

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 31, 2017

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Executive Summary

The Hawaiian Electric Companies¹ (“Companies”) continue to support third-party development of high-demand electric vehicle (“EV”) charging infrastructure through rate Schedule EV-F. Although third-party companies no longer provide fast charging services on O‘ahu, more fast charging stations were installed on Maui in 2016, resulting in a net increase in EV-F participation. The Hawaiian Electric Companies also supported State EV adoption by opening direct current (“DC”) fast charging stations at the Companies’ Honolulu office on Ward Avenue, in Hilo, and in Kona. At the end of 2016, eight DC fast charging stations were available throughout the Companies’ service territories. Construction of charging stations in Iwilei, Waianae, Waimea, and a second station at Ward Avenue also started in 2016.

Background

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), this 2016 report provides year ending December 31, 2016 information on the status of implementing Commercial Public Electric Vehicle Charging Service Pilot Rates Schedules EV-F and EV-U.

I. Schedule EV-F Tariff

On July 3, 2013, in accordance with Decision and Order No. 31338, the Hawaiian Electric Companies filed their commercial rate Schedule EV-F to be effective July 4, 2013 pursuant to certain terms, including:

1. The rate is applicable only to separately metered commercial public EV charging facilities providing charging services with demand no greater than 100 kW. The facility is limited to no more than 5 kW for ancillary load, such as area lighting.
2. Time-of-use (“TOU”) rate periods include Priority-Peak, Mid-Peak, and Off-Peak periods.

Priority-Peak	5:00 p.m.-9:00 p.m., Monday-Friday
Mid-Peak	7:00 a.m.-5:00 p.m., Monday-Friday
	7:00 a.m.-9:00 p.m., Saturday-Sunday
Off-Peak	9:00 p.m.-7:00 a.m., Daily
3. The maximum number of accounts is limited to: (A) 100 meters within Hawaiian Electric's service territory; (B) 40 meters within Hawai‘i Electric Light's service territory; and (C) 40 meters within Maui Electric’s service territory, consisting of its Lana‘i, Maui, and Moloka‘i Divisions.
4. The five year pilot is effective through June 30, 2018.

¹ The Hawaiian Electric 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”).

Schedule EV-F supports clean energy goals by encouraging “the development of public EV charging facilities by pricing electricity at levels that are lower than Schedule EV-C and Schedule J at lower energy consumption levels for start-up EV public charging operators.”²

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”.³ Therefore, as of October 1, 2015 Schedule EV-F is the only commercial EV rate available for EV charging services.

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 filed Order No. 33783 and opened Docket No. 2016-0168 for the purpose of reviewing the Companies’ request. On September 15, 2016, the Commission filed Order No. 33918, establishing the procedural schedule. On November 18, 2016, the Companies filed their Reply Statement of Position thereby completing the procedural schedule. Docket No. 2016-0168 remains open at the time of this report filing and ready for Commission decision-making.

A. Adoption and Status of Schedule EV-F

The Companies consider the electrification of transportation to play an integral role towards achieving State clean energy goals and eliminating Hawai‘i’s dependence on imported fossil fuels. The proliferation of EVs for ground transportation is a key component of the electrification of transportation in Hawai‘i. A memorandum of understanding (“MOU”) was co-signed by parties including the State of Hawai‘i Department of Business, Economic Development, and Tourism (“DBEDT”), State of Hawai‘i Department of Transportation, State of Hawai‘i Division of Consumer Advocacy, and the Hawaiian Electric Companies in December 2016. This MOU culminated in the formation of the Drive Electric Hawai‘i (“DEH”) Initiative which in part endeavors to “pursue opportunities to enable lower-cost electricity and electric drive transportation options for residents and businesses in Hawai‘i through near-term investments that support long-term value to all electric customers.”⁴ The Companies believe Schedule EV-F provides lower-cost EV charging options to customers which support businesses to invest in charging infrastructure and the transition to electric transportation.

The Hawaiian Electric Companies continue to recognize a need to support fast charging as alternatives to Level 1 or Level 2 charging services.⁵ It has been found that EV drivers prefer

² Transmittal No. 13-07 at 22.

³ Docket No. 2015-0342, Decision and Order No. 33165, issued on September 25, 2015, at 36. The Commission subsequently closed Docket No. 2015-0342 with Order No. 33279, filed October 23, 2015, stating “the commission’s review and adjudication of the Companies’ proposed electric vehicle time-of-use tariff schedules will be undertaken in Docket No. 2014-0192, as part of the commission’s consideration of all of the Companies’ proposed time-of-use tariff proposal as a whole”.

⁴ Drive Electric Hawai‘i Initiative “Memorandum of Understanding”, https://www.hawaiianelectric.com/Documents/about_us/news/2016/20161220_drive_electric_hawaii_mou_with_sig_natures.pdf, at 3.

⁵ SAE Level 1 generally utilizes a manufacturer provided charging cord plugged into a 120 VAC receptacle and provides approximately 4 miles for every hour charged. SAE Level 2 requires 240 VAC services and provides

fast charging and the EV industry is supporting higher powered fast charging. The 2015 Annual Report⁶ references studies finding EV drivers prefer DC fast charging 12 to 1 over Level 2 charging, and nearly half of all drivers of long-range battery EVs reported having used fast charging despite availability of only 3 percent fast charging stations among all public charging stations in the U.S. As the EV market matures, the industry is preparing for DC fast charging rates exceeding the currently provided 50 kW. EVgo, the nation's largest network of DC fast charging, recently announced the installation of its first public charging station with a maximum charging rate of 150 kW. This charging station has the capability to be upgraded to 350 kW. The industry is finding the need to "enable improved fast charging service in the future, helping . . . automotive [original equipment manufacturer] partners provide even more convenient and appealing options to their customers."⁷ As EV ownership and demand for faster charging services increase, innovative rate structures like EV-F can help lower the financial risk associated with start up EV charging facilities.

While fast charging deployment in Hawai'i is currently limited, continued growth in EV adoption may improve market conditions for increased market participation. As reported by DBEDT, EV ownership in the State increased by roughly 28% between January 2016 and January 2017.⁸ The continued availability of Schedule EV-F can help lower the financial risk for businesses to install new high demand charging. To date, "[r]oughly 70 percent of properties on O'ahu required to have an electric vehicle charging station have not installed one"⁹ Many businesses are sensitive to the cost of installing and operationing charging infrastructure especially considering "the stalls can be costly for businesses as some EV owners charge but don't shop."¹⁰ Lowering costs for businesses to install EV charging, such as providing relief from demand billing charges, is essential to futher support of EV adoption.

Table 1 below provides a breakdown of the number of customer accounts for each month in 2016 on the Schedule EV-F pilot rate for all the three Companies. On O'ahu, one commercial customer provided fast charging services at the three locations. The usage at these three sites dropped in 2016 and the customer removed the charging stations and terminated service at all three sites in July 2016. Growth in EV-F enrollment at Maui Electric is attributed to the JUMPSmart Maui program, which expanded in 2016 and provides participants unlimited access to the program's DC fast charging stations for a fee of \$15 or \$30 per month.¹¹ There were no changes in the number of external customers billed on Schedule EV-F between the end of 2015 to the beginning of 2016. While increased participation in this rate is currently low, improved

approximately 12 to 25 miles for every hour charged, depending upon the EV, the charge station, and the installation of the charging infrastructure.

⁶ Transmittal No. 13-17 for pilot Annual Report, filed March 30, 2016, at 12.

⁷ PluginCars.com, "Is 350-Kilowatt Ultra-Fast Charging the Future of EV Refueling?," October 20, 2016, available at <https://chargedevs.com/newswire/evgo-and-abb-deploy-150-kw-dc-fast-charging-station-for-industry-testing/>.

⁸ Department of Business, Economic Development and Tourism, *Monthly Energy Trend Highlights January 2017*, at 2. Available at http://files.hawaii.gov/dbedt/economic/data_reports/energy-trends/Energy_Trend.pdf.

⁹ Honolulu Star Advertiser, "Disregard of Law Causes EV Parking Shortage", February 27, 2017, available at <http://www.staradvertiser.com/2017/02/27/business/disregard-of-law-causes-ev-parking-shortage/>.

¹⁰ *Id.*

¹¹ JUMPSmart Maui participants were provided DC fast charging for \$15 per month, and non-participants were provided access to these charging stations for \$30 per month. JUMPSmart Maui, *Phase II (v1)*, available at <http://www.jumpsmartmaui.com/electric-vehicles/>.

EV market adoption should increase interest in high-demand EV charging services. During this stage of early EV adoption, many third-party business are currently not installing charging infrastructure due to the cost of infrastructure and separately metered service. As more third-party businesses begin to appreciate the benefits of installing multiple Level 2 charging stations or a DC fast charging station on site host property, and the cost of infrastructure decreases due to market competitiveness, the Companies expect rate participation to increase.

Table 1
Schedule EV-F Customers Billed
January-December 2016

Month	Hawaiian Electric	Hawai'i Electric Light	Maui Electric	Total
January	3	1	2	6
February	3	1	2	6
March	3	1	2	6
April	3	1	2	6
May	3	1	4	8
June	3	1	4	8
July	3	1	4	8
August	0	1	5	6
September	0	1	6	7
October	0	1	6	7
November	0	1	6	7
December	0	1	7	8

As reflected in Table 2 below a total of 180,156 kWh were billed under Schedule EV-F in the year 2016. The larger kWh consumption at Maui Electric is attributed to the JUMPSmart Maui program.

Table 2
Schedule EV-F kWh Billed
January-December 2016

Month	Hawaiian Electric	Hawai'i Electric Light	Maui Electric	Total
January	702	206	8,042	8,950
February	560	120	7,733	8,413
March	290	161	7,766	8,217
April	253	175	8,026	8,454
May	243	0	16,610	16,853
June	228	137	17,463	17,828
July	245	115	16,602	16,962
August	0	223	18,482	18,705
September	0	305	20,918	21,223
October	0	178	15,350	15,528
November	0	308	19,964	20,272
December	0	252	18,499	18,751
TOTAL	2,521	2,180	175,455	180,156

The average billed kWh per customer account is provided in Table 3 below. As stated above, the larger average kWh consumption on Maui is attributed to the JUMPSmart Maui program. New JUMPSmart charging stations were installed in August, September and December 2016. These new locations were not utilized as much as the existing locations, lowering the overall average kWh consumption per site during those months.

Table 3
Schedule EV-F Average kWh Billed per Account
January-December 2016

Month	Hawaiian Electric	Hawai‘i Electric Light	Maui Electric	Company Average
January	234	0	4,021	1,492
February	187	0	3,867	1,402
March	97	161	3,883	1,370
April	84	175	4,013	1,409
May	81	0	4,153	2,107
June	76	137	4,366	2,229
July	82	115	4,151	2,120
August	0	223	3,696	3,118
September	0	305	3,486	3,032
October	0	178	2,558	2,218
November	0	308	3,327	2,896
December	0	252	2,643	2,344
ANNUAL AVERAGE	120	182	3,509	2,171

The Companies defined rate Schedule EV-F such that “[w]hen monthly consumption exceeds around 5,000 kWh on a regular basis, the public EV charging facility may be considered large enough such that it no longer needs rate tariff support.”¹² As monthly average billed kWh remains below 5,000 kWh per month, the Companies believe Schedule EV-F is still needed to further support the development of third-party EV charging facilities. The Companies will continue to monitor the utilization of the EV-F rate as the market matures and demand for EV charging grows.

Table 4 below provides a breakdown of Schedule EV-F consumption in each TOU period for each service territory in 2016. Throughout the Companies’ service territories, 17.6% of the energy was consumed during the tariff’s Priority-Peak, 68.8% during the Mid-Peak, and 13.6% during the Off-Peak. Currently, the Companies are not aware of any of the Schedule EV-F customers extending a TOU fee to their EV driving customers. However, the Companies are currently contemplating potential changes to the rate to further align EV drivers’ needs with existing TOU rate periods, and better align with the dynamic needs of the grid. As stated in the Companies’ Reply Statement of Position to Docket No. 2016-0168, “The Companies are agreeable to the Consumer Advocate’s [suggestion] that within 90 days of a Commission decision and order approving the Companies’ proposed Pilot extension, the Companies will submit revised rate structures that better align rates with updated information regard charging session costs, system costs, and the system need.”¹³

¹² Transmittal No. 12-05, filed October 26, 2012, at 22.

¹³ Hawaiian Electric Companies’ Reply Statement of Position, Docket No. 2016-0168, filed November 18, 2016, at 10.

Table 4
Schedule EV-F Billed kWh Consumption by TOU Period
January-December 2016

Territory	Priority	Mid	Off	Total
Hawaiian Electric	364	1,337	820	2,521
Hawai'i Electric Light	291	1,625	264	2,180
Maui Electric	31,033	120,920	23,502	175,455
TOTAL	31,688	123,882	24,586	180,156
PERCENTAGE	17.6%	68.8%	13.6%	100.0%

B. Summary of Cost and Revenue

Table 5 below presents a breakdown of the revenue generated each month from Schedule EV-F for the three Companies. In 2016, \$60,874.82 in revenue was generated from customers under the Schedule EV-F Pilot rate.

Table 5
Schedule EV-F Revenues
January-December 2016

Month	Hawaiian Electric	Hawai'i Electric Light	Maui Electric	Total
January	\$ 311.53	\$ 105.64	\$ 2,677.88	\$ 3,095.05
February	\$ 260.54	\$ 72.05	\$ 2,493.29	\$ 2,825.88
March	\$ 173.84	\$ 87.12	\$ 2,499.84	\$ 2,760.80
April	\$ 161.42	\$ 90.16	\$ 2,641.60	\$ 2,893.18
May	\$ 159.36	\$ 29.65	\$ 4,479.54	\$ 4,668.55
June	\$ 154.96	\$ 75.31	\$ 5,649.96	\$ 5,880.23
July	\$ 163.89	\$ 67.36	\$ 5,630.85	\$ 5,862.10
August	\$ -	\$ 104.69	\$ 6,387.46	\$ 6,492.15
September	\$ -	\$ 135.51	\$ 7,204.99	\$ 7,340.50
October	\$ -	\$ 90.28	\$ 6,139.03	\$ 6,229.31
November	\$ -	\$ 136.37	\$ 6,570.07	\$ 6,706.44
December	\$ -	\$ 117.08	\$ 6,003.55	\$ 6,120.63
TOTAL	\$ 1,385.54	\$ 1,111.22	\$ 58,378.06	\$ 60,874.82

Incremental costs to support Schedule EV-F, including cost to enroll and bill customers, are *de minimis*. The labor to support the participation of this rate is similar to other rates and participation is currently limited.

C. Subsidization by non-participating customers

As discussed in the Companies' 2015 Annual Report, "Schedule EV-F is meant to support the development of EV charging infrastructure, which may otherwise be uneconomical

for customers to install under a pre-existing tariff.”¹⁴ 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.”¹⁵ The Companies contend that such a rate can help to reduce initial cost barriers for prospective third-party infrastructure providers and incentivize greater investment in infrastructure.

Table 6 below summarizes the total monthly revenue generated from Schedule EV-F compared to the potential revenue generated if the charging facility were billed under each Company’s respective Schedule J.¹⁶ The potential Schedule J revenue provided in Table 6 is calculated based on an assumed monthly billing demand of 47.5 kW.¹⁷ The total potential revenue under Schedule EV-J for the year 2016 was \$28,777.45 above revenues from Schedule EV-F.

Table 6
Schedule EV-F to Potential Schedule J Revenue Comparison
January-December 2016

Month	Total Schedule EV-F	Potential Schedule J	Difference
January	\$ 3,095.05	\$ 4,448.49	\$ 1,353.44
February	\$ 2,825.88	\$ 5,581.14	\$ 2,755.26
March	\$ 2,760.80	\$ 5,542.15	\$ 2,781.35
April	\$ 2,893.18	\$ 5,657.06	\$ 2,763.88
May	\$ 4,668.55	\$ 8,663.50	\$ 3,994.95
June	\$ 5,880.23	\$ 8,893.85	\$ 3,013.62
July	\$ 5,862.10	\$ 9,128.13	\$ 3,266.03
August	\$ 6,492.15	\$ 8,081.49	\$ 1,589.34
September	\$ 7,340.50	\$ 8,681.36	\$ 1,340.86
October	\$ 6,229.31	\$ 7,740.36	\$ 1,511.05
November	\$ 6,706.44	\$ 8,708.49	\$ 2,002.05
December	\$ 6,120.63	\$ 8,526.25	\$ 2,405.62
TOTAL	\$ 60,874.82	\$ 89,652.27	\$ 28,777.45

D. Recommendation of revisions to rate structures

Decision and Order No. 31338 requires that the Companies “determine and recommend any revisions to the applicable rate structures that are necessary to: (A) meet the objectives of sufficiently addressing “range anxiety” among EV end-users and conducting the Companies’

¹⁴ Transmittal No. 13-17 for pilot Annual Report, filed March 30, 2016, at 11.

¹⁵ Idaho National Laboratory, “What is the Impact of Utility Demand Charges on a DCFC Host?”, June 2015

¹⁶ 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.

¹⁷ A typical EV will fast charge at power up to 50 kW, but will reduce power as the battery state of charge increases.

research, development, and demonstration activities related to EV charging technologies and load control; and (B) minimize the level or extent of subsidization by non-participating ratepayers”¹⁸.

Addressing Range Anxiety

As previously discussed, high demand charging is essential to support EV adoption and meet drivers’ needs. The growth of fast charging infrastructure is vital to continued EV adoption, not only to alleviate range anxiety, but to also provide essential charging infrastructure to drivers living in condominiums, townhouses, and apartments.

Company Research, Development, and demonstration activities related to EV charging Technologies and Load Control

The Hawaiian Electric Companies do not recommend any revisions to Schedule EV-F at this time to facilitate further research or development. New technologies and load control for DC fast charging may be developed on Company-owned and operated DC fast charging stations under Schedule EV-U. This strategy provides third-party developers surety that their investment will not be constrained by excessive technological requirements. Currently through the demonstration projects with the Demand Response team, testing is being done on different types of EV chargers to verify their capability to provide various grid services. Pending results of the demonstration, the Companies will develop load control strategies for EV for consolidation with broader demand response efforts.

Minimize the level or extent of subsidization by non-participating ratepayers

It must be stated that the concept of subsidization for the tariff rate structure by non-participating ratepayers is not necessarily the same when dealing with electric vehicle charging as it would be from other utility programs. In particular, some portion of electric vehicle charging is additive load that would not otherwise exist on the system. To the extent that the provision of the tariffs incentivize or enable customers to purchase or lease a new electric vehicle, this new load, charging at any rate provided in the Companies’ rate structure should not necessarily be characterized as benefitting from a subsidy *per se*. In other words, electric vehicle charging may be considered incremental additional discretionary load that occurs over and above the existing load on the system. As the EV market continues to grow, this rate will provide support for third parties to operate new charging infrastructure and provide incremental load. Therefore, Schedule EV-F and EV-U rates that support this incremental load should not be considered as subsidized by other ratepayers. Further, the revenues collected by the incremental discretionary load of electric vehicle charging would not contribute to overall Company profits, but instead would constitute contributions to fixed costs and support the State’s transition to cleaner transportation.

¹⁸ Transmittal No. 13-07, filed July 1, 2013, at 41. As set forth by the Companies in its Reply Statement of Position in Docket 2016-0168, if the proposed Pilot extension is approved by the Commission, the Companies will “submit revised rate structure[s] that better align rates with updated information regarding charging session costs, system costs, and system need.” See Companies’ Reply Statement of Position, filed November 18, 2016, at 11.

II. Schedule EV-U Tariff

On July 3, 2014, in accordance with Decision and Order No. 31338, the Hawaiian Electric Companies filed their commercial rate Schedule EV-U to be effective July 4, 2013 pursuant to certain terms, including:

1. Company-operated public charging facilities are based upon a fee-per-charge session.
2. Per session fees during the Priority-Peak and Off-Peak periods are set no more than \$0.50 above and \$0.50 below the Mid-Peak fee, respectively.
3. The maximum, aggregate amount of Company accounts will be 25.
4. The Company may curtail charging of EVs under certain circumstances.
5. The five year pilot is effective through June 30, 2018.

Schedule EV-U is 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”).¹⁹

A. Describe and Review the Adoption and Status of Schedule EV-U

Hawaiian Electric New Site Installation

In 2015, Hawaiian Electric opened four charging stations at strategic public sites around O‘ahu. In 2016, Hawaiian Electric installed three more charging stations and started construction at an additional site.

- In March 2016, a DC fast charging station was opened at the Hawaiian Electric’s main office on Ward Avenue. This charging station provides fast charging service to customers that commute into Honolulu, as well as nearby EV owners that live in MUDs. A media release (see Attachment A) was provided on April 7, 2016.
- In December 2016, a second DC fast charging station completed construction at Hawaiian Electric’s Ward Avenue location, and it was made available for use in early January 2017.
- Also in December 2016, a DC fast charging station completed construction at the Waianae Mall. Although construction completed in 2016, the network provider commissioned the charging station in January 2017. This station brings fast charging to the leeward coast and will serve to incentivize EV adoption in this area.

¹⁹ This tariff is under review for extension with the Commission at the time of this filing, in Docket No. 2016-0168.

Utilization of the charge station at Hawaiian Electric's main office quickly grew, presenting an opportunity to provide an additional station to meet growing demand for facilities in urban Honolulu. Therefore, Hawaiian Electric purchased and installed a second charging station, which was opened to the public on January 1, 2017.

As stated in the jointly signed Transmittal No. 13-07, the "Companies will competitively bid for Schedule EV-U EV fast charging system[s]."²⁰ The request for proposals ("RFP") for the first charging station at Hawaiian Electric's main office included the equipment, network services, and the development of software to demonstrate demand response capabilities. This RFP was awarded to Zeco Systems Inc. doing business as Greenlots ("Greenlots"). The second charging station at the Company's main office was also provided by Greenlots. The RFP for the equipment and network for the charging station at Waianae Mall was awarded to OpConnect, LLC ("OpConnect"). The RFP requested bids for two charging stations, with the second station targeted to be available April 2017.

Hawai'i Electric Light New Site Installation

Hawai'i Electric Light installed three charging stations, opening two of them for service in 2016. A media release (see Attachment A) was provided for both sites on May 24, 2016.

- In May 2016, Hawai'i Electric Light opened a DC fast charging station at their offices located at 1200 Kilauea Avenue, Hilo.
- Also in May 2016, Hawai'i Electric Light opened a DC fast charging station at their offices located at 74-5519 Kaiwi Street, Kailua-Kona.
- In December 2016, the construction of a third DC fast charging station was completed at a new parking lot for a KTA grocery store at 65-1158 Mamalahoa Highway, Waimea. This third location is approximately 40 miles from the Kailua-Kona and 56 miles from the Hilo locations, providing an intermediate EV charging option for commuters between Hilo and Kona. The Waimea charge station was opened to the public in January 2017.

The three charge stations were acquired through a single RFP, which was awarded to Greenlots.

Maui Electric New Site Installation

In June 2014, Maui Electric began providing DC fast charging services to the public at their headquarters located at 210 W. Kamehameha Avenue, Kahului, Maui. The JUMPSmart Maui project currently provides DC fast charging at 13 locations on Maui, with most locations providing facilities to charge more than one EV at a time. As of March 2016, the JUMPSmart Maui project provides DC fast charging for \$15 or \$30 per month.²¹ Assuming an EV owner travels the average annual vehicle miles on Maui and obtains all of their charging needs from the JUMPSmart Maui program, this equates to an effective electricity rate slightly below \$0.08 per

²⁰ Transmittal No. 13-07, filed June 3, 2013, at 14.

²¹ JUMPSmart Maui, DC Charging Locations, available at <http://www.jumpsmartmaui.com/dc-charger-locations/>.

kilowatt hour or \$0.15 per kilowatt hour based upon the monthly fees above. These effective rates are extremely cost-competitive when compared to similar fast charge options such as: under the Schedule EV-U rate, at other public DC fast charging stations providing service under Schedule EV-F, or even the driver’s residence.²² At this time, the Companies have not committed to develop additional charging locations on Maui and continue to evaluate how they can best provide fast charging services in conjunction with the JUMPSmart Maui project. In addition, the Companies are evaluating approaches to provide EV charging services to Moloka‘i and Lana‘i.²³

Combined Adoption

The deployment of Company-owned and operated DC fast charging stations on each island throughout 2016 is summarized in Table 7 below. There was no change between the end of 2015 to the beginning of 2016. While the charging stations at Waianae Mall, Waimea KTA, and the second station at Hawaiian Electric’s main office completed construction in 2016, they were not available for public use until 2017, and therefore are not represented in this table.

Table 7
Total DC Fast Charger Under Schedule EV-U
January-December 2016

Month	Hawaiian Electric	Hawai‘i Electric Light	Maui Electric
January	4	0	1
February	4	0	1
March	5	0	1
April	5	0	1
May	5	2	1
June	5	2	1
July	5	2	1
August	5	2	1
September	5	2	1
October	5	2	1
November	5	2	1
December	5	2	1

Hawaiian Electric Adoption and Status

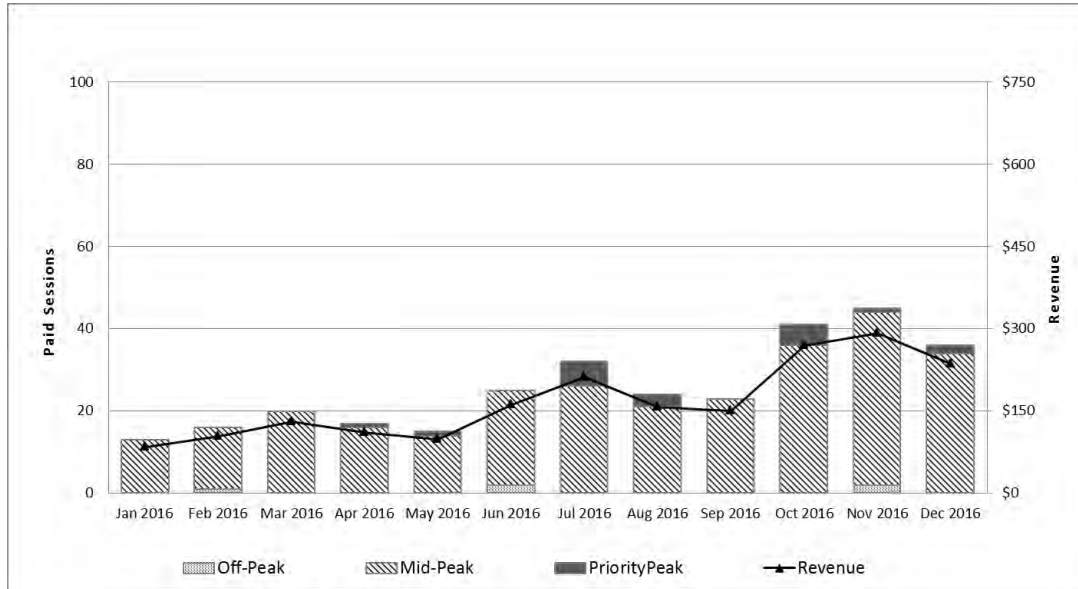
A charging station at Dole Plantation was opened to the public in June 2015. This central location is along the major roadway to the north shore of O‘ahu, where there is little available public charging. Since there are few residential dwellings near this location, this location may be largely utilized by drivers traveling along this route or visting Dole Plantation.

²² This calculation assumes an electric fuel economy of 3.5 miles per kWh and utilizes the 2014 average vehicles miles for Maui (8,130 miles) from DBEDT’s “Data Book”, available at http://dbedt.hawaii.gov/economic/databook/data_book_time_series/.

²³ The Companies are in discussions with DBEDT and various stakeholders to evaluate solutions that best match the needs and future energy plans for the islands.

While providing modest usage in 2015, Figure 1 below reveals a trend of increased usage in 2016. This charging station is generally only available during Dole Plantation’s business hours of 10:00 a.m. to 5:00 p.m. daily. Therefore, almost all charging occurred in the Mid-Peak time period.

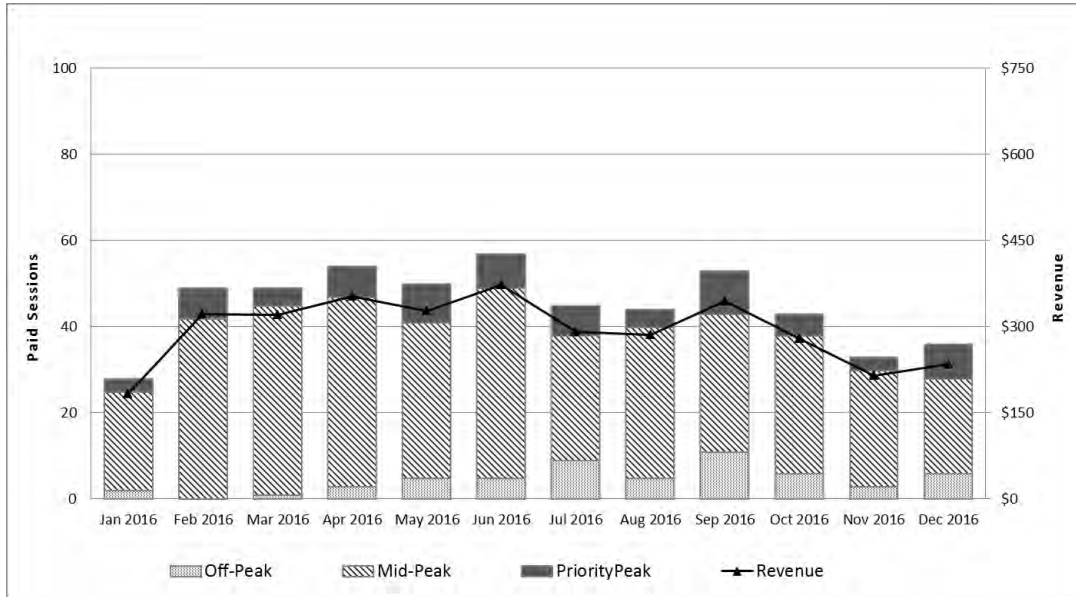
Figure 1
Monthly Charge Sessions, TOU Periods, and Gross Revenue
Dole Plantation



A DC fast charging station at Ko‘olau Center was opened to the public in October 2015, providing fast charging along O‘ahu’s windward coast. This charging station is available 24 hours a day and is near a fast food restaurant and grocery store. The monthly usage for 2016 at this location is provided in Figure 2, below.

In November, maintenance was performed on the Ko‘olau Center credit card reader. At that time the vendor discovered evidence that a wiring connector overheated. Although the charging station was operational, Hawaiian Electric deemed this to be a potential safety issue. The station was closed for two weeks for investigation and part replacements. The issue was determined to have been caused by a loose connection within the charging station.

Figure 2
Monthly Charge Sessions, TOU Periods, and Gross Revenue
Ko‘olau Center



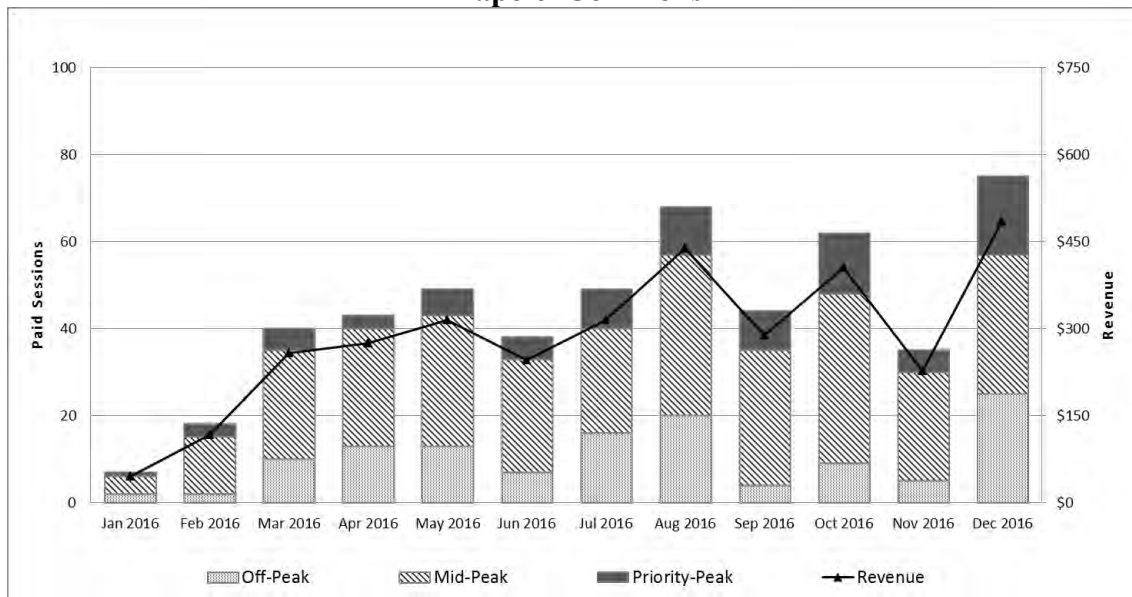
A DC fast charging station at Kapolei Commons opened to the public in November 2015. This station is in close proximity to shopping and restaurants, and is available 24 hours a day. The charging station at Kapolei Commons incorporates an integrated battery energy storage system (“BESS”) as part of a research and demonstration project with the Electric Power Research Institute (“EPRI”). This charging system only supports the CHAdeMO standard for DC fast charging.²⁴ CHAdeMO is currently utilized by the Nissan Leaf, Mitsubishi i-MiEV, Kia Soul EV, and Teslas with an adaptor. All other Company-owned DC fast charging stations on O‘ahu support both CHAdeMO and SAE Combined Charging System (“CCS”). CCS is generally utilized by American and European designed EVs. DC fast charging stations equipped to support both standards can only charge one vehicle at any moment in time. Usage at the Kapolei Commons charging station may be limited due to its support of CHAdeMO protocol only.

Additionally, there are two fee-based Level 2 charging ports and two free (for the first two hours) Level 2 charging ports provided by third parties at the Kapolei Commons properties. Despite the availability of slower but lower cost Level 2 charging options, the Companies’ DC fast charging station at Kapolei Commons experienced increased utilization in 2016, as shown in Figure 3 below. This finding underscores the demand for DC fast charging options among EV drivers.

In November 2016, it was discovered that the communications antenna was vandalized. The charge station was temporarily closed for one week. The communications antenna was replaced and relocated to reduce the possibility of future vandalism.

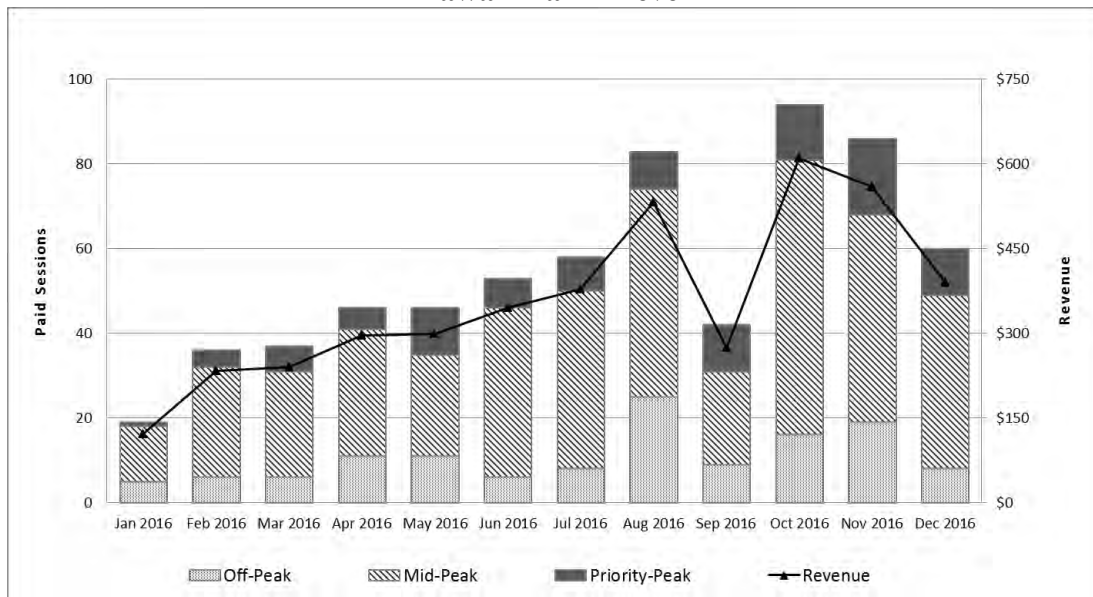
²⁴ CHAdeMO is a trade name for an association of companies defining protocols and certification chargers providing DC fast charging.

Figure 3
Monthly Charge Sessions, TOU Periods, and Gross Revenue
Kapolei Commons



A DC fast charging station at Hawaii Kai 7-Eleven opened to the public in December 2015. This location is near residential houses and condominiums. The Hawaii Kai charging station experiences relatively high usage, as shown in Figure 4 below. In September 2016, Hawaiian Electric received several notices that customers were unable to charge at this location. The charge station was removed from service for a week while Hawaiian Electric investigated this issue. The issue was remedied by replacing a circuit board and reconnecting a wire found to be partially disconnected within the charging station. This location was also removed from service during the last week of December, after two occurrences of the service breaker opening. The cause was discovered to have been initiated by a short circuit through conductor contact with a gecko. Customer usage of this charging station returned after the situation was corrected.

Figure 4
Monthly Charge Sessions, TOU Periods, and Gross Revenue
Hawaii Kai 7-Eleven

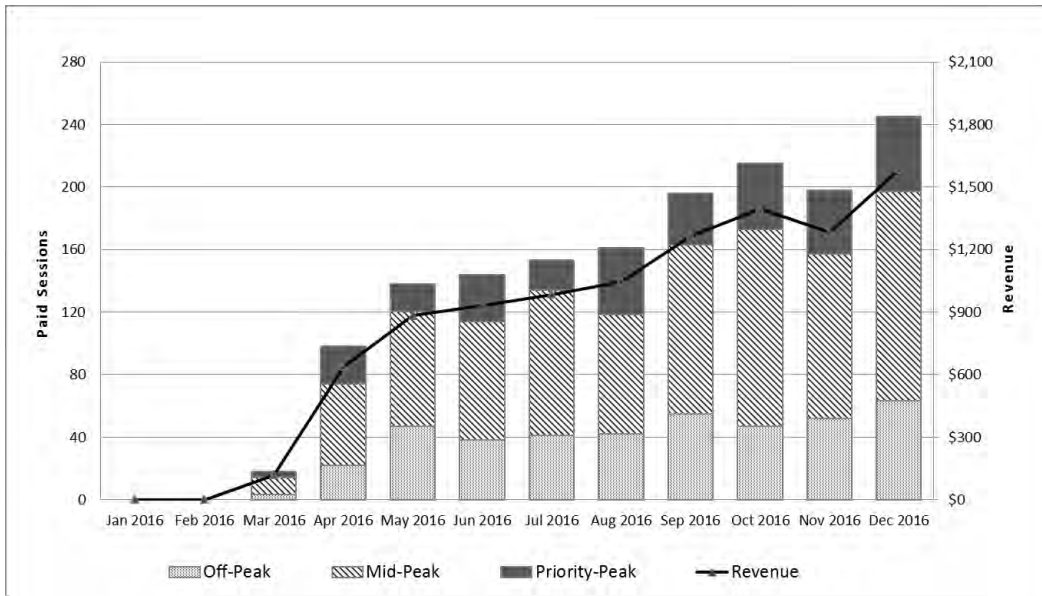


A DC fast charging station at the Hawaiian Electric main office on Ward Avenue became available to the public in March 2016. This location is near the business district of Honolulu as well as many MUDs. The utilization is shown in Figure 5, below. In its first full month of service in April, the utilization at this location surpassed all other Company-owned charging stations. In 2016, this location provided approximately 70% of all charge sessions at the Companies' locations. At the same time, usage of all other charging locations did not decrease.

This charging station is also highly utilized by drivers of long range EVs, such as Teslas. For example, this location had 152 total charge sessions in July 2016, 41% of which were presumed to be for long range vehicles (62 sessions).²⁵

²⁵ For this comparison, charge sessions for long range electric vehicles are defined as sessions consuming more than 20 kWh and connected longer than 45 minutes.

Figure 5
Monthly Charge Sessions, TOU Periods, and Gross Revenue
Hawaiian Electric Main Office



In August 2016, the Ala Moana Tesla showroom installed charging stations exclusively for their sales fleet and stopped utilizing the Hawaiian Electric charge stations. Despite the drop in utilization from the Tesla Showroom, the number of charge sessions at the Hawaiian Electric office increased during the following month to 196 while usage by long range vehicles dropped to 19% of all sessions. This data indicates that this charging station was heavily utilized and supported the need for additional fast charging capacity. In response to this customer need, the Companies installed a second charging station at the Ward Avenue location, which was made available to the public in January 2017.

Hawai'i Electric Light Adoption and Status

Hawai'i Electric Light opened its first two charging stations in May 2016 at its Hilo and Kona facilities. The monthly usage is provided below in Figures 6 and 7, respectively. The Kona charging station nets slightly more monthly usage than the Hilo charging station.

Figure 6
Monthly Charge Sessions, TOU Periods, and Gross Revenue
Hawai'i Electric Light Hilo Office

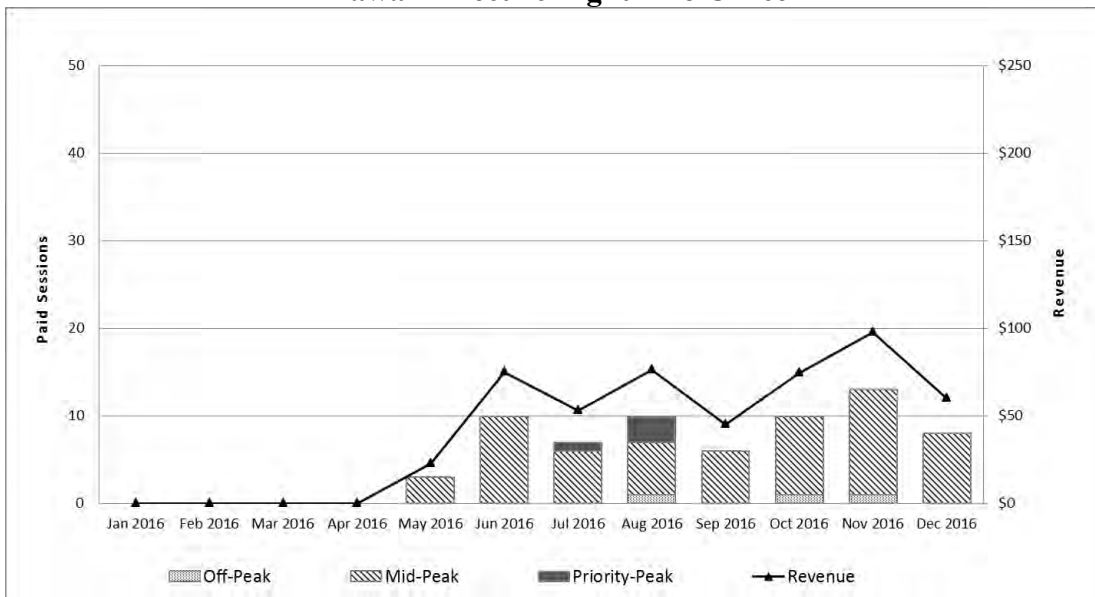
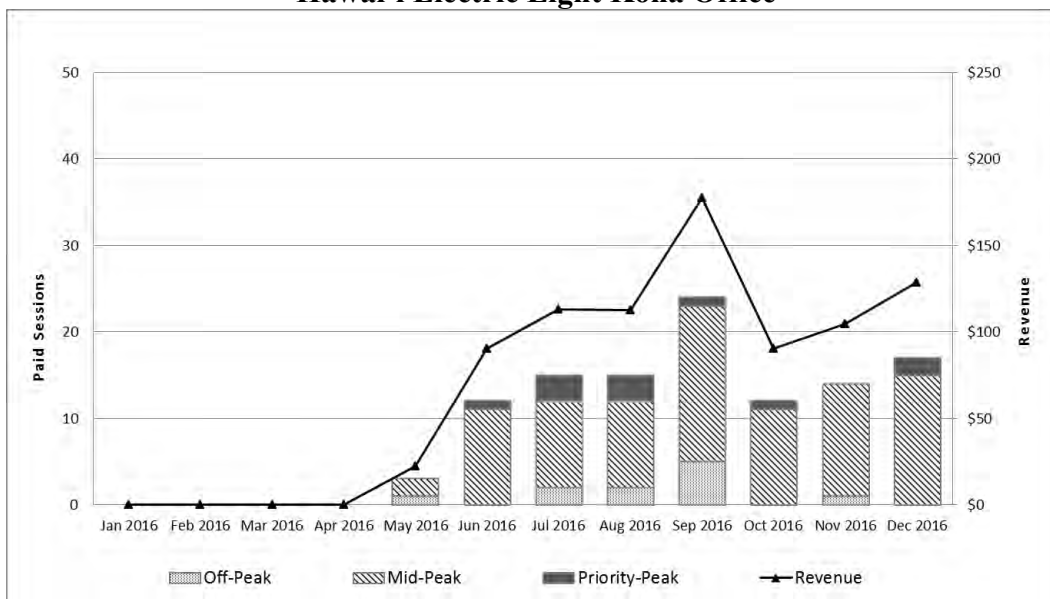


Figure 7
Monthly Charge Sessions, TOU Periods, and Gross Revenue
Hawai'i Electric Light Kona Office



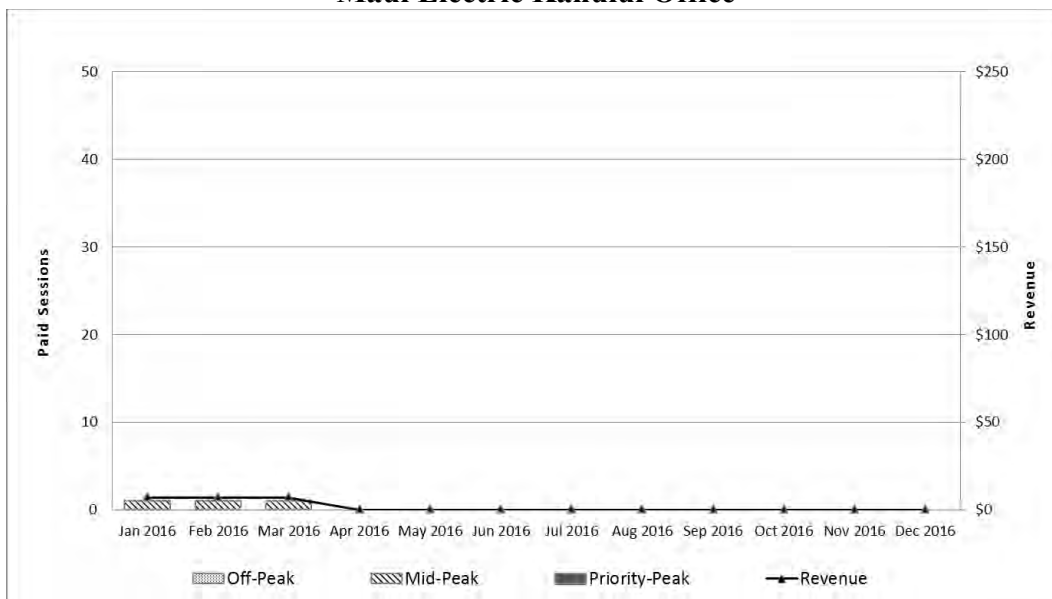
Maui Electric Adoption and Status

The DC fast charging station at Maui Electric main office continues to experience limited use. As previously discussed, the JUMPSmart Maui program provides DC fast charging at 13 locations throughout Maui for \$15 or \$30 per month, which is more cost competitive in

comparison to Schedule EV-U. One of these locations is approximately one-half mile from the Maui Electric main office and offers four fast charging stalls.

The charging station at Maui Electric also experienced technical difficulties in 2016. In April, the charge station was determined to be inoperable. After Maui Electric and the vendors conducted troubleshooting, it was discovered that a CPU board and two of the five power modules had failed. The CPU board has been replaced. The two power modules have also been replaced, after one replacement was received in a damaged condition. The replaced parts were covered under warranty. The charging station is now able to provide a 50 kW fast charge through the Greenlots cellular app. However, the system is currently not accepting credit card transactions. This issue is currently under investigation. The Companies are proactively in discussions with the vendor to determine ways to mitigate future equipment issues and minimize down-time.

Figure 8
Monthly Charge Sessions, TOU Periods, and Gross Revenue
Maui Electric Kahului Office



Aggregate Utilization Details

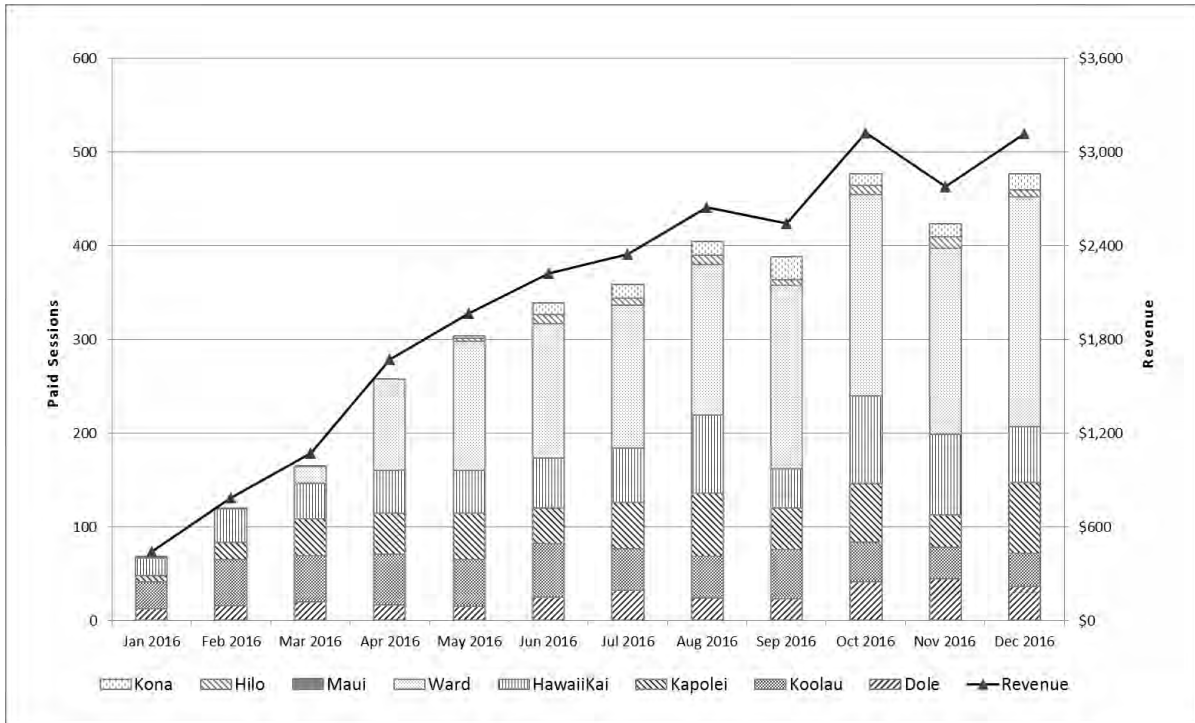
Table 8 below provides details of monthly charging sessions for each service territory. All data reflects paid sessions and does not include any sessions used for testing or Company purposes. It should be noted that some stations did not experience usage in every month. Due to data communication issues, a few charge sessions were reported to have no energy consumption. However, since this was a rare occurrence, the data in this section serves as very close approximation of actual consumption. The Companies are continuing to work with network providers to resolve intermittent data and communication issues.

Table 8
Schedule EV-U Aggregate Charging Detail
January-December 2016

Month	Hawaiian Electric		Hawai'i Electric Light		Maui Electric		Total	
	Sessions	kWh	Sessions	kWh	Sessions	kWh	Sessions	kWh
January	67	852	0	0	1	8	68	860
February	120	1,348	0	0	1	6	121	1,354
March	165	1,877	0	0	1	50	166	1,926
April	259	4,226	0	0	0	0	259	4,226
May	298	5,519	6	48	0	0	304	5,567
June	317	6,712	22	220	0	0	339	6,932
July	337	7,251	22	218	0	0	359	7,469
August	380	7,192	26	248	0	0	406	7,440
September	358	6,512	30	342	0	0	388	6,854
October	455	9,309	22	234	0	0	477	9,542
November	397	8,089	27	290	0	0	424	8,378
December	452	8,793	25	259	0	0	477	9,051
TOTAL	3,605	67,678	180	1,858	3	63	3,788	69,599

Figure 9 below illustrates the combined usage and gross revenues of the eight charging stations for each month in 2016.

Figure 9
Monthly Charge Sessions and Gross Revenue
All Sites



Tables 9 and 10 below provide the breakdown of charging sessions by TOU period²⁶ for each service territory in 2016. Table 9 provides kWh consumption for each TOU period while Table 10 provides sessions per TOU period. The TOU period of a charge session is based upon its start time.

Table 9
Schedule EV-U kWh Consumption by TOU Period
January-December 2016

Company	Priority	Mid	Off	Total
Hawaiian Electric	12,571	40,690	14,417	67,678
Hawai'i Electric Light	150	1,539	169	1,858
Maui Electric	0	63	0	63
TOTAL	12,721	42,292	14,586	69,599
% TOTAL	18.3%	60.8%	21.0%	100.0%

Table 10
Schedule EV-U Charge Sessions by TOU Period
January-December 2016

Company	Priority	Mid	Off	Total
Hawaiian Electric	589	2,289	727	3,605
Hawai'i Electric Light	15	151	14	180
Maui Electric	0	3	0	3
TOTAL	604	2,443	741	3,788
% TOTAL	15.9%	64.5%	19.6%	100.0%

Figure 10 below depicts the aggregated charge sessions, for all Companies, in each Schedule EV-U TOU period by month. The final DC fast charging station installed in 2016 was made available in May. However, overall utilization continued to increase throughout the year with 64.5% of all sessions starting in the Mid-Peak, when there is available renewable solar generation.

²⁶²⁶ Schedule EV-U TOU periods are: Priority-Peak (5:00 p.m.-9:00 p.m., Monday-Friday); Mid-Peak (7:00 a.m.-5:00 p.m., Monday-Friday, 7:00 a.m.-9:00 p.m., Saturday-Sunday); Off-Peak (9:00 p.m.-7:00 a.m., daily).

Figure 10
Monthly Charge Sessions, TOU Periods
All Sites

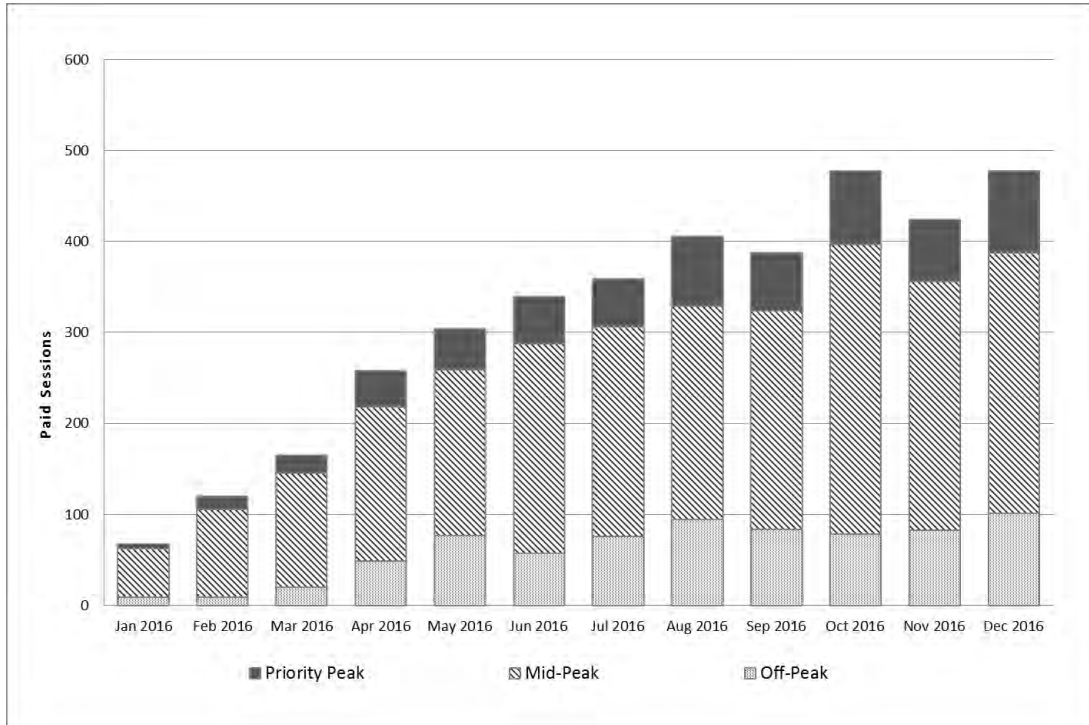
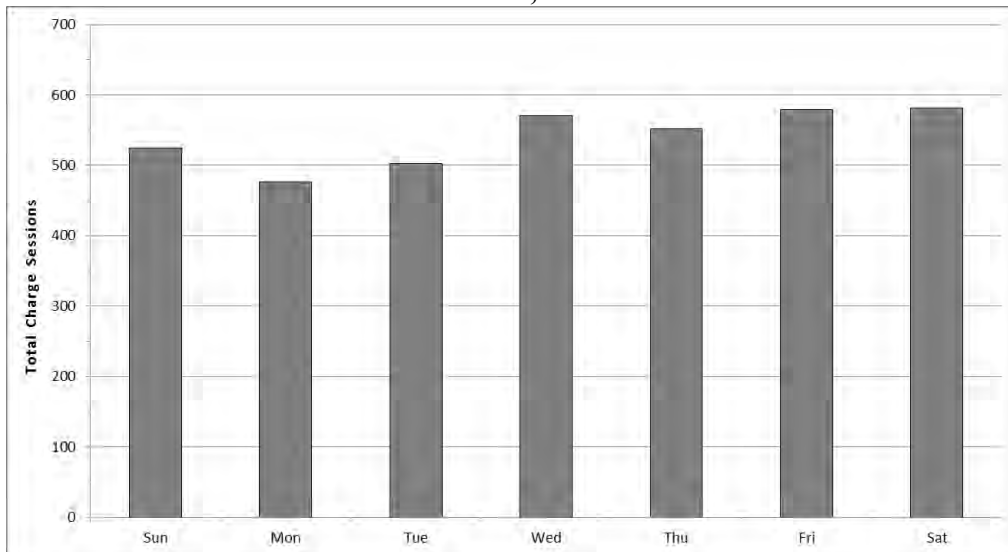


Figure 11 below shows that charge sessions did not vary much based upon day of week. Implementing rates based upon day of week may not affect utilization of charging infrastructure.

Figure 11
Charge Session by Day of Week
All Sites, 2016



The EV charging network providers report the length of time an EV is connected to the charging station for each charge session. Figure 12 below provides the number of charge sessions by connection duration for all sessions in 2016.²⁷ Approximately 79% of all charge sessions were for connection durations of 40 minutes or less and 35% of all charge sessions were 30 minutes in duration. This data suggests that the majority of all charge sessions are used by conventional EVs and most EVs charge to their maximum battery capacity.

Figure 12
Charge Session by Average Connection Time²⁸
All Sites, 2016

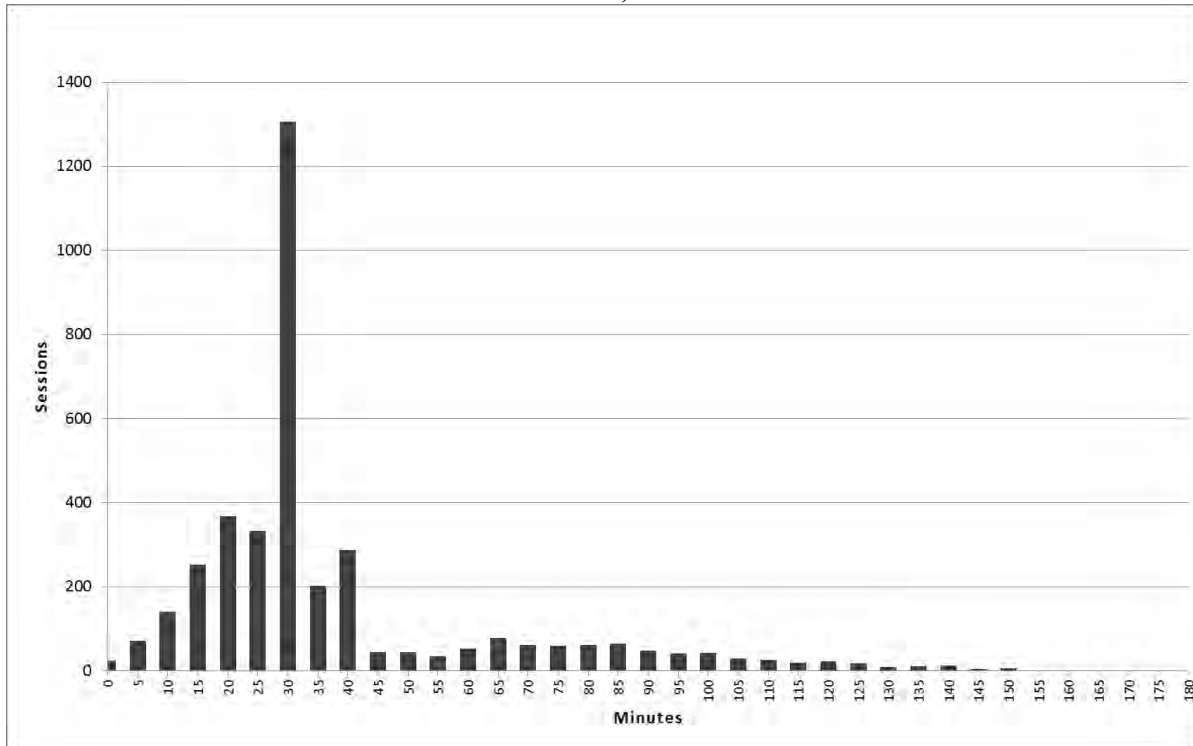


Table 11 below outlines the difference in connection time, electricity consumption and the resulting effective electricity rate paid by drivers of long range EVs compared to drivers of conventional EVs. The average connection time for all charge sessions was 39.8 minutes. However, segregating long-range EVs from other EVs, the average connection time of long-range EVs was 81 minutes and other EVs was 31 minutes²⁹. During 2016, the average DC fast charging session consumed 18.4 kWh. However, similar to connection time, there was some variability of energy consumed in each session. Conventional EVs consumed on average 11.2 kWh per session while long range EVs consumed on average 48.2 kWh per session. Assuming the Hawaiian Electric Mid-Peak session fee of \$6.50, the average conventional EV driver paid an

²⁷ There were five recorded charge sessions over 180 minutes. This data is assumed to be in error due to data communication issues and were not used for this calculation.

²⁸ Connection time is represented in 5-minute bins, starting from 0-5 minutes.

²⁹ In this comparison, long-range EVs were defined as EVs exceeding 20 kWh per charge session.

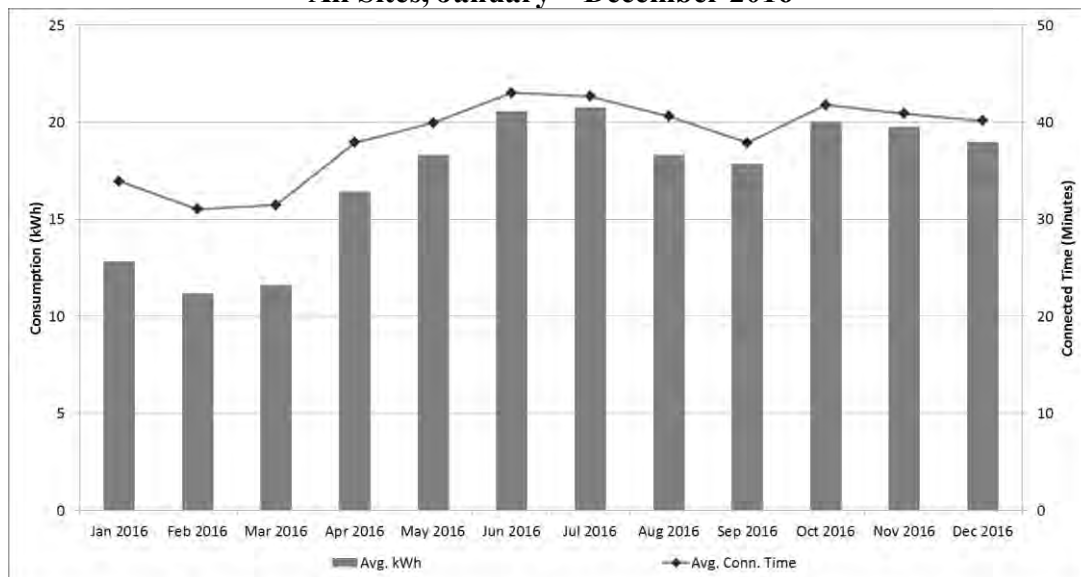
equivalent \$0.58 per kWh and the average long-range EV driver paid an equivalent \$0.13 per kWh.

Table 11
Average Session Statistic by Conventional vs. Long Range EVs³⁰
2016

	Conventional EVs	Long Range EVs	
Consumption/Session Avg	11.2	48.2	kWh
Energy Cost/Session Avg	58	13	cents/kWh
Time/Session Avg	31	81	minutes

As shown in Figure 13 below, the Companies observed an increase in average session kWh consumption and connection times after the month of March 2016, after the opening of the first charging station at Hawaiian Electric’s main office on Ward Avenue. This is assumed to be due to the higher utilization by long range EVs at that charging location. A flat rate session price encourages longer dwell times and results in lower effective electricity rates for long range EVs, which are able to consume more electricity in a single session compared to conventional EVs. As previously stated, pending Pilot extension beyond the original termination date in June 2018, the Companies plan to request changes to Schedule EV-U for Commission approval proposing a usage fee to enable better utilization of charging stations and address the differences in cost for charging services between long-range and conventional EVs.

Figure 13
Average Session Energy Consumption and Connection Time
All Sites, January – December 2016



³⁰ Long range EVs were categorized as any session consuming 20 kWh or greater. Conventional EVs were categorized as any session consuming less than 20 kWh.

Customers predominantly used credit cards at the point of sale credit card reader to pay for charge sessions. While other payment options are available, such as by phone app, network subscription card, and phone call authorization, 79% of all 3,788 transactions were paid by credit card at the charge station's credit card reader. Customer identification of any credit card transaction is confidential and not available to the Companies.

Hawaiian Electric's Demonstration Projects and Data Analytics

The deployment of Company-owned and operated DC fast charging stations has provided opportunities for research and demonstration of new technologies. As described in the Decision and Order No. 31338 one of the objectives of the Companies' Schedule EV-U pilot is to conduct research, development, and demonstration activities related to EV charging technologies and load control.

The DC fast charging station in Kapolei Commons incorporates an internal 12 kWh BESS. This integrated battery DC fast charging system is configured to not exceed a demand of 23 kW from the grid while providing up to 50 kW to the EV, thereby lowering (i.e., "buffering") the grid impact of fast charging. Data will be collected and provided to EPRI to analyze the system's ability to reduce potential impacts to the grid, cost for infrastructure upgrades, and customer billing demand charges. Initial research discussions have occurred with EPRI and the equipment supplier. Formal data collection for this demonstration project will begin in 2017.

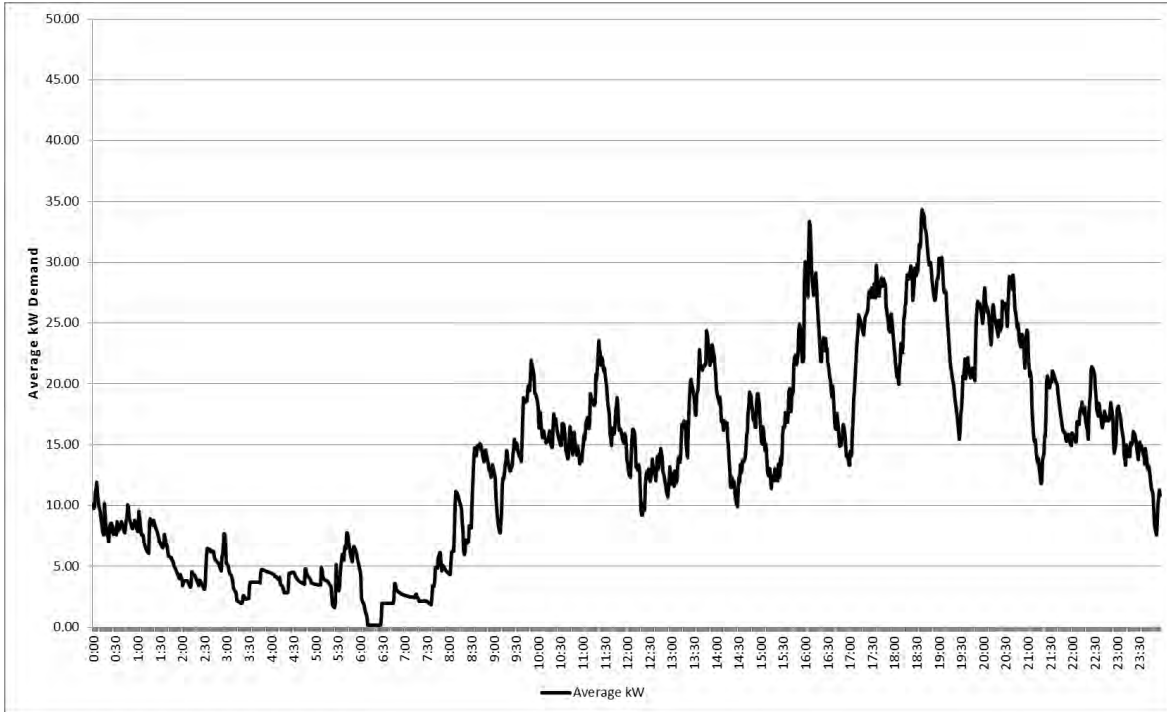
In 2016, this system experienced intermittent issues while charging long-range EVs, resulting in early termination of some charge sessions. Last year, Hawaiian Electric analyzed charging data with the charging system supplier. This charging system was initially designed to charge conventional EVs (i.e., EVs with battery systems of 30 kWh capacity or less) with a combination of power from its internal battery and the grid. The analysis of collected data resulted in a determination that there is a significant difference between charging profiles of long range and conventional EVs, and the integrated battery-DC fast charging system would not properly transition between battery and grid power for the longer charging times required of long-range EVs. Software modifications have been incorporated and Hawaiian Electric is currently monitoring usage to validate improved operation.

In conjunction with Greenlots and EPRI, Hawaiian Electric will also be implementing and demonstrating demand response capabilities on the first DC fast charging station at Hawaiian Electric's main office on Ward Avenue. This project will develop and demonstrate the ability to reduce the maximum output of DC fast charging from 50 kW to 25 kW. Despite CHAdeMO's current lack of support for demand response, the technical capability being developed in this industry-leading project will result in the ability to re-initialize an ongoing charge session at the lower output level without customer intervention, minimizing potential impact to the customer during a curtailment event. In 2016, Hawaiian Electric and Greenlots defined the OpenADR configurations to execute this demonstration project. Data collection for the baseline use case is underway, with the four demonstration use cases targeted for completion in 2017.

Hawaiian Electric has installed power quality monitors for each of the Company-owned DC fast charging stations on O'ahu. These power quality monitors allow the Companies to

analyze the charging equipment’s ability to tolerate power quality events and any electrical aberrations that the equipment may inject onto the grid. To date, there have been no known equipment failures correlated to power quality events. These power quality monitors also collect energy consumption data every minute. Figure 14 below utilizes this one-minute data to provide the average aggregate daily kW load of the five O’ahu DC fast charging stations during the month of December 2016.

Figure 14
Average Aggregate Daily Load for O’ahu DCFC
December 2016



B. Summary of Costs and Revenue

Tables 12 and 13 below provide overall program costs and revenues related to Schedule EV-U. Table 12 reflects costs and revenues incurred during 2016, and Table 13 reflects costs and revenues for the pilot from inception through December 2016. Included in the table are Capital cost (for purchase of equipment and labor for design and installation of the project site), operation and maintenance (“O&M”) labor (for project management and research), O&M non-labor (for operations and maintenance), and other costs (for revenue, reimbursements, and other adjustments) for each company. Project reimbursements through research partnerships with EPRI are reflected as negative costs in Other Costs.

Table 12
Program Costs
January – December 2016

Company	Cost Element	Cost
Hawaiian Electric	Capital Costs	\$ 427,607
	O&M Labor Costs	\$ 183,789
	O&M Non-Labor Costs	\$ 22,502
	Other Costs	\$ (23,317)
	Total Costs	\$ 610,582
Hawai'i Electric Light	Capital Costs	\$ 377,582
	O&M Labor Costs	\$ 954
	O&M Non-Labor Costs	\$ 2,089
	Other Costs	\$ -
	Total Costs	\$ 380,625
Maui Electric	Capital Costs	\$ -
	O&M Labor Expense	\$ 6,173
	O&M Non-Labor Expense	\$ 2,200
	Other Costs	\$ (28)
	Total Costs	\$ 8,345
ALL	CAPITAL COSTS	\$ 805,189
	O&M LABOR COSTS	\$ 190,916
	O&M NON-LABOR COSTS	\$ 26,791
	OTHER COSTS	\$ (23,345)
	TOTAL COSTS	\$ 999,552

Table 13
Program Costs
Pilot Inception Through December 2016

Company	Cost Element	Cost
Hawaiian Electric	Capital Costs	\$ 1,227,616
	O&M Labor Costs	\$ 254,155
	O&M Non-Labor Costs	\$ 31,748
	Other Costs	\$ (187,848)
	Total Costs	\$ 1,325,671
Hawai'i Electric Light	Capital Costs	\$ 721,637
	O&M Labor Costs	\$ 1,754
	O&M Non-Labor Costs	\$ 2,089
	Other Costs	\$ (1,350)
	Total Costs	\$ 724,130
Maui Electric	Capital Costs	\$ 86,776
	O&M Labor Expense	\$ 111,843
	O&M Non-Labor Expense	\$ 6,246
	Other Costs	\$ (84)
	Total Costs	\$ 204,781
ALL	CAPITAL COSTS	\$ 2,036,029
	O&M LABOR COSTS	\$ 367,752
	O&M NON-LABOR COSTS	\$ 40,083
	OTHER COSTS	\$ (189,282)
	TOTAL COSTS	\$ 2,254,582

Table 14 below details expenses related to Schedule EV-U for each site in service as of December 31, 2016. The capital cost of the Kapolei site was offset by funds through the joint EPRI project. These offsets and site revenues are included as "Other" cost elements. "Other" sites include costs for sites not yet in service, project administration, and overall research.

**Table 14
Costs Per Available Site
Pilot Inception Through December 2016**

Territory	Site	Cost Element	Cost
O'ahu	Kapolei	Capital	\$ 217,615
		O&M	\$ 25,176
		Other	\$ (166,951)
		TOTAL	\$ 75,840
	Dole Plantation	Capital	\$ 128,094
		O&M	\$ 11,594
		Other	\$ (2,708)
		TOTAL	\$ 136,981
	Koolau Center	Capital	\$ 177,329
		O&M	\$ 13,346
		Other	\$ (3,756)
		TOTAL	\$ 186,920
	Hawaii Kai	Capital	\$ 163,976
		O&M	\$ 11,065
		Other	\$ (4,302)
		TOTAL	\$ 170,739
	Hawaiian Electric Office	Capital	\$ 163,312
		O&M	\$ 20,375
		Other	\$ (10,132)
		TOTAL	\$ 173,556
Other	Capital	\$ 377,291	
	O&M	\$ 204,346	
	Other	\$ -	
	TOTAL	\$ 581,637	
Hawai'i	Hawai'i Electric Light Hilo	Capital	\$ 261,437
		O&M	\$ 1,747
		Other	\$ (504)
		TOTAL	\$ 262,680
	Hawai'i Electric Light Kona	Capital	\$ 266,666
		O&M	\$ 2,096
		Other	\$ (847)
		TOTAL	\$ 267,916
	Other	Capital	\$ 193,534
		O&M	\$ -
Other		\$ -	
TOTAL		\$ 193,534	
Maui	Maui Electric Office	Capital	\$ 86,776
		O&M	\$ 18,078
		Other	\$ (84)
		TOTAL	\$ 104,770
	Other	Capital	\$ -
		O&M	\$ 100,011
		Other	\$ -
TOTAL	\$ 100,011		

Table 15 below provides gross revenues reported for Schedule EV-U between January 1 and December 31, 2016. Due to lags in processing transactions, some of these revenues are reported by the charging network, but may not yet be remitted to the Companies.

Table 15
Schedule EV-U Revenue
January-December 2016

Month	Hawaiian Electric	Hawai'i Electric Light	Maui Electric
January	\$ 433.50	\$ -	\$ 7.00
February	\$ 782.50	\$ -	\$ 7.00
March	\$ 1,072.00	\$ -	\$ 7.00
April	\$ 1,679.00	\$ -	\$ -
May	\$ 1,921.50	\$ 45.00	\$ -
June	\$ 2,056.50	\$ 165.50	\$ -
July	\$ 2,178.00	\$ 166.00	\$ -
August	\$ 2,459.00	\$ 196.00	\$ -
September	\$ 2,319.00	\$ 222.50	\$ -
October	\$ 2,958.00	\$ 165.00	\$ -
November	\$ 2,574.50	\$ 202.00	\$ -
December	\$ 2,929.00	\$ 188.50	\$ -
TOTAL	\$ 23,362.50	\$ 1,350.50	\$ 21.00

C. Identify and Describe the Level and Extent of Subsidization by Non-Participating Ratepayers

The Companies maintain that a key criterion in developing EV rates and programs is to encourage the adoption of EVs by 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 rate support for the development of public EV charging infrastructure. As stated herein, the Companies contend that EV customers using Company chargers should not necessarily be characterized as benefitting from a subsidy *per se*, but viewed within the context of the customer's entire load increased by EV charging, an increment that would not otherwise exist on the system.

To the extent that the provision of the EV tariffs incentivize or enable customers to purchase or lease a new EV, the subsidization of the EV charging should not be viewed in isolation, but as part of package of incentives to adopt clean transportation as a technology that is still in the nanceant stages. Therefore, Schedule EV-F and EV-U rates that support this incremental load should not completely be considered to be subsidized by other ratepayers. 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 cleaner transportation.

That said, the difference between revenues collected is provided in Table 16 below, summarizing the total monthly revenue generated from Schedule EV-U compared to the

potential revenue generated if the charging facility were billed under each Companies’ respective Schedule J, representing potential revenue that may have been generated if similar fast charging services were provided by a private commercial entity. 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. Months in which existing charging stations had no usage are reflected with the minimum charge for Schedule J.

Table 16
Schedule EV-U to Potential Schedule J Revenue Comparison
January-December 2016

Month	Total EV-U Revenues	Potential Schedule J Revenue	Difference
January	\$ 440.50	\$ 3,027.14	\$ 2,586.64
February	\$ 783.00	\$ 2,998.40	\$ 2,215.40
March	\$ 1,072.50	\$ 3,810.65	\$ 2,738.15
April	\$ 1,672.50	\$ 5,307.45	\$ 3,634.95
May	\$ 1,966.50	\$ 4,911.68	\$ 2,945.18
June	\$ 2,222.00	\$ 6,103.50	\$ 3,881.50
July	\$ 2,344.00	\$ 6,203.52	\$ 3,859.52
August	\$ 2,647.50	\$ 6,239.87	\$ 3,592.37
September	\$ 2,541.50	\$ 6,213.17	\$ 3,671.67
October	\$ 3,123.00	\$ 6,363.87	\$ 3,240.87
November	\$ 2,776.50	\$ 6,565.18	\$ 3,788.68
December	\$ 3,117.50	\$ 6,380.49	\$ 3,262.99
TOTAL	\$ 24,707.00	\$ 64,124.92	\$ 39,417.92

D. Recommendation of revisions to rate structures

Decision and Order No. 31338 requires that the Companies “determine and recommend any revisions to the applicable rate structures that are necessary to: (A) meet the objectives of sufficiently addressing ‘range anxiety’ among EV end-users and conducting the Companies’ research, development, and demonstration activities related to EV charging technologies and load control; and (B) minimize the level or extent of subsidization by non-participating ratepayers.”

Addressing Range Anxiety

Public charging infrastructure is needed to extend driving range and provide drivers the confidence to own and drive an EV. A recent Star Advertiser article stated, “[i]n some cases, difficulty to find a charger has caused owners to sell their electric cars.”³¹

³¹ Honolulu Star Advertiser, “Disregard of Law Causes EV Parking Shortage”, February 27, 2017, available at <http://www.staradvertiser.com/2017/02/27/business/disregard-of-law-causes-ev-parking-shortage/>.

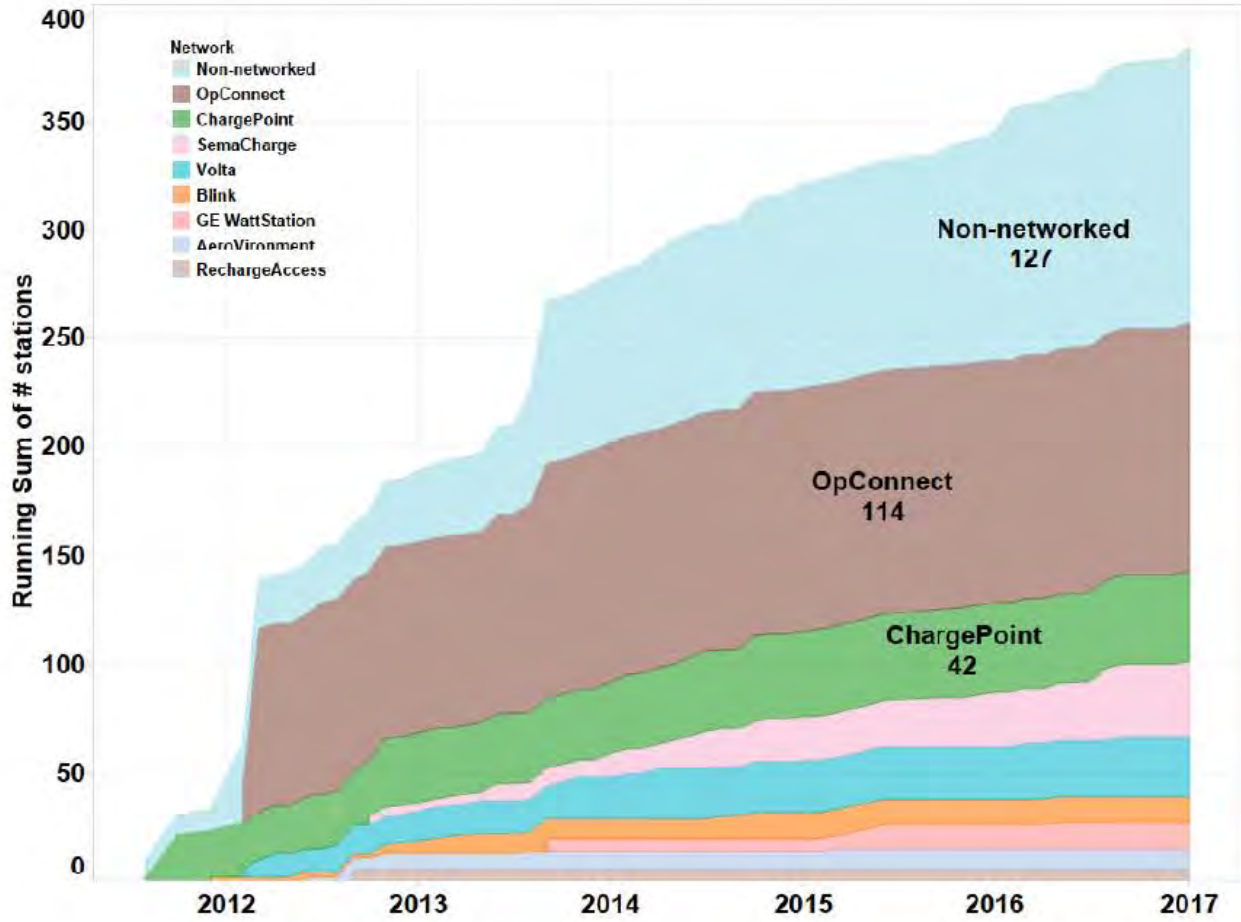
The article also notes the limited availability of existing charging options, stating that “even if a parking garage had a charging station, it was often being used by another car.” DC fast charging also allows EVs to charge quickly, providing faster turnover of available vehicle charging and greater accessibility to public charging than Level 2 charging. In locations with high real estate values, such as Hawai‘i, DC fast charging can provide greater EV charging capacity with less dedicated space.

Figure 15 below provides the number of publicly accessible Level 2 charging ports in the State. Figure 16 below shows that during this pilot the growth in public Level 2 charging infrastructure is being outpaced by the growth in EV registration. The number of available Level 2 charging stations grew 155% from the beginning of 2013 to the end of 2016.³² In comparison, the number of registered EVs in the State increased by 307% over the same time period.³³ Through Schedule EV-U, the Companies can help provide charging infrastructure if private businesses cannot support the continual growth of EV adoption.

³² Source: PlugShare, provided by EPRI

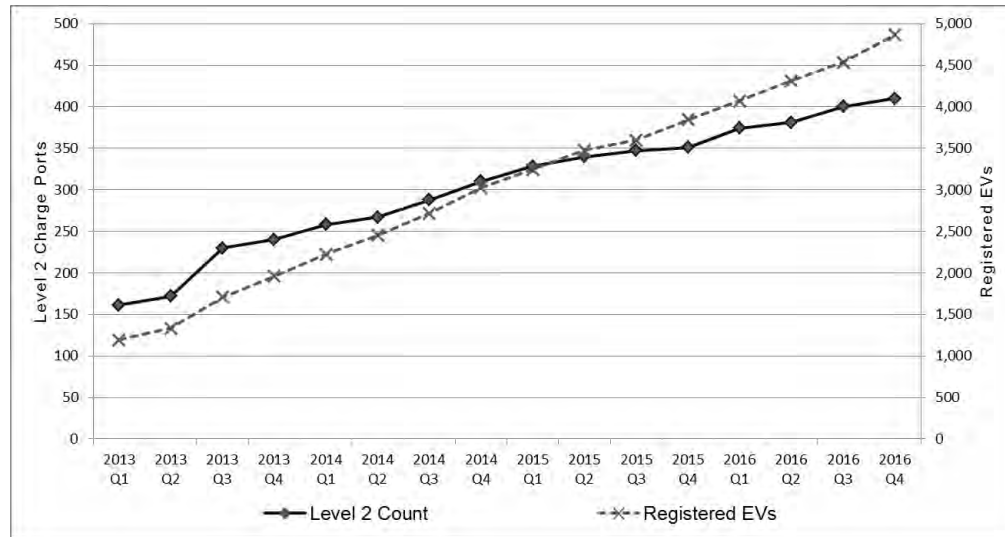
³³ DBEDT, *Monthly Energy Trend Highlights January 2017*, available at http://files.hawaii.gov/dbedt/economic/data_reports/energy-trends/Monthly_Energy_Data.xlsx.

Figure 15
Publicly Accessible Level 2 Charging Ports in Hawaii³⁴



³⁴ Source: PlugShare, provided by EPRI

Figure 16
Public Level 2 Charging Ports³⁵ and Registered EVs in Hawaii³⁶
2013-2016



As stated in the Companies’ Reply Statement of Position in Docket No. 2016-2018, the Companies maintain that a ten-year extension would:

- (1) help to meet EV charging needs through 2028, based on forecasted EV adoption rates (even under more conservative scenarios);
- (2) send a strong signal that both the Companies and the State intend to support long-term growth in EV infrastructure, thereby encouraging continued EV market development;
- (3) align with the anticipated eight- to twelve-year average useful life of the investments in direct current fast chargers (“DCFC”);
- (4) help address uncertainties and concerns of potential site hosts that the DCFCs will only be operated and maintained for a short duration; and
- (5) maximize the value derived from existing and planned DCFC facilities.

As previously stated, if the EV Pilot Rates are extended beyond the current termination date in June 2018, the Companies will file a request to change Schedule EV-U to provide consistency among TOU rates, lower pricing disparity between long range and conventional EVs, and increase availability and convenience for EV drivers.

³⁵ Source: PlugShare, provided by EPRI

³⁶ DBEDT, *Monthly Energy Trend Highlights January 2017*, http://files.hawaii.gov/dbedt/economic/data_reports/energy-trends/Monthly_Energy_Data.xlsx.

Company Research, Development, and Demonstration Activities Related to EV Charging Technologies and Load Control

In 2016, Hawaiian Electric continued to monitor the DC fast charging station with integrated BESS at Kapolei Commons. Hawaiian Electric observed some issues with the system's ability to charge long range EVs and worked with the vendor to implement modifications. In 2017, Hawaiian Electric is continuing to monitor the utilization of this system and will provide EPRI data to analyze its ability to lower grid and customer bill impacts.

In 2016, Hawaiian Electric installed a DC fast charging station that will demonstrate demand response on DC fast chargers. Data collection of the baseline use case began in 2016. The data collection of the remaining use cases are targeted to be completed in 2017.

The Companies will evaluate these technologies and potential changes in rate structures to determine how fast charging may better serve the needs of the grid.

Minimize the level of extent of subsidization by non-participating ratepayers

The Hawaiian Electric Companies maintain that Schedule EV-U supports the State's policy to increase EV charging infrastructure and supports the adoption of EVs for all customers. The deployment of DC fast charging stations under this pilot is providing charging infrastructure where the private market has not sustained support. If the EV Pilot Rates are extended beyond the current termination date in June 2018, the Companies will request changes to Schedule EV-U to increase utilization of these charging stations, provide consistency among TOU rates, and lower pricing disparity between long range and conventional EVs.

Electric Vehicle Pilot Rates Report

Attachment A

Informational Material on
Commercial Public Electric Vehicle Charging Service Pilot Rates
and Locations

Press Release for Hawaiian Electric Company



**Hawaiian
Electric**



Hawaiian Electric & Greenlots test EV charging and energy storage as ideal grid allies

HONOLULU, HI—Feb. 25, 2016—Greenlots and Hawaiian Electric Company are working to show how an electric vehicle (EV) fast charger combined with energy storage can support EV initiatives on the road to a clean energy future for Hawaii.

Greenlots has implemented its pioneering SKY platform — a scalable, vehicle-grid integration (VGI) technology — in an EV fast charger owned and operated by Hawaiian Electric Company as part of a joint research, development and demonstration project with the Electric Power Research Institute.

The innovative fast charger is located at Kapolei Commons, a popular shopping mall in West Oahu. By giving residents and visitors in the area a convenient place to quickly charge their EVs with minimal impact on the Oahu grid, the goal is to encourage EV adoption.

The fast charger's integrated energy storage allows it to remain in full power using electricity stored at times when generation is abundant, such as mid-day when many rooftop solar panels are sending power to the grid. Stored energy is then available later in the day during peak use times when electricity is in high demand.

The fast charger allows electric vehicle owners to get up to an 80 percent charge in as little as 30 minutes. Drivers can easily locate the fast-charge stations and charge using the Greenlots mobile app and pay for a charge through the app or by using a credit card, much as at a self-service gasoline pump.

"With our state's 100-percent renewable portfolio goals, we are working to support the build out of electric vehicle charging infrastructure to provide EV drivers with range confidence," said Jim Alberts, Hawaiian Electric senior vice president for customer service.

"We're pleased to be working with Greenlots on this battery-backed fast charging initiative, because in conjunction with VLI-EV Partners, Greenlots helped provide a demand-side management system to meet our evolving power grid needs. An advantage of the Greenlots open standards system is that it can be used with a variety of fast chargers built by different companies."

A similar fast charger system will also be used when Hawaiian Electric opens its fifth utility-owned fast charger at its Ward Avenue facility next month. By harmonizing electric vehicles with the grid, Greenlots has created a flexible grid management platform to meet the specific electricity demand needs of Hawaiian Electric and electric vehicle drivers alike.

In leveraging the industry's leading open standards for demand response and price communications, OpenADR and the Open Charge Point Protocol (OCPP), the Greenlots SKY Smart Charging™ platform can respond to demand response load modification requests and allow HECO to remotely control grid loads through demand response actions.

"Increasingly, utilities are looking toward open standards-based charging to be utilized in energy management strategies," said Brett Hauser, CEO of Greenlots. "We are particularly excited about this storage-backed fast charge initiative with Hawaiian Electric, because we see vast opportunities to support electric vehicle mobility while also managing energy loads more reliably as the industry expands."

About Greenlots

Greenlots is a global provider of open standards-based distributed energy resource solutions. Its award-winning SKY Smart Charging™ charge management platform bridges electric mobility, demand side management, and behind-the-meter energy storage markets for the built environment. Greenlots operates the largest open fast charging network in North America, and provides utilities the ability to remotely control grid loads through smart charging, demand response, and energy storage initiatives. Visit www.greenlots.com for more information or follow us on Twitter @greenlots.

Contact: MissionCTRL for Greenlots
greenlots@missionc2.com
(415) 429-8124



NEWS RELEASE

CONTACT: Peter Rosegg, 808.543.7780
Peter.Rosegg@HawaiianElectric.com

FOR IMMEDIATE RELEASE

Hawaiian Electric adds another public access EV Fast Charger to network in central Honolulu

HONOLULU, April 7, 2016 – Hawaiian Electric Company has opened a DC Fast Charger for electric vehicles accessible to the public at its Ward Avenue facility. It is the fifth utility-owned and operated public charging station on O’ahu.

The fast charger will help eliminate “range anxiety” for residents and visitors driving EVs to and from Honolulu. Additionally, the fast charger will serve EV owners residing in multi-unit dwellings in the Honolulu area who may not have access to EV charging in their buildings. Using a fast charging station, a near-depleted battery can be recharged to 80 percent capacity in 30 minutes, less for smaller recharges. Drivers will be able to safely operate the charger and pay by credit card or by a Greenlots smartphone app.

A fast charging session will cost \$6.50 during most of the day; slightly more during times of peak electric use or less if used during overnight hours. Session prices may change based on the changing cost of electricity. Information on charging, including the current price, is available at www.hawaiianelectric.com/goev.

“At the Hawaiian Electric Companies, we are committed to making Hawaii a world leader in electric vehicle use as an essential part of our clean energy future,” said Jim Alberts, Hawaiian Electric senior vice president for customer service. “To this end, we continue to help accelerate use of electric vehicles by providing public fast-charging stations so drivers always know where they can top off quickly across the islands. And we are eager to cooperate in other ways to help automobile dealers and their customers make the electric vehicle decision that makes so much sense in Hawaii.”

The DC Fast Charger at Ward, like those at Dole Plantation in Wahiawa, Ko’olau Center in Kaneohe, and 7-Eleven in Hawaii Kai, has both a CHAdeMO connection (used mostly by Japanese and Korean EVs like the Nissan Leaf, Mitsubishi i-MiEV, and Kia Soul EV) and a CCS connection (used by American and European EVs like the BMW i3).

Hawaiian Electric is working with Greenlots – a global provider of open standards-based distributed energy resource solutions – on the Ward Avenue fast charger. As with the fast charger at Kapolei Commons, the Ward Avenue installation is designed to show how electricity demand management strategies can support EV initiatives on the road to a clean energy future for Hawaii.

“We are pleased to be working with Hawaiian Electric and support a burgeoning electric vehicle industry in Hawaii,” said Brett Hauser, CEO of Greenlots. “Fast charge infrastructure is critical to

More...

Hawaiian Electric

PO BOX 2750 / HONOLULU, HI 96840-0001



NEWS RELEASE

CONTACT: 808.430.4691

FOR IMMEDIATE RELEASE

Hawai'i Electric Light opens two EV fast chargers on Hawai'i Island

HILO, May 24, 2016 – Hawai'i Electric Light announces the opening of two utility-owned and operated electric vehicle DC fast chargers accessible to the Hawai'i Island community. The company held a dedication ceremony for the unit located at its main office at 1200 Kilauea Avenue in Hilo today. A dedication is planned for tomorrow for the unit located at the company's Kona office at 74-5519 Kaiwi Street in Kailua-Kona.

"Our customers are at the center of everything we do," said Jay Ignacio, Hawai'i Electric Light president. "One of our goals is to provide customers with more services and options, including an electric vehicle program. The DC Fast Charger is one part of the program."

In an effort to support clean transportation, the Hawaiian Electric Companies received approval to operate publicly-accessible DC Fast Chargers across O'ahu, Maui County, and Hawai'i Island. These facilities allow drivers to quickly recharge their vehicles for a per-session fee.

Most charging stations offer chargers at Level 1 or 2 which take anywhere from 3-20 hours to fully charge an EV. These two facilities feature a Level 3 fast charger that can recharge a near-depleted EV battery to 80 percent capacity in about 30 minutes, and even less time for smaller recharges. This is the first Level 3 charger in east Hawai'i and the second in west Hawai'i. The DC Fast Charger has both a CHAdeMO connection (used mostly by Nissan Leaf, Mitsubishi i-MiEV and Kia Soul EV) and a CCS connection (used by the BMW i3).

These fast chargers are available 24/7 with three different rates ranging from \$7.00 to \$8.00 per session depending on time of use. Session prices may change based on the changing cost of electricity. Drivers will be able to safely operate the charger and pay by credit card or by a Greenlots subscription.

The Hawaiian Electric Companies are working with Greenlots – a global provider of open standards-based distributed energy resource solutions – on both the Hilo and Kona chargers. The installation is designed to show how electricity demand management strategies can support EV initiatives on the road to a clean energy future for Hawai'i.

The Hawai'i Public Utilities Commission authorized a five-year demonstration for the utilities to install, own and operate up to 25 fast chargers in their service territory. Additional sites are now being sought on O'ahu and the neighbor islands.

(more)

Hawai'i Electric Light

PO BOX 1027 / HILO, HI 96721-1027



NEWS RELEASE

FOR IMMEDIATE RELEASE

Hawaiian Electric to site electric vehicle fast charging station at Waianae Mall

HONOLULU, Aug. 29, 2016 – Hawaiian Electric Company will install and operate a new electric vehicle (EV) fast charger at Waianae Mall at 86-120 Farrington Highway, the sixth utility-owned public fast charging site on O'ahu and ninth in its service territories.

Waianae Mall is a primary shopping destination and community center on the Leeward Coast. It is anchored by Longs/CVS drugstore and City Mill. Other tenants include Bank of Hawaii, Burger King, Goodyear Tire, Jamba Juice, American Savings Bank, Pizza Hut, Radio Shack and Starbucks.

"We are happy to bring this opportunity to residents and visitors to the Waianae community," said Jim Alberts, Hawaiian Electric senior vice president for customer service. "Not only will this serve current electric vehicle drivers, but we hope it will encourage others to consider an EV as a way to save money while helping Hawai'i to reach a clean energy future, reduce fossil fuel use and protect the environment.

"A fast charger can recharge a typical EV battery to 80 percent in less than half an hour, reducing 'range anxiety' and helping more people take advantage of the benefits of electric vehicles," said Alberts.

In addition to electric vehicles being less expensive overall to drive and needing less maintenance than gasoline vehicles, O'ahu EV drivers get free parking at municipal lots and metered parking and may use high-occupancy vehicle lanes with only one person aboard.

The Waianae Mall fast charger is expected to be in operation by early 2017. It will join publicly accessible fast chargers at Dole Plantation in Wahiawa, Ko'olau Center in Kaneohe, Kapolei Commons, 7-Eleven in Hawai'i Kai and at Hawaiian Electric's Ward Avenue customer parking lot, as well as two chargers on Hawai'i Island and one on Maui. Additional sites on O'ahu and neighbor islands are being sought. The Hawai'i Public Utilities Commission has authorized up to 25 utility-owned fast chargers across the Hawaiian Electric Companies' service territories.

Hosting a fast charger helps with compliance of the Hawai'i state law that requires public parking lots with at least 100 parking spaces to have at least one exclusive parking space equipped with a charging station for electric vehicles. Hawaiian Electric will operate the equipment at no cost to the host for installation, maintenance or electricity. Hosts must be willing to provide the requested space and minimal assistance for operation. More information is available by contacting 808-543-GoEV (4638), GoEV@hawaiianelectric.com or Hawaiian Electric GoEV, CP10-SR, P.O. Box 2750, Honolulu, Hawai'i, 96840-0001.

###

Advertising of DC fast charging pilot
 HawaiiDealer, 2016 1st Quarter and Summer Editions

We're charging faster than ever all across O'ahu

Fast charging electric vehicles, that is

Dole Plantation
64-1550 Kamehameha Hwy.

Kapa'ala Center
47-588 Hui Iwa Street

Kapa'ala Commons
4450 Kapa'ala Parkway

Hawai'i Kai
6640 Hawai'i Kai Drive

The Hawaiian Electric Companies' electric vehicle fast charger program is well underway. In 2015, Hawaiian Electric installed four utility-owned and operated fast chargers at locations around O'ahu and we are looking for more sites for 2016, including on Hawai'i Island and Maui. Your business could be on the map.

Hawaiian Electric Companies will operate the equipment at no cost to the host for installation, maintenance, or electricity. Want to participate? Call (808) 543-GoEV or email GoEV@hawaiianelectric.com.



Hawaiian Electric
Maul Electric
Hawai'i Electric Light

www.hawaiianelectric.com/GoEV

Charging Station Locations

Information regarding the location and fees for the charging stations are provided on the Companies' and third-party websites.

The follow information is provided on the Company website³⁷.

Electric Vehicle Charging Locations

Hawaiian Electric Companies DC Fast Chargers

To support clean transportation, the Hawaiian Electric Companies received approval from the Hawaii Public Utilities Commission to own and operate publicly accessible DC Fast Chargers across Oahu, Maui County, and Hawaii Island. These chargers allow drivers to quickly charge their vehicles for a per-session fee. Below are the prices and sites where electric vehicle owners can quickly charge their vehicles.

Oahu - Prices & Locations

Price per sessions based upon start of session:		
\$7.00	5 p.m. - 9 p.m.	Monday - Friday
\$6.50	7 a.m. - 5 p.m.	Monday - Friday
	7 a.m. - 9 p.m.	Saturday - Sunday
\$6.00	9 p.m. - 7 a.m.	Daily

Dole Plantation

64-1550 Kamehameha Hwy
Wahiawa, Hawaii 96786

Located: Near parking lot entrance by Bus Stop (Map: 21.5258, -158.0387)
Hours of Operation: About 10:00 a.m. - 5:00 p.m., 7 days a week
Charging Standard: CHAdeMO, SAE - CCS
Payment Option: Major Credit Cards or OpConnect Network



Hawaiian Electric Company Ward Office

820 Ward Avenue
Honolulu, Hawaii 96814

Located: In lot between Hawaiian Electric building and Symphony Park (Map: 21.3004, -157.8517) (stalls for EV charging only)
Hours of Operation: 24/7
Charging Standard: CHAdeMO, SAE - CCS
Payment Option: Major Credit Cards or Greenlots Network



³⁷ <https://www.hawaiianelectric.com/clean-energy-hawaii/electric-vehicles/ev-charging-locations>

Koolau Center

47-388 Hui Iwa Street
Kaneohe, Hawaii 96744

Located: Near main shopping center entrance (across from McDonalds) (Map: 21.4360,-157.8258)

Hours of Operation: 24/7

Charging Standard: CHAdeMO, SAE - CCS

Payment Option: Major Credit Cards or OpConnect Network



Waianae Shopping Mall

86-120 Farrington Hwy
Waianae, Hawaii 96792

Located: Mall south entrance behind Burger King (Map: 21.4356,-158.1839)

Hours of Operation: 24/7

Charging Standard: CHAdeMO, SAE - CCS

Payment Option: Major Credit Cards or OpConnect Network



Kapolei Commons

4470 Kapolei Parkway
Kapolei, Hawaii 96707

Located: Next to Ruby Tuesday near Kapolei Parkway (Map: 21.3290,-158.0916)

Hours of Operation: 24/7

Charging Standard: CHAdeMO

Payment Option: Major Credit Cards or Greenlots Network



Hawaii Kai 7-Eleven

513 Pepeekeo St
Honolulu, Hawaii 96825

Located: Near Hawaii Kai Drive entrance (Map: 21.2940,-157.7102)

Hours of Operation: 24/7

Charging Standard: CHAdeMO, SAE - CCS

Payment Option: Major Credit Cards or OpConnect Network



Hawaii Island - Prices & Locations

Price per sessions based upon start of session:		
\$8.00	5 p.m. - 9 p.m.	Monday - Friday
\$7.50	7 a.m. - 5 p.m. 7 a.m. - 9 p.m.	Monday - Friday Saturday - Sunday
\$7.00	9 p.m. - 7 a.m.	Daily

Hawaii Electric Light Hilo Office

1200 Kilauea Avenue
Hilo, Hawaii 96720

Located: Turn left after entering gate (Map: 19.7108, -155.0768)

Hours of Operation: 24/7

Charging Standard: CHAdeMO, SAE - CCS

Payment Option: Major Credit Cards or Greenlots Network



Hawaii Electric Light Kona Office

74-5519 Kaiwi Street
Kailua-Kona Hawaii 96740

Located: Turn left before the gate entrance (Map: 19.6455, -156.0009)

Hours of Operation: 24/7

Charging Standard: CHAdeMO, SAE - CCS

Payment Option: Major Credit Cards or Greenlots Network



Waimea KTA

65-1158 Mamalahoa Hwy
Waimea, Hawaii 96743

Located: In new KTA parking lot (Map: 20.0215, -155.6678)

Hours of Operation: 24/7

Charging Standard: CHAdeMO, SAE - CCS

Payment Option: Major Credit Cards or Greenlots Network



Maui - Prices & Locations

Price per sessions based upon start of session:		
\$7.50	5 p.m. - 9 p.m.	Monday - Friday
\$7.00	7 a.m. - 5 p.m. 7 a.m. - 9 p.m.	Monday - Friday Saturday - Sunday
\$6.50	9 p.m. - 7 a.m.	Daily

Maui Electric Company

Kahului Office
210 W Kamehameha Avenue
Kahului, Hawaii 96733

Located: (Map: 20.885330,-156.471304)

Hours of Operation: 24/7

Charging Standard: CHAdeMO

Payment Option: Major Credit Cards or Greenlots Network



Additional Public Charging Resources

Many public places are installing Level 2 chargers and DC Fast chargers to support the EV Community. A few external websites which track the locations of public charging stations around the state are:

- Plugshare
- State of Hawaii Charging Stations

Payment Option Information

Learn more about the available payment options by visiting the websites below:

- OpConnect
- Greenlots