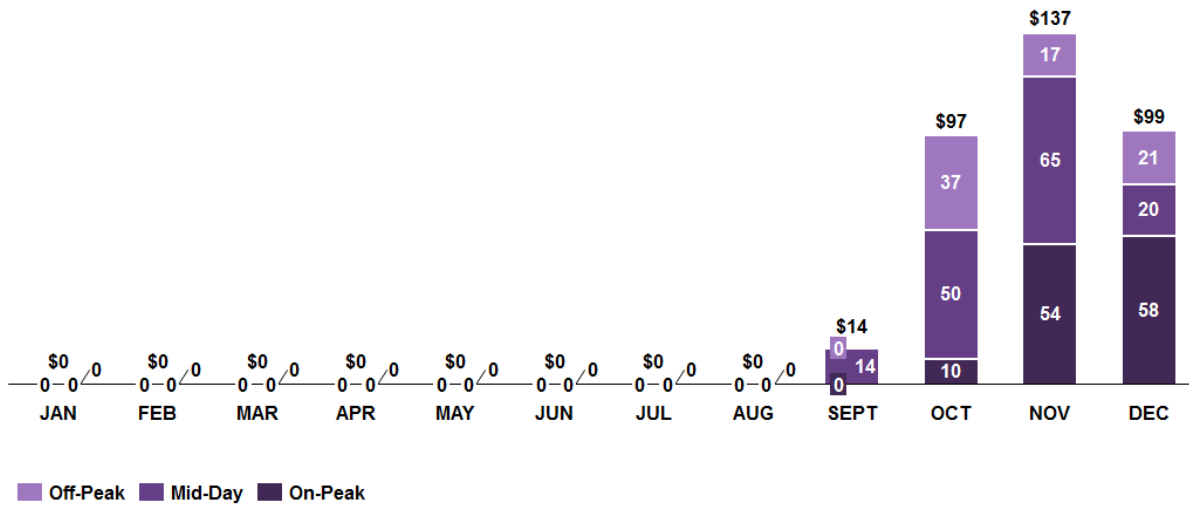


MECO-MAUI

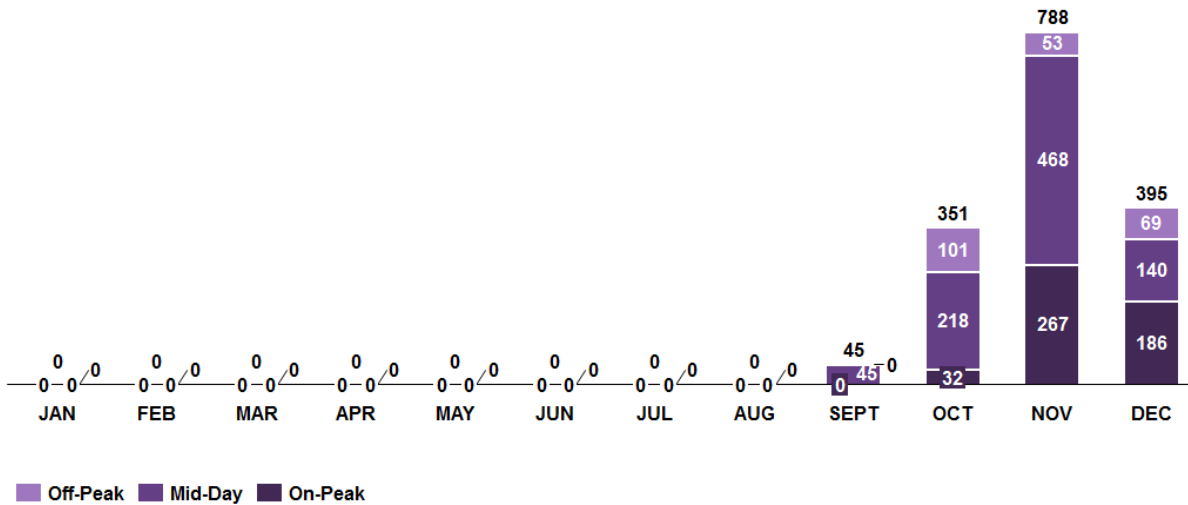
MECO Kahului Office– Energy (kWh) by time of day



MECO Kahului Office– Gross Revenue (\$) by time of day



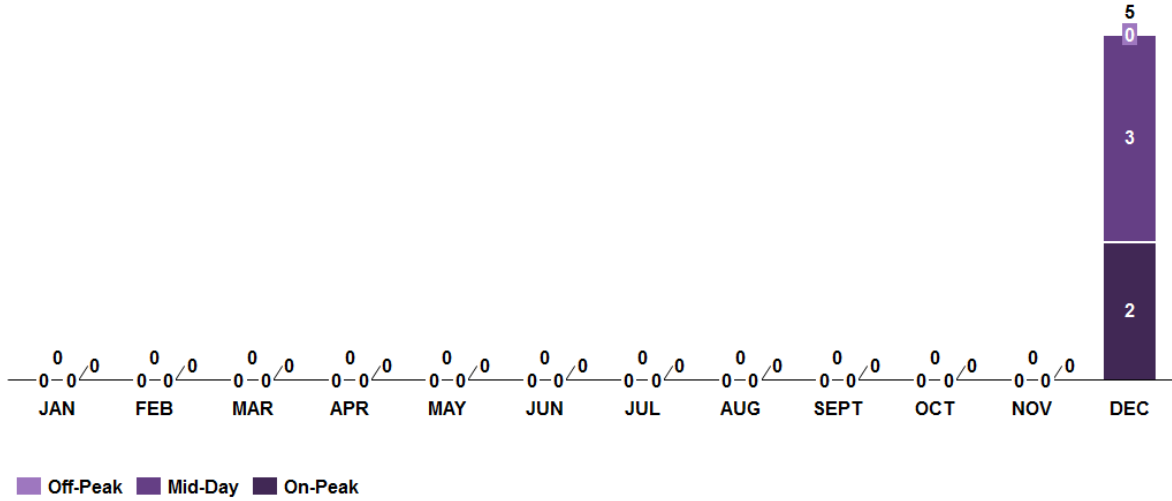
MECO Kahului Office– # minutes by time of day



Kaunakakai

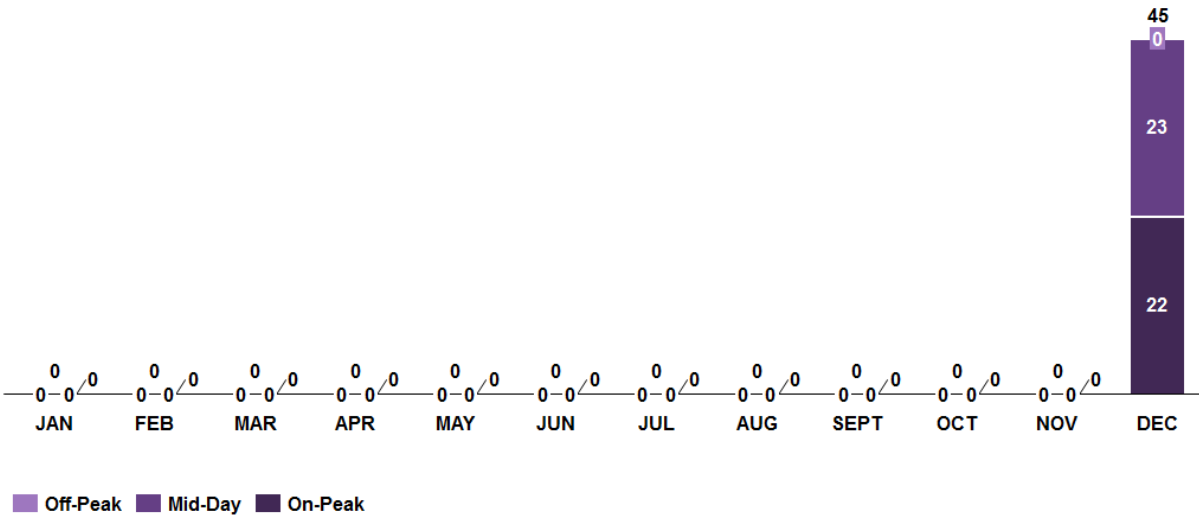
MECO-Molokai

Kaunakakai-- # of sessions by time of day

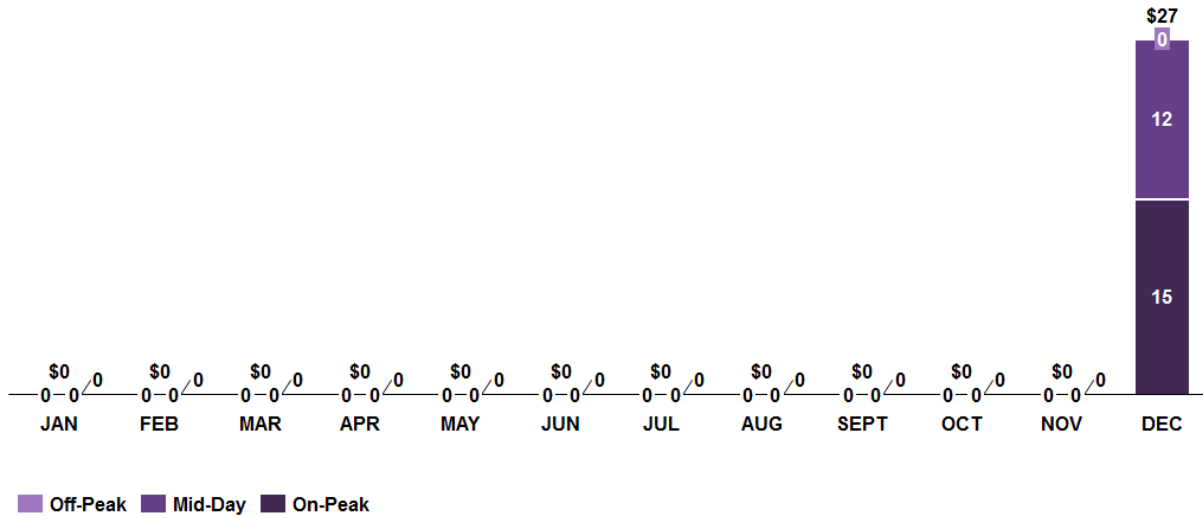


MECO-Molokai

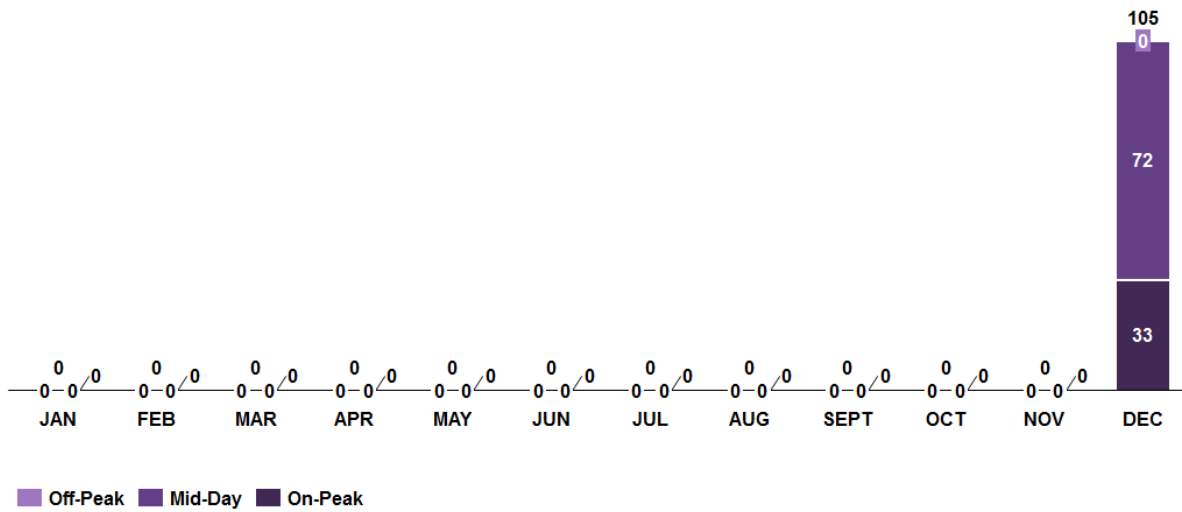
Kaunakakai– Energy (kWh) by time of day



Kaunakakai– Gross Revenue (\$) by time of day



Kaunakakai– # minutes by time of day



Appendix D

Details of Capital, O&M and Labor for EV-U from inception of pilot program

Program Costs Pilot Inception Through December 2018

	Hawaiian Electric	Hawaii Electric Light	Maui Electric	Totals
Revenue	\$ (204,705)	\$ (28,889)	\$ (471)	\$ (234,065)
Expenses				
Energy charge	\$ 146,292	\$ 28,927	\$ 10,304	\$ 185,523
Reverse energy charge	\$ (146,292)	\$ (28,927)	\$ (10,304)	\$ (185,523)
O&M				
Labor	\$ 585,483	\$ 6,366	\$ 43,385	\$ 635,234
Non-labor	\$ 121,937	\$ 3,670	\$ 42,022	\$ 167,629
Total Expenses	\$ 707,420	\$ 10,036	\$ 85,407	\$ 802,863
Capital costs, net of CIAC	\$ 1,365,753	\$ 919,227	\$ 116,276	\$ 2,401,256

Appendix E

In June 2016, the Companies filed Transmittal No. 13-07 requesting for an extension of the pilot term for Schedule EV-F and EV-U. In September 2016, the Consumer Advocate (“CA”) filed a submission of information requests. In part, CA-IR-13 requested to “indicate how the Schedule EV-F to Schedule J Revenue Comparison is forecasted to change annually based on the Hawaiian Electric Companies’ best utilization projections. . . .”⁵⁷ In October 2016, the Companies files responses to the CA stating “the Companies will provide an update to the analysis in response to CA-IR-13 b and d, in the subsequent Annual report, provided updated official Company EV forecasts are available.”⁵⁸

In 2018, as part of the Companies’ Roadmap and Addendum to the Roadmap, an updated EV forecast was developed for O’ahu, Maui and Hawai’i Island.⁵⁹ As such, the following is an update to CA-IR-13 b and d filed in October 2016. The following items were updated as part of this analysis: new EV forecast, updated utilization (# of sessions and energy consumed) data and TOU distribution based on the 2018 results in this report, and March 2019 effective rates for Schedule J, EV-F and EV-U. The following two tables summarize the forecasted subsidization through the end of the pilot program.

Year	Schedule J Revenue (a)	Schedule EV-U Revenue (b)	Difference (a-b)
2019	\$ 263,370	\$ 233,096	\$ 30,274
2020	\$ 361,626	\$ 372,336	\$ (10,710)
2021	\$ 454,849	\$ 516,907	\$ (62,058)
2022	\$ 470,232	\$ 550,118	\$ (79,886)
2023	\$ 235,116	\$ 275,059	\$ (39,943)

Year	Schedule J Revenue (a)	Schedule EV-F Revenue (b)	Difference (a-b)
2019	\$ 367,016	\$ 235,520	\$ 131,496
2020	\$ 509,285	\$ 378,176	\$ 131,109
2021	\$ 722,339	\$ 591,677	\$ 130,662
2022	\$ 983,941	\$ 828,669	\$ 155,272
2023	\$ 619,617	\$ 521,396	\$ 98,222

⁵⁷ Ibid, at page 62.

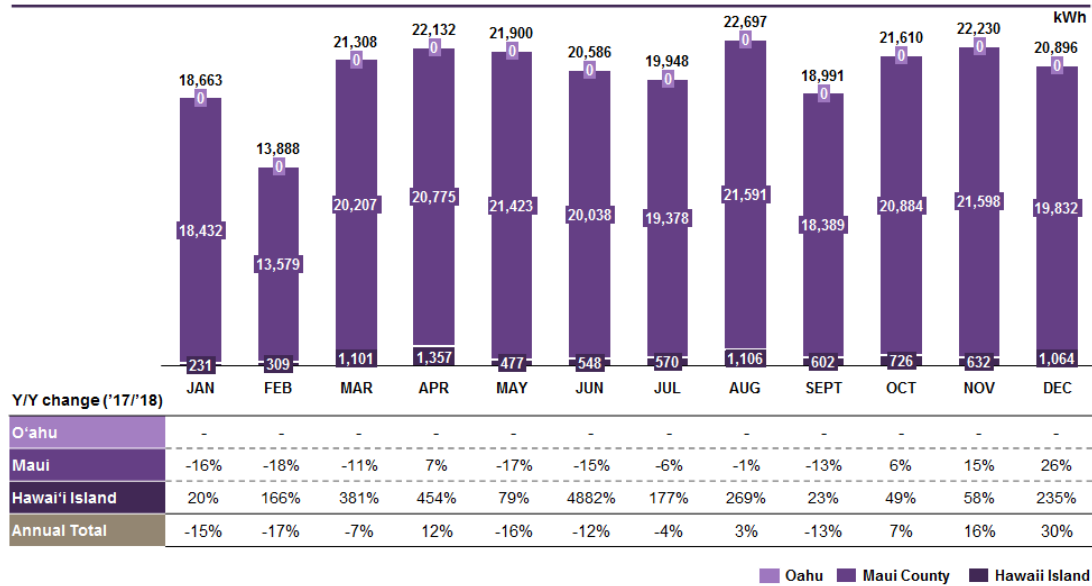
⁵⁸ Ibid, at CA-IR-12 page 76.

⁵⁹ Docket No. 2018 0135 Hawaiian Electric Companies Electrification of Transportation Roadmap filed on March 29, 2018 page 34 is the O’ahu light duty EV forecast. Docket No. 2018-0135 Addendum to Hawaiian Electric Companies Electrification of Transportation Strategic Roadmap filed on November 29, 2018. Exhibit B page 2 of 11 is the Maui light duty EV forecast and Exhibit C page 2 of 11 is the Hawai’i Island light duty EV forecast.

Appendix F

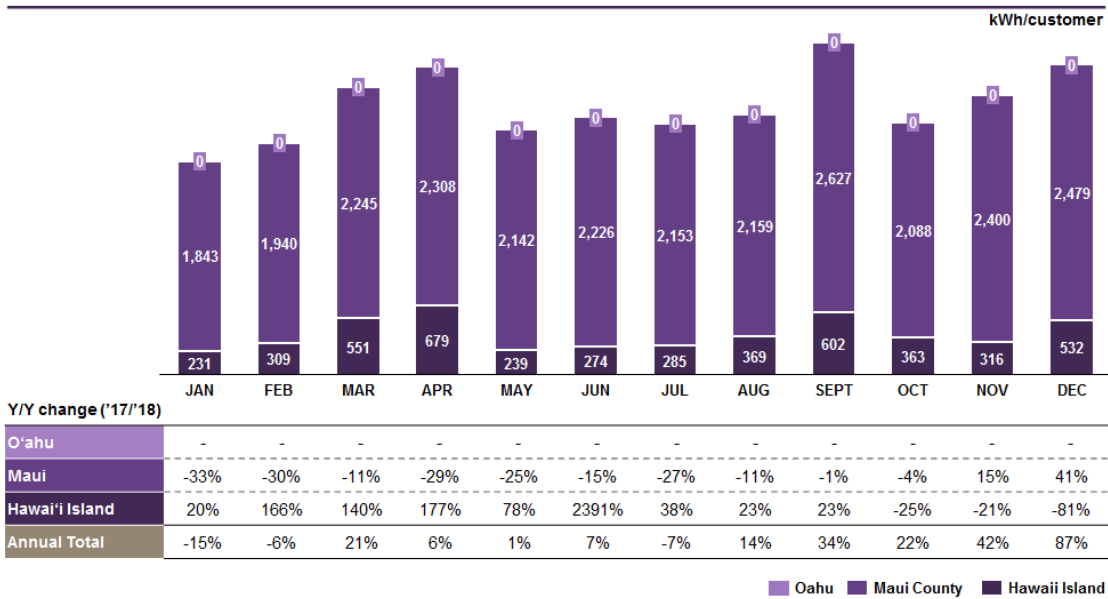
Details of EV-F for 2018 and comparison to 2017

2018 Billed kWh by month (EV-F)*



*customers may migrate in and out of the program during the calendar year

2018 Average kWh/customer billed by month (EV-F)*



*customers may migrate in and out of the program during the calendar year