BEFORE THE PUBLIC UTILITIES COMMISSION

OF THE STATE OF CALIFORNIA

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Application of SAN DIEGO GAS & ELECTRIC COMPANY (U 902 E) for Approval of its Electric Vehicle-Grid Integration Pilot Program.	Application No.14-04-014 (Filed April 11, 2014)
Order Instituting Rulemaking to Consider Alternative-Fueled Vehicle Programs, Tariffs, and Policies.	Rulemaking 13-11-007 (Filed November 22, 2013)

LOAD RESEARCH REPORT COMPLIANCE FILING OF SAN DIEGO GAS & ELECTRIC COMPANY (U 902-M), ON BEHALF OF ITSELF, SOUTHERN CALIFORNIA EDISON COMPANY (U 338-E), AND PACIFIC GAS AND ELECTRIC COMPANY (U 39E), PURSUANT TO ORDERING PARAGRAPH 4 OF D.13-06-014 AND ORDERING PARAGRAPHS 6 AND 7 OF D.11-07-029

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December 23, 2014

BEFORE THE PUBLIC UTILITIES COMMISSION

OF THE STATE OF CALIFORNIA

Application of SAN DIEGO GAS & ELECTRIC COMPANY (U 902 E) for Approval of its Electric Vehicle-Grid Integration Pilot Program.	Application No.14-04-014 (Filed April 11, 2014)
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San Diego Gas & Electric Company, on behalf of itself, Southern California Edison Company, and Pacific Gas and Electric Company, attached hereto as Appendix A, as required by Ordering Paragraph 4 of Decision (D.) 13-06-014 and by Ordering Paragraphs 6 and 7 of D.11-07-029. The Load Research Report was prepared based on the load research methodology developed by the California Public Utilities Commission's Energy Division with input from stakeholders pursuant to Ordering Paragraph 3 of D.13-06-014.

Respectfully submitted,

_____/s/_____

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APPENDIX A

Joint IOU Electric Vehicle Load Research Report

3rd Report

Filed December 2014

Electric Vehicle Load Research & Cost Studies

R.09-08-009/R.13-11-007 (AFV OIR)

Ordered in D.11-07-029 and D.13-06-014

Contents

Executive Summary

On July 25, 2011, the California Public Utilities Commission (CPUC) issued D.11-07-029 (the Phase 2 Decision) in the Alternative-Fueled Vehicle Rulemaking, R.09-08-009 (AFV OIR), to evaluate policies and develop infrastructure sufficient to overcome barriers for the deployment and use of Plug-in Electric Vehicles (PEVs) in California. The Phase 2 Decision ordered California's investor owned utilities (IOUs), made up of Pacific Gas & Electric Co. (PG&E), San Diego Gas & Electric (SDG&E), and Southern California Edison (SCE), to conduct research to examine PEV customer charging behavior, as well as track service and distribution system upgrade costs related to PEV load. The IOUs filed the first Joint IOU Electric Vehicle Load Research Report (1st Load Research Report) in December 2012. Decision 13-06-014, issued July 3, 2013 (the Extension Decision), extended the research for an additional three years[1] with reports to begin in December 2013.[2] The Extension Decision also directed the Energy Division to work with stakeholders to revise the load research methodology.[3] The deadline for the December 2013 report (2nd Load Research Report) was extended to January 31, 2014, by CPUC Executive Director Paul Clanon, to allow the IOUs more time to prepare the report under the revised methodology.

This December 2014 report (3rd Load Research Report) includes data through October 2014 for service line and distribution system upgrades and for the period September 2013 through August 2014 for load research data, along with the conclusions reached through analyzing this data. Data from the 1st and 2nd Load Research Report is considered in drawing conclusions. It is important to note that the PEV market is still evolving. New vehicle models, vehicle battery sizes, charging levels, charging equipment, and charging services are continually entering the PEV market. PEV manufacturers and charging providers are also leaving the market. This evolution is expected to continue in the near team as the PEV market grows and matures.

As of October 31, 2014, the IOUs estimate there are over 97,350 PEVs within the three service territories. Of the 97,350 vehicles estimated to be currently on the road, only 126, or 0.1%, have required a service line and/or distribution system upgrade. Further, PG&E and SCE have completed more than 14,639 residential infrastructure checks related to PEVs[4] and only 115, or 0.8%, of the checks identified the need for an upgrade. In all but 20 instances, the allowance for residential service upgrades was sufficient to cover the portion of the service upgrade cost that is assigned to the utility.[5] The IOUs have evaluated the service and distribution system upgrades needed due to the addition of

1 D.13-06-014, p 15

2 D.13-06-014, Ordering Paragraph 4

3 D.13-06-014, Ordering Paragraph 3

4 SDG&E does not separately track distribution infrastructure checks related to PEVs, the service call is tagged as PEV only if a construction project is opened to perform an upgrade.

5 For a service line upgrade, the utility is responsible for the cost of the service conductor, connecters, support poles, and metering. These costs are covered by the residential allowance and any amount in excess of the allowance (absent the CPUC's current policy for the excess to be paid by all customers for upgrades related to PEVs) is billed to the customer. The customer is responsible for any trenching, conduit, substructures, or protective structures required for the upgrade. These costs are not covered by the residential allowance, or the CPUC policy currently in place that directs costs in excess of the allowance to be paid by all customers.

PEV load and have determined that the number of upgrades and associated costs to date is immaterial. The IOUs will continue to track and report data on service and distribution system upgrades related to PEVs through 2015, as required by the Extension Decision.

The IOUs tracked load research data on a monthly basis and have included 12 months of data in this report. The usage and demand of customers was tracked in each rate group. The goal of this structure was to determine how monthly usage varies, how rates impact peak demand, and how usage varies by time-of-use rate among different groups of customers.

Generally, the usage and demand levels for customers on single-metered PEV rates are higher than that of the typical residential customer. PEV customers (separately-metered and single-metered) on TOU rates take advantage of the lower off-peak costs and tend to charge their vehicles during the super off-peak period. Single-metered PEV customers tend to peak during the super off-peak period. Many of these customers use timers either equipped in the vehicle or on the charging station.

Part 1: Introduction

California is the fifteenth largest emitter of greenhouse gases in the world, representing about 2% of worldwide emissions. California's transportation sector is the largest contributor, consisting of 38% of the State's total greenhouse gas emissions. Passenger vehicles alone are responsible for almost 30% of California's greenhouse gas emissions.[6] To address these vehicle emissions, the California Air Resources Board (CARB) proposed a comprehensive three pronged strategy, which includes the following: reduce greenhouse gas emissions from vehicles, reduce the carbon content of the fuel vehicles use, and reduce the miles vehicles travel. Electrification of vehicles is a critical component of this strategy.[7]

The California Public Utilities Commission (CPUC) opened the Alternative-Fueled Vehicle Rulemaking, R.09-08-009 (AFV OIR), to consider alternative-fueled vehicle tariffs, infrastructure, and policies to support California's Greenhouse Gas Emissions Reductions Goals.

At the time of this report, December 2014, Go Electric Drive lists on its online virtual showroom 22 PEVs currently for sale by dealers[8]: the Audi A3 Sportback e-tron, BMW i3, BMW i8, Cadillac ELR, Chevrolet Spark EV, Chevrolet Volt, Fiat 500e, Ford C-Max Energi, Ford Focus Electric, Ford Fusion Energi SE, Honda Accord Plug-in, Honda Fit-EV, Mercedes-Benz B-Class Electric Drive, Mitsubishi iMiev, Nissan Leaf, Porsche Panamara S E-Hybrid, Smart Electric Drive, Tesla Model S, Toyota Prius Plug-in, Toyota RAV 4 EV, Volkswagen E-Golf, and Wheego Life. These vehicles have on-board chargers capable of charging at levels ranging from 3.3 kW to 19.2 kW.

The IOUs estimate more than 97,350 PEV are in their service territories, as of October 31, 2014. The number of PEVs forecasted to be operating in the IOUs service territories from 2015 through 2022 are:

Year	PG&E[9]	SCE[10]	SDG&E[11]
2015	66,000	63,828	12,103
2016	84,000	103,270	16,036
2017	102,000	151,796	20,024
2018	120,000	211,534	24,289
2019	138,000	278,244	29,708

6 *Climate Change Scoping Plan, A Framework for Change, Pursuant to AB 32, the California Global Warming Solutions Act of 2006* (herein ARB's 2008 Scoping Plan) at 11, adopted by the California Air Resources Board on December 11, 2008. The ARB 2008 Scoping Plan is available at: http://www.arb.ca.gov/cc/scopingplan/document/scopingplandocument.htm.

7 D.11.07-029, p 3-4

8 http://www.goelectricdrive.org/electric-cars/virtual-showroom

9 PG&E's EV forecast assumes sufficient customer demand in California to meet the CARB's Zero Emission Vehicle compliance requirements and sufficient installation and maintenance of EV infrastructure, including by electric utilities in the State, to support EV customer needs for EV charging infrastructure. If either of these assumptions is not accurate, then forecast EV market penetration likely will be significantly less than PG&E's forecast.

10 SCE's PEV Forecast Methodology Overview presentation to CEC IEPR workshop on August 21, 2013.

11 SDG&E Electric Vehicle-Grid Integration Pilot Program Application (A.14-04-014), Direct Testimony of J.C. Martin, Revised July 29, 2014, page JCM-17.

Year	PG&E[9]	SCE[10]	SDG&E[11]
2020	156,000	356,324	37,311
2021	190,000	443,456	46,940
2022	228,000	540,308	61,618

This report includes data through October 2014 for service line and distribution system upgrades and for the period September 2013 through August 2014 for load research data along with the conclusions reached analyzing the data. Data from the 1st and 2nd Load Research Reports are also considered in drawing conclusions. It is important to note that the behavior of the early adopters of PEVs during this time period may not be representative of the average customer. While the data collected is illustrative of the behaviors of early adopters of PEVs, one cannot conclude that these behavior patterns will hold as PEV technology matures, charging technology and charging behaviors evolve, and PEVs achieve greater market adoption beyond the early adopter phase.

Part 2: Scope of Load Research

In the Phase 2 Decision, the CPUC required the IOUs to perform load research to inform future Commission policy.[12] The CPUC determined that additional research is needed to inform policies for the next stages of PEV market development.[13] Specifically, the CPUC ordered the IOUs to:

1. Track and quantify all new load and associated upgrade costs in a manner that allows PEV load and related costs to be broken out and specifically identified. This information shall be collected and stored in an accessible format useful to the Commission.

2. Evaluate how metering arrangements and rate design impact PEV charging behavior.

3. To the extent relevant, determine whether participation in demand response programs impacts PEV charging behavior.

4. Determine how charging arrangements, including metering options and alternative rate schedules impact charging behavior at Multi Dwelling Units (MDU).

5. Evaluate whether distribution costs are increased by different charging levels, i.e., Level 1, Level 2, and quick charging, in public locations.

6. Separately track costs associated with PEV-related residential service facility upgrade costs and treated as "common facility costs" between the effective date of this decision and June 30, 2013, and propose a policy and procedural mechanism to address these residential upgrade costs going forward.[14]

In collaboration with the Energy Division and other stakeholders, the IOUs developed a load research plan to meet these specific requirements and filed the plan with the CPUC on October 1, 2012.[15] The plan identified certain areas where data is not available or sufficient to produce data or conclusions. The CPUC further ordered the IOUs to complete the load research by January 1, 2013 and file a load research report by January 1, 2013.[16] The IOUs filed the 1st Load Research Report in December 2012. The Extension Decision extended the research an additional three years[17] to begin in December 2013[18] and directed the Energy Division to work with stakeholders to revise the load research methodology.[19] The deadline for the December 2013 report was extended to January 31, 2014 by CPUC Executive Director Paul Clanon, to allow the IOUs more time to prepare the report under the revised methodology. This December 2014 report is the third report to be filed.

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12 D.11-07-029, p. 3
13 D.11-07-029, p. 60
14 D.11-07-029, Ordering Paragraph 6
15 See Advice Letters 2403-E for SDG&E, 2786-E for SCE, and 4115-E for PG&E
16 D.11-07-029, Ordering Paragraph 7
17 D.13-06-014, p 15
18 D.13-06-014, Ordering Paragraph 4
19 D.13-06-014, Ordering Paragraph 3

Part 3: Cost Tracking Data, Findings, and Policy Recommendations

Introduction

In the Phase 2 Decision the CPUC ordered that "Between July 25, 2011 and June 30, 2013, all residential service facility upgrade costs in excess of the residential allowance shall be treated as common facility costs rather than being paid for by the individual plug-in hybrid and electric vehicle customer."[20] The CPUC further ordered "the IOUs to separately track costs associated with PEV-related residential service facility upgrade costs and treated as 'common facility costs' and propose a policy and procedural mechanism to address these residential upgrade costs going forward." [21] Lastly, the CPUC ordered that "The IOUs should evaluate whether distribution costs are increased by different charging levels, i.e., Level 1, Level 2, and quick charging, in public locations."[22]

The Extension Decision extended the "common facility treatment" for costs in excess of the allowance to June 30, 2016,[23] and extended the cost tracking and research an additional three years[24] with reporting to begin in December 2013.[25]

Approach

Based on notification of a PEV's location, such as from the customer or auto OEMs, the utilities' service planning departments may conduct assessments of the customer's service line and the distribution system supporting the customer's electric service (such as the secondary line, transformer, etc.) to determine whether the new PEV load can be served by the existing infrastructure. The assessment considers factors such as voltage drop and flicker on the service and diversity of load on the local distribution system feeder. If the assessment indicates that existing infrastructure can accommodate the new PEV load, no upgrade is needed and the assessment is complete. If the existing infrastructure cannot accommodate the new PEV load, then the customer service line and the distribution system supporting the customer service are evaluated to determine if one or both need to be upgraded. As part of the evaluation, the service planning departments consider if the upgrade was needed before the addition of the PEV, and the PEV simply brought attention to the need for the upgrade. If an upgrade was needed before the addition of the PEV, then the upgrade is not attributed to the PEV because the PEV did not cause the need for the upgrade.[26] Similarly, if the customer is adding a PEV plus other new load such as a room addition, air conditioner, or pool pump, and an upgrade is needed, the upgrade is not attributed to the PEV since it was not the sole source of the new load.[27] Once the evaluation is complete, a new project is opened for the upgrade and attributed to the PEV if it was the sole source of

[20] D.11-07-029, Ordering Paragraph 5
[21] D.11-07-029, Ordering Paragraph 6
[22] D.11-07-029, Ordering Paragraph 6
[23] D.13-06-014, Ordering Paragraph 1
[24] D.13-06-014, p 15
[25] D.13-06-014, Ordering Paragraph 4
[26] That is, even if the customer ultimately decided not to purchase the car, the upgrade would still be completed because it was needed absent the PEV.
[27] The upgrade would be completed absent the PEV because other new load is being added.

the new load and an upgrade was not needed before the PEV was added. The utilities create PEV-specific work orders to capture the upgrade costs and track them for reporting purposes when the upgrade work is complete. This is the most practical way for the IOUs to capture and report upgrade costs attributable solely to PEVs.

Upgrade costs related to PEVs fall into three general categories:

- Equipment on the customer side of meter
- The individual customer service line, and
- The utility distribution system that serves multiple customers.

The costs for each category are treated differently.

Costs for equipment on the customer side of the meter are borne by the customer and the utility does not have information on these costs. Therefore, they are not included in this report.

The table on the following page illustrates how costs for upgrades to the individual customer service line are split between the customer and the utility. The customer's assigned costs are the costs incurred in fulfilling the Applicant Responsibility of Rule 16. The utility's contribution toward the utility-assigned costs is limited to the amount of the residential allowance and any costs in excess of the allowance are billed to the customer. The customer is responsible for the costs of the service line upgrade that are assigned to them. These costs are not covered by the residential allowance or the CPUC policy currently in place that directs costs in excess of the allowance to be paid by all customers. The utility does not have information on the costs borne by the customer for the service upgrade and they are not included in this report.

Costs for upgrades to the utility distribution system, including secondary lines and transformers, are paid by the utility and recovered through distribution rates. The following table summarizes the types of costs in each category and the party responsible for the costs.

Table IOU-1: Summary of Upgrade Costs and Responsibilities

	Customer Assigned Costs	Allowance?	Utility Assigned Costs
Equipment on Customer Side of Meter	Customer pays all costs for charging equipment, including costs to plan, design, install, own, maintain, and operate facilities and equipment beyond the Service Delivery Point		
Service Line Upgrade	• Excavation: trenching, backfilling, and other digging as required including permit fees • Furnishing, installing, owning, and maintaining all Conduits (including pulling tape) and Substructures, furnishing riser materials • Protective Structures: Furnishing, installing, owning, and maintaining all necessary Protective Structures as specified by utility for utility's facilities	Yes, to cover work responsibility assigned to utility. Customer pays amount exceeding allowance. This is in addition to Customer assigned costs. **NOTE: CPUC policy exemption in place through June 2016 for residential upgrades when PEV load is added. Under exemption, amount exceeding allowance is not paid by customer and instead paid by utility and recovered through distribution rates.**	• Underground Service: Service conductors and connectors • Overhead Service: conductors and support poles • Metering: meters and associated utility owned metering equipment
Secondary Lines/ Transformer Upgrade (serving 2 or more Service Lines)			Utility pays all costs for upgrading and maintaining the distribution system. Recovered through distribution rates.

Summary Data

Table IOU-2 summarizes the PEV-related service line and distribution system upgrade costs for July 2011 through October 2014.

Table IOU-2: Summary of Service Line and Distribution System Upgrades

	PG&E	SCE	SDG&E	Total
Residential Customers				
Estimated PEV customers through October 31, 2014	52,500	33,350	11,500	97,350
Residential Upgrades				
Number of PEV-related Infrastructure Checks Completed	5,339	9,300	Not[28] tracked	14,639
Number PEV-related Service Line and/or Distribution System Upgrades[29]	89	26	11	126
Total Costs Incurred by Utility for Upgrades	$1,323,677	$124,968	$32,041	$1,480,686
Range of Costs for Upgrades	$148 to $119,089	$274 to $33,499	$294 to $11,604	N/A
Average Cost for Distribution System Upgrade[30]	$15,852	$7,165	$4,089	N/A
Average Cost for Service Line Upgrade	$4,558	$2,055	$939	N/A
Number of Service Line Upgrades Exceeding Residential Allowance	20	0	0	20
Current Residential Allowance	$1,918[31]	$3,038	$2,841[33]	N/A
Amount of Foregone Billings to Customers for Service Line Upgrades Pursuant to "Common Facility Treatment" Policy Exemption for PEVs	$84,810	$0	$0	$84,810

[28] SDG&E does not separately track distribution infrastructure checks related to PEVs, the service call is tagged as PEV only if a construction project is opened to perform an upgrade.

[29] If a both a service line upgrade and distribution line upgrade was performed at the same residence, it is counted as one upgrade.

[30] For upgrades that included both a distribution system and service line upgrade PG&E and SDG&E broke them out between the distribution upgrade and service line upgrade line items. SCE reported total amount in distribution system upgrade line item.

[31] PG&E Electric Rule 15, Section C.3: http://www.pge.com/tariffs/tm2/pdf/ELEC_RULES_15.pdf

[32] SCE Electric Rule 15, Section C.3: https://www.sce.com/NR/sc3/tm2/pdf/Rule15.pdf

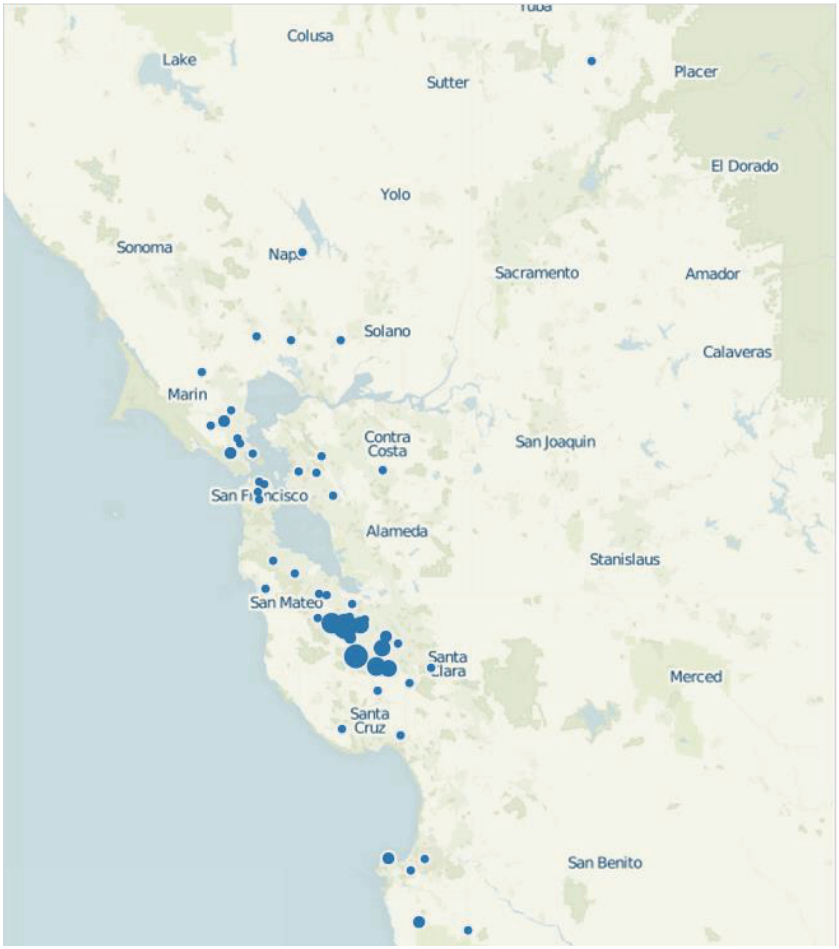
[33] SDG&E Electric Rule 15, Section C.3: http://regarchive.sdge.com/tm2/pdf/ELEC_ELEC-RULES_ERULE15.pdf

PG&E Specific Details

As of October 2014, PG&E's best estimate of the number of PEVs in the PG&E service territory is 52,500. This value reflects all PEVs registered in PG&E service territory according to data obtained from a third party DMV vendor. There is a significant amount of uncertainty in this number and it is appropriately considered to be a lower bound of the number of PEVs in the territory.

While PG&E's total estimate of PEVs in the service territory is 52,500, PG&E is only able to perform service assessments for those vehicles for which customer specific notification is received. As of October 31, 2014, PG&E had completed 5,339 such service assessments. Of the 5,339 service assessments completed to date, 89, or 1.7%, have required upgrades due solely to the addition of PEV load. In 20 instances the allowance was not sufficient to cover the portion of the service upgrade assigned to the utility, and the customer would have incurred additional costs had the exemption not been in place. The total cost of the excess over the allowance for the 20 customers combined was $84,810. The map below identifies the locations of the 89 upgrades.

Figure PG&E-1: Location of Cutsomers in the PG&E's Service Territory Requiring a Residential Upgrade due to a PEV in 2014 (as of October 2014)



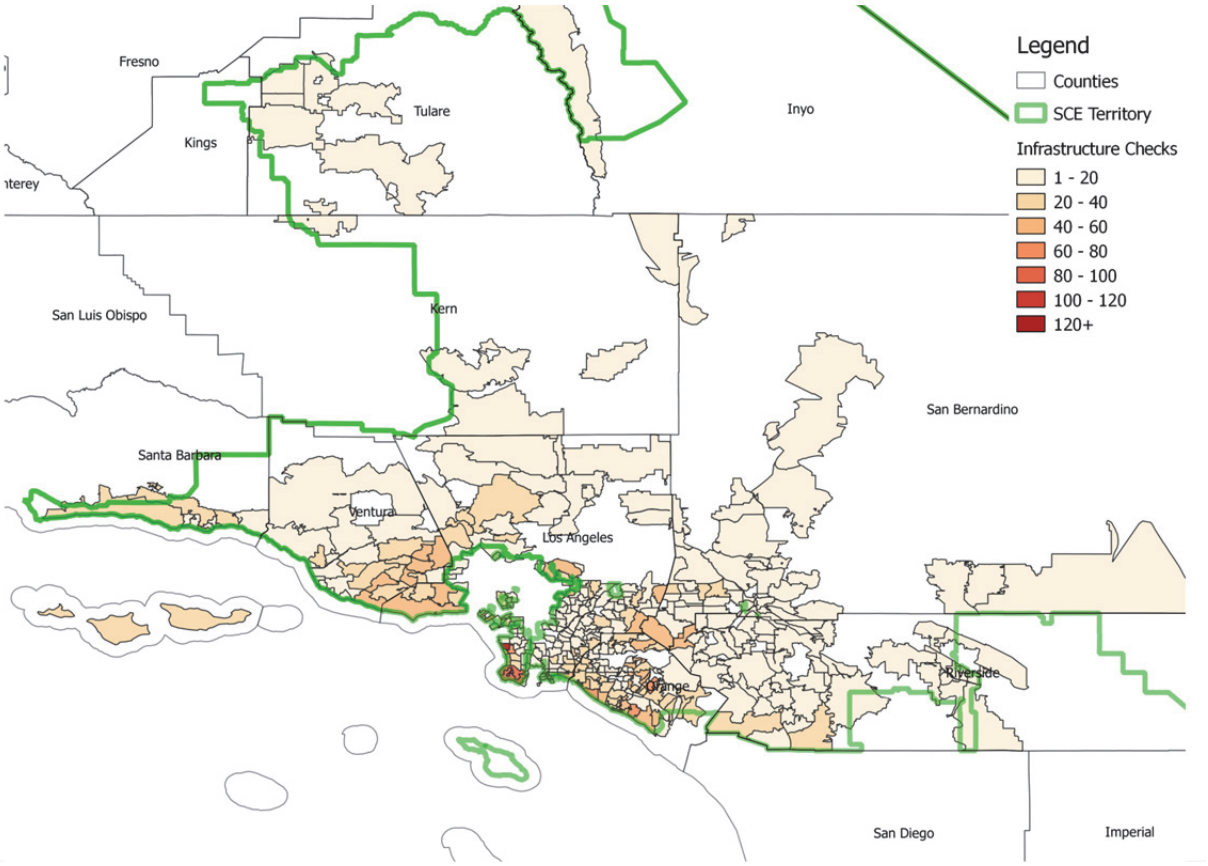
SCE Specific Details

As of October 2014, SCE's best estimate of the number of PEVs registered to residential customers in SCE's service territory is 33,350. The data sources for this estimate are: PEV counts received through a third party DMV vendor (as of September 30, 2014), adjusted as of October 31, 2014, and with estimates based on national sales. There is some amount of uncertainty in this number and it is appropriately considered to be a lower bound of the number of PEVs in the territory.

SCE is only able to perform a residential service assessment when it has been notified of the street address of a charging location. As a result, as of October 31, 2014, SCE had completed approximately 9,300 such on-site residential service assessments out of the 33,350 electric vehicles estimated in its service territory. In 2014, SCE changed its practice to only conduct on-site infrastructure assessments for those customers with a PEV with the capability of charging at 6.6kW and higher.

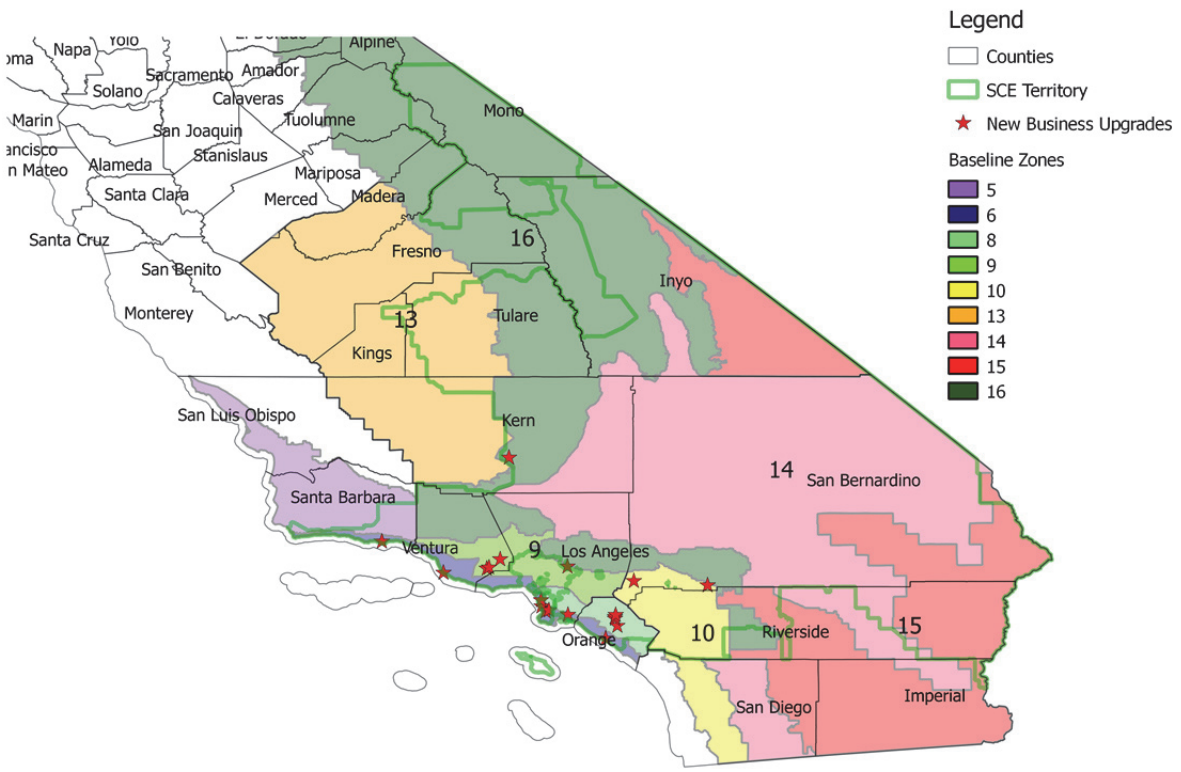
This map shows the concentration of infrastructure checks by ZIP Code.

Figure SCE-1: Infrastructure Checks Completed SCE Service Territory



Of the 9,300 residential service assessments completed to date, 26, or 0.3%, have required upgrades due solely to the addition of PEV load. The locations of the upgrades are depicted on this map.

Figure SCE-2: PEVs in the SCE Service Territory Requiring a Residential Upgrade as of October 2014



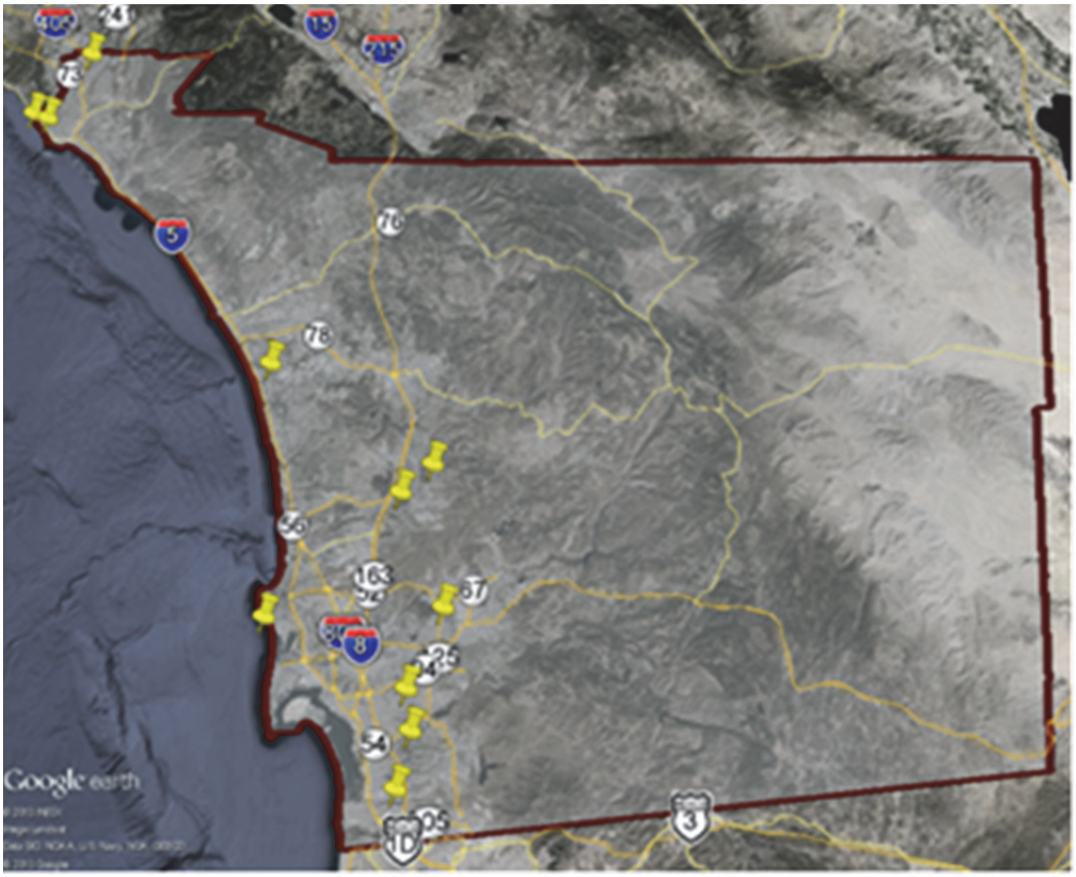
SCE also had 9 upgrades relating to the commercial installation of PEV charging stations totaling approximately $158,000.

SDG&E Specific Details

As of October 2014, SDG&E's best estimate of the number of PEVs registered to residential customers in the SDG&E service territory is 11,500. The data sources for this estimate are: customer self-identification, OEM opt-in notification, car dealership reporting, and PEV counts received through a third party DMV vendor. There is some uncertainty in this number and it is appropriately considered to be a lower bound of the number of PEVs in the SDG&E service territory.

Of the approximately 11,500 residential vehicles in SDG&E's service territory, 11, or 0.1%, have required upgrades where the PEV was the sole source of the new load. The locations of the PEV-related upgrades are depicted on the map that follows.

Figure SDG&E-1: Location of PEVs Requiring a Residential Upgrade in the SDG&E Service Territory as of October 2014



SDG&E also completed 9 commercial upgrades for the installation of PEV charging, totaling approximately $133,000.

Conclusions/Recommendations

As of October 31, 2014, the IOUs estimate there are approximately 97,350 PEVs within the three service territories. Of the 97,350 vehicles estimated to be currently on the road, only 126, or 0.1%, have required a service line and/or distribution system upgrade. Further, PG&E and SCE have completed more than 14,639 residential infrastructure checks[34] and only 115, or 0.8%, of the checks identified the need for an upgrade. In all but 20 instances, the allowance for residential service upgrades was sufficient to cover the portion of the service upgrade cost that is assigned to the utility. The IOUs have evaluated the service and distribution system upgrades needed due to the addition of PEV load and have determined that the number of upgrades and associated costs to date to be immaterial. The IOUs will continue to track and report data on residential service and distribution system upgrades related to PEVs, as required by the Extension Decision.

[34] SDG&E does not separately track distribution infrastructure checks related to PEVs, the service call is tagged as PEV only if a construction project is opened to perform an upgrade.

Part 4: Load Research & Customer Behavior on Rates in Various Settings

Introduction

The Extension Decision directed the IOUs to continue its load research reporting related to PEVs for an additional three years. The Extension Decision along with the Phase 2 Decision provided direction on scope and instructed the IOUs to work with the Energy Division on revising and continuing PEV load research reporting. In the Phase 2 Decision the IOUs were ordered to:

- Evaluate how metering arrangements and rate design impact PEV charging behavior.
- To the extent relevant, determine whether participation in demand response programs impacts PEV charging behavior.
- Determine how charging arrangements, including metering options and alternative rate schedules impact charging behavior at MDU.[35]

To satisfy these requirements, metering data was collected to provide insight into residential charging behavior under:

- Whole House TOU Rates known as "single–metered"
- Electric Vehicle TOU Rates known as "separately–metered"
- Tiered Residential rates

This metering data provided the basis for analysis as to how charging behavior has been impacted by tariff rates or charging levels. Additionally, the recorded metrics allowed for the evaluation of metering scenarios on PEV charging behavior for customers in the following residential categories[36]:

- Single Family Home (SF)
- Multi Family Dwelling Unit (MDU)
- Net Energy Metering (NEM)
- Demand Response (DR)

The data for this 3rd Load Research Report covers the 12-month period of September 2013 to August 2014. Distinctions between single metering and separate metering are shown, as well as Net Energy Metering (NEM) and Demand Response (DR) program participation. The usage and demand of customers were tracked in each rate group. The goal of this structure was to determine how monthly usage varies, how rates impact peak demand and how usage varies by time-of-use rate among different groups of customers. A baseline for residential customers has been analyzed for context in the form of an average for a month during the season being examined.

To the extent possible, the IOUs provided similar information for easy comparisons. However, there are some cases where this is simply not possible due to differences in the underlying IOU data. Metrics with less than 15 customers are clearly noted and not reported due to confidentiality concerns described in the 15/15 Rule adopted by the Commission in Decision 97-10-031 and Decision 14-05-016. All statistics in this report are provided as an average on a per-customer basis in each rate group and are based on interval data collected by each IOU. All time periods are reported in clock time, except for SCE's load

[35] D.11-07-029, Ordering Paragraph 6

[36] The MDU and SF categories are mutually exclusive. However, the others categories can overlap. For example, a NEM customer that is also on DR would appear in three categories.

profiles, which are reported in Pacific Standard Time. Time-of-use periods vary across the IOUs and will be explicitly defined within each separate section below.

Pacific Gas & Electric Co.

Single-Metered (EV-A) and Separately-Metered (EV-B) PEV Rates

As of the date of this report, PG&E has two residential PEV rates, EV-A and EV-B, as described in Schedule EV[37] for single and separately-metered PEVs respectively. The EV-A rate is designed for residential customers who have their typical load and electric vehicle charging on the same meter. The EV-B rate is designed for customers who wish to bill their vehicle charging separately and who have installed a separate meter to do so. Both rate plans use an un-tiered time-of-use (TOU) rate structure. They offer on-peak, partial peak, and off-peak energy prices according to the time periods in Table PG&E-1a.

These rates are the successors to the experimental time-of-use rates for low emission vehicle customers, E-9A and E-9B, as described in Schedule E-9[38]. Schedule E-9 was closed to new customers as of August 1, 2013, the effective date of the new Schedule EV, and will be eliminated on the later of the date of a decision in Phase 2 of PG&E's 2014 General Rate Case, or December 31, 2014.[39] Because the lifespan of the two schedules overlap during the study period and because Schedule EV was patterned after Schedule E-9, for the purposes of this study, data for EV-A and E-9A customers will be reported as "EV-A" and data for EV-B and E-9B customers will be reported as "EV-B."

Regardless of season, or day of the week, both rates seek to encourage usage in off-peak hours from 11:00 p.m. to 7:00 a.m. The rates further encourage weekend usage by removing the "partial-peak" time periods on Saturdays and Sundays.

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[37] Pacific Gas and Electric Company. Electric Schedule EV. Residential Time-of-Use Service for Plug-in Electric Vehicle Customers. Retrieved from http://www.pge.com/tariffs/tm2/pdf/ELEC_SCHEDS_EV.pdf

[38] Pacific Gas and Electric Company. Electric Schedule E-9. Experimental Residential Time-of-Use Service for Low Emission Vehicle Customers. Retrieved from http://www.pge.com/tariffs/tm2/pdf/ELEC_SCHEDS_E-9.pdf.

[39] At that time all, all Schedule E-9 customers will be migrated to an otherwise available rate schedule as described in Electric Schedule E-9, http://www.pge.com/tariffs/tm2/pdf/ELEC_SCHEDS_E-9.pdf.

Table PG&E-1a: Tariff Type and Rate ($/kWh)

Rate: EV-A

Clock Hour Ending*	Winter Weekday	Winter Weekend / Holidays	Summer Weekday	Summer Weekend / Holidays
1	0.10081	0.10081	0.09807	0.09807
2	0.10081	0.10081	0.09807	0.09807
3	0.10081	0.10081	0.09807	0.09807
4	0.10081	0.10081	0.09807	0.09807
5	0.10081	0.10081	0.09807	0.09807
6	0.10081	0.10081	0.09807	0.09807
7	0.10081	0.10081	0.09807	0.09807
8	0.16487	0.10081	0.21560	0.09807
9	0.16487	0.10081	0.21560	0.09807
10	0.16487	0.10081	0.21560	0.09807
11	0.16487	0.10081	0.21560	0.09807
12	0.16487	0.10081	0.21560	0.09807
13	0.16487	0.10081	0.21560	0.09807
14	0.16487	0.10081	0.21560	0.09807
15	0.27603	0.10081	0.38119	0.09807
16	0.27603	0.27603	0.38119	0.38119
17	0.27603	0.27603	0.38119	0.38119
18	0.27603	0.27603	0.38119	0.38119
19	0.27603	0.27603	0.38119	0.38119
20	0.27603	0.10081	0.38119	0.09807
21	0.27603	0.10081	0.38119	0.09807
22	0.16487	0.10081	0.21560	0.09807
23	0.16487	0.10081	0.21560	0.09807
24	0.10081	0.10081	0.09807	0.09807

Rate: EV-B

Clock Hour Ending*	Winter Weekday	Winter Weekend / Holidays	Summer Weekday	Summer Weekend / Holidays
1	0.10039	0.10039	0.09768	0.09768
2	0.10039	0.10039	0.09768	0.09768
3	0.10039	0.10039	0.09768	0.09768
4	0.10039	0.10039	0.09768	0.09768
5	0.10039	0.10039	0.09768	0.09768
6	0.10039	0.10039	0.09768	0.09768
7	0.10039	0.10039	0.09768	0.09768
8	0.16199	0.10039	0.21292	0.09768
9	0.16199	0.10039	0.21292	0.09768
10	0.16199	0.10039	0.21292	0.09768
11	0.16199	0.10039	0.21292	0.09768
12	0.16199	0.10039	0.21292	0.09768
13	0.16199	0.10039	0.21292	0.09768
14	0.16199	0.10039	0.21292	0.09768
15	0.27027	0.10039	0.40140	0.09768
16	0.27027	0.27027	0.40140	0.40140
17	0.27027	0.27027	0.40140	0.40140
18	0.27027	0.27027	0.40140	0.40140
19	0.27027	0.27027	0.40140	0.40140
20	0.27027	0.10039	0.40140	0.09768
21	0.27027	0.10039	0.40140	0.09768
22	0.16199	0.10039	0.21292	0.09768
23	0.16199	0.10039	0.21292	0.09768
24	0.10039	0.10039	0.09768	0.09768

Legend:

	Winter	Summer
On		
Part		
Off		

* While the table depicts "clock-time", there is a daylight saving time adjustment as described in the tariff.

** Changes to EV-A and EV-B since the 2013 report occurred on October 1, 2014; however, there were no changes to the time of use periods. For details see Electric Schedule EV, Residential Time-of-Use Service for Plug-in Electric Vehicle Customers, retrieved from http://www.pge.com/tariffs/tm2/pdf/ELEC_SCHEDS_EV.pdf

These rates change seasonally, rising in summer and dropping in winter. Table PG&E-1b depicts price ratios for the TOU periods by season to illustrate this seasonal difference.

Table PG&E-1b: Price Ratios

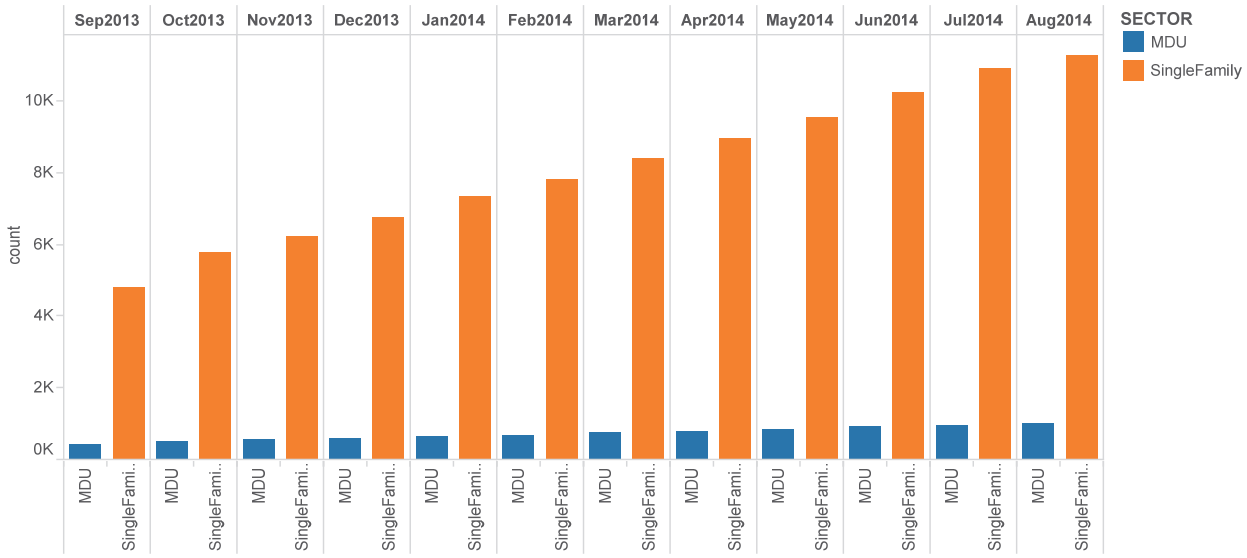
	EV-A Tariff		EV-B Tariff	
Season	Between Off-Peak and Partial Peak	Between Off-Peak and Peak Period	Between Off-Peak and Partial Peak	Between Off-Peak and Peak-Period
Winter	0.61	0.37	0.62	0.37
Summer	0.45	0.26	0.46	0.24

Single Metering (EV-A) Rate Growth

Participation in both EV-A and EV-B has increased during the study period, with EV-A participants increasing more than two fold from 5,273 to 12,294. However, not all PEV customers have adopted PEV rates.[40] The vast majority of PEV rate participants (12,294 of a total 12,563, or 98%) are on the EV-A single metering rate.

All EV-A Customers: Chart PG&E-1 below displays the total customers on the EV-A rate. During the study period, there was a steady increase in EV-A overall, as well as the Single Family and MDU subcategories. Between September 2013 and August 2014, the number of accounts in the EV-A group as a whole increased by 133% at the last reported month compared to the base month.

Chart PG&E-1: Single Metering Accounts by Customer Type



[40] Data obtained by PG&E from auto manufacturers and other sources cannot be verified by the due date of this report to produce a load analysis for Chart 9 or Tables 10, 11, or 12 from Energy Division's reporting requirements. PG&E will seek to include these data in future reports, if feasible. Therefore, the load research figures in this report only represent the number of PG&E PEV customers on PEV rates, not all PEV customers.

NEM EV-A Customers: NEM (Net Energy Metering) customers on the PEV rates are an important group to consider. Of all the PG&E customers who were on a PEV rate up to 19% were also on NEM at any given time during the study period. Virtually all of these dual PEV Rate/NEM customers were on the single-metered EV-A rate (see Tables PG&E-2 and PG&E-4).

The fact that NEM customers with PEVs predominately use the EV-A rate presents a load research challenge. The presence of onsite distributed generation (DG) alongside a PEV behind these customers' meters indicates that their utility energy usage data does not reflect their gross consumption. This is because the DG will have offset some portion of consumption. However, without additional metering of the DG, it is not feasible to isolate the effect PEV ownership has on usage patterns for this group using utility metering data alone. [41]

Table PG&E-2: Single Metering NEM Program Enrollment by Customer Type

Year	Month	Total Single Metering NEM (n)	NEM % of Single Metering	NEM % of SF Single Metering	NEM % of MDU Single Metering
2013	Sep	999	19%	20%	6%
2013	Oct	1096	19%	20%	7%
2013	Nov	1199	18%	19%	7%
2013	Dec	1299	18%	19%	7%
2014	Jan	1393	17%	18%	7%
2014	Feb	1462	17%	18%	6%
2014	Mar	1574	17%	18%	6%
2014	Apr	1677	17%	18%	6%
2014	May	1772	17%	17%	6%
2014	Jun	1896	16%	17%	5%
2014	Jul	1999	16%	17%	5%
2014	Aug	2127	16%	17%	5%

DR EV-A Customers: Demand Response (DR) program participating customers on the PEV rates are another important group to consider. Of all the PG&E customers who were on a PEV rate up to 11% were also participating in a DR program at any given time during the study period. Virtually all of these dual PEV Rate/DR customers were on the single-metered EV-A rate (see Tables PG&E-3 and PG&E-5). This dual participation is important to consider because DR customers are familiar with altering their usage patterns in response to TOU price signals. Consequently, these customers should respond to the PEV rate price signals and charge their vehicles during partial or off-peak periods.

[41] While there are numerous other demographic and behavioral attributes of this early PEV adopter group that affect usage, there was insufficient data or resources to isolate and identify their contribution to load shapes.

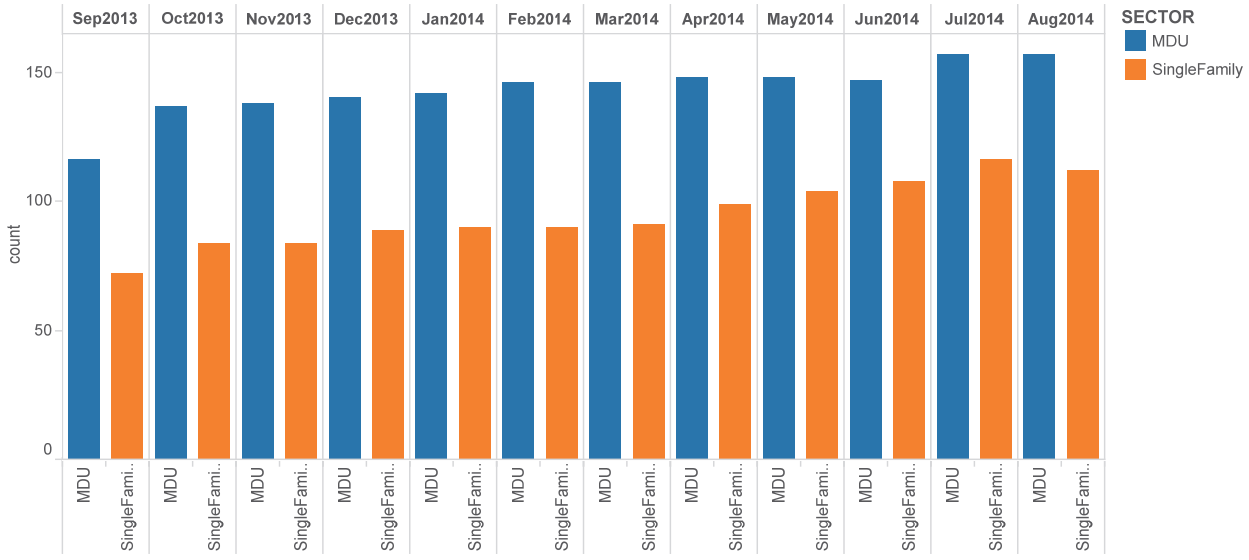
Table PG&E-3: Single Metering DR Program Enrollment by Customer Type[42]

Year	Month	Total Single Metering DR (n)	DR % of Single Metering	DR % of SF Single Metering	DR % of MDU Single Metering
2013	Sep	575	11%	11%	13%
2013	Oct	646	11%	11%	13%
2013	Nov	697	11%	11%	12%
2013	Dec	801	11%	11%	12%
2014	Jan	842	10%	10%	12%
2014	Feb	893	10%	10%	12%
2014	Mar	920	10%	10%	11%
2014	Apr	869	9%	9%	11%
2014	May	897	8%	8%	10%
2014	Jun	963	8%	8%	10%
2014	Jul	1001	8%	8%	9%
2014	Aug	1024	8%	8%	9%

Separate Metering (EV-B) Rate Growth

All EV-B Customers: The EV-B rate also saw steady growth over the study period from 188 customers to 269 customers. Despite this growth (see Chart PG&E – 2), separate metering remains a much less popular option for PEV rate customers than single metering.

Chart PG&E-2: Separate Metering Accounts by Customer Type



[42] The 2014 Demand Response enrollment population used for this report considers both the enrollment date and de-enrollment date. Previous reports only considered the enrollment date.

NEM EV-B Customers: Though the number of PEV rate customers on EV-B and NEM increased during the study period, the growth was minor and inconsequential. This trend is not surprising as customers with PEVs on NEM can offset their PEV load with retail rate credits for their DG system production. PEV customers with a separate meter currently cannot offset their load on the PEV meter with DG production on a separate meter. Therefore, the EV-A rate is a more attractive option for PEV customers on NEM despite the aforementioned challenges it poses to load research.

Table PG&E-4: Separate Metering NEM Program Enrollment by Customer Type

Year	Month	Total Separate Metering NEM (n)	NEM % of Separate Metering	NEM % of SF Separate Metering	NEM % of MDU Separate Metering
2013	Sep	6	3%	5%	1%
2013	Oct	6	3%	4%	1%
2013	Nov	7	3%	5%	1%
2013	Dec	7	3%	5%	1%
2014	Jan	7	3%	5%	1%
2014	Feb	7	3%	5%	1%
2014	Mar	7	3%	5%	1%
2014	Apr	7	2%	4%	1%
2014	May	7	2%	4%	1%
2014	Jun	8	3%	5%	1%
2014	Jul	9	3%	5%	2%
2014	Aug	9	3%	4%	2%

DR EV-B Customers: Similar to dual participation in NEM and PEV rates, there was minimal dual participation during the study period in EV-B and a DR program.

Table PG&E-5: Separate Metering DR Program Enrollment by Customer Type[43]

Year	Month	Total Separate Metering in DR (n)	DR % of Separate Metering	DR % of SF Separate Metering	DR % of MDU Separate Metering
2013	Sep	2	1%	1%	1%
2013	Oct	2	1%	1%	1%
2013	Nov	2	1%	1%	1%
2013	Dec	2	1%	1%	1%
2014	Jan	2	1%	1%	1%
2014	Feb	3	1%	2%	1%
2014	Mar	2	1%	1%	1%
2014	Apr	2	1%	1%	1%
2014	May	2	1%	1%	1%
2014	Jun	2	1%	1%	1%
2014	Jul	2	1%	1%	1%
2014	Aug	2	1%	1%	1%

[43] The 2014 Demand Response enrollment population used for this report considers both the enrollment date and de-enrollment date. Previous reports only considered the enrollment date.

Notes of Caution Regarding Reliance upon Load Research Data

The reader should take careful note of the following issues that make the load research data ill-suited for drawing conclusions for policymaking at this time.

1. The current group of PEV owners is comprised of early adopters who are likely to be materially different than later PEV owners. These differences could include, but are not limited to, income, pre-PEV ownership usage habits, NEM penetration, altruistic tendencies, and willingness to adopt usage patterns beneficial to grid stability.
2. The types of PEVs available in the market changed significantly during the study period, suggesting that the types of PEVs owned by PEV rate customers would have changed during that same time frame. New vehicles and charging requirements will likely lead to changes in charging profiles in the future (i.e. differing charging demands and durations).
3. The study period was relatively short and the customer counts were fairly small in all cases. This is particularly true for EV-B data derived from PG&E's load research sample.
4. The mix of customers being evaluated changed over time due to customers joining or leaving the EV-A or EV-B.
5. While PEV charging for EV-A (single meter) may be fairly obvious if peak customer demand occurs during off-peak rate periods, the lack of on-site survey or end-use data to help disaggregate other loads from PEV charging prevents the identification of PEV charging in other periods (particularly partial-peak) where multiple significant loads are likely present.

Therefore, while the data collected are illustrative of the behaviors of early adopters based on the types of vehicles that are currently available in the market, one cannot conclude that these behavior patterns will hold as PEV technology matures, as charging technology and charging behaviors evolve, and as PEVs achieve greater market adoption beyond the early adopter phase. Data that is sufficiently reliable for policymaking can only be obtained via an appropriately funded and carefully designed study that controls for the above issues.

Average Monthly Usage for PEV Rate Customers

Keeping in mind the above cautions about the data collected, Chart PG&E-3 displays the average monthly usage for each EV-A category including NEM customers, which means that the average monthly usage of these categories is net of behind the meter generation. Chart PG&E-4 displays the average monthly usage for each EV-A category but does not include NEM customers. NEM customers are not segregated in the EV-B rate class for Chart PG&E-5 due to much lower penetration.

Chart PG&E-3: Single Metering Average Monthly Usage (kWh) by Customer Type with NEM

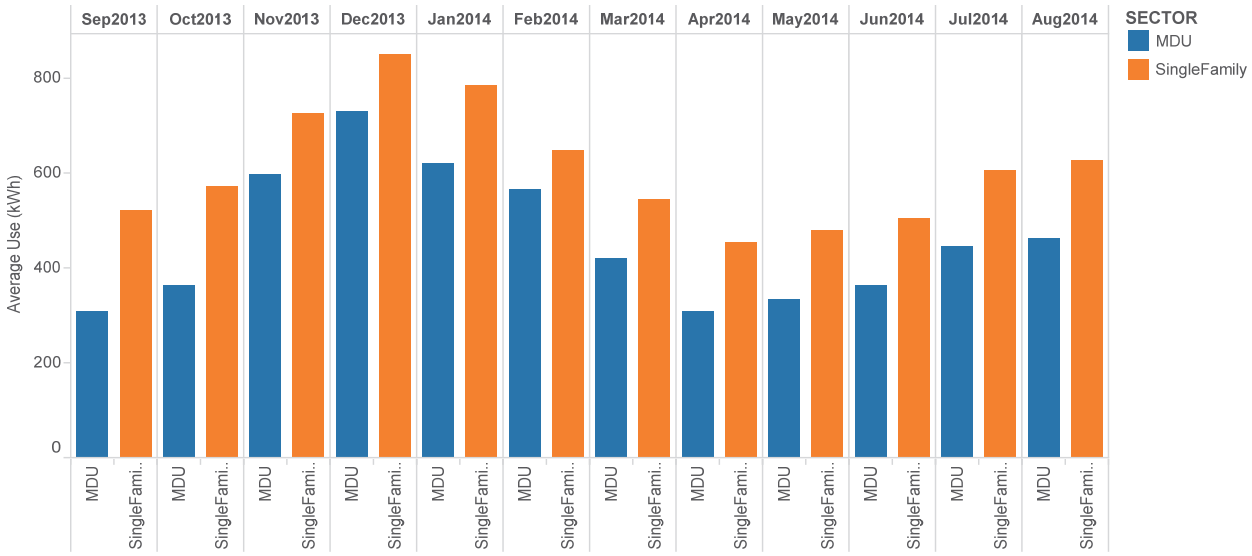
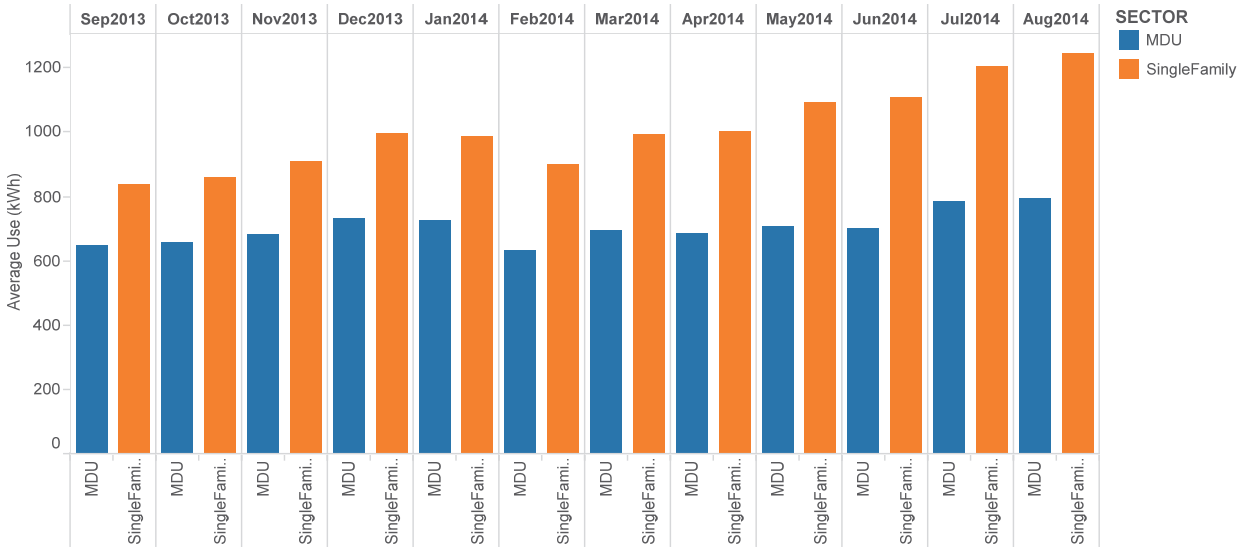
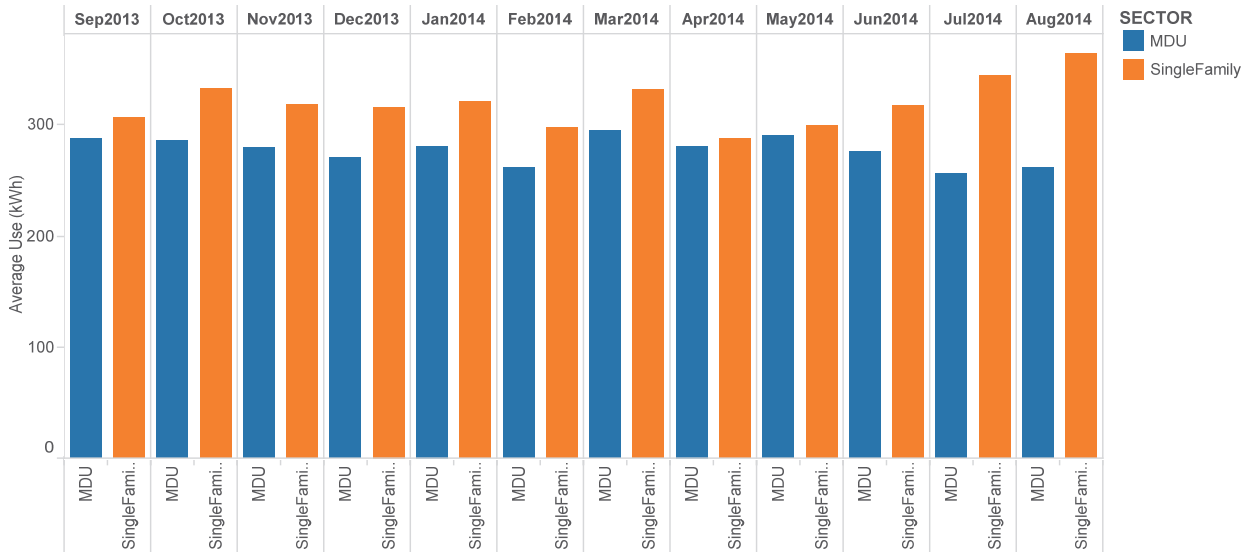


Chart PG&E-4: Single Metering Average Monthly Usage (kWh) by Customer Type without NEM



A comparison of Charts PG&E 3 and 4 reveals an unsurprising result for both sectors: absent the NEM accounts, usage is flatter for both PEV rate customers throughout the study period. This result demonstrates that offsetting consumption with behind-the-meter generation obfuscates researchers' ability to parse PEV load from other site loads for NEM customers using their consumption data alone.

Chart PG&E-5: Separate Metering Average Monthly Usage (kWh) by Customer Type



The results depicted in Chart PG&E-5 demonstrate that absent other loads on the meter, researchers can better observe PEV rate customers' charging patterns. For example, the increase in single family usage during summer months (June to August), relative to fall and winter months (September to February), suggests increased charging in spring/summer months to support the typical increased driving and travel patterns during that period.

Average Usage during Time of Use Periods

TOU PEV rates are designed to discourage charging during on-peak hours and instead encourage charging during off-peak hours when the grid is less stressed and generation costs are lower. For both EV-A and EV-B customers, the time of use periods are defined in Table PG&E-1a.

One useful way to determine whether the TOU PEV rates are achieving their goal of avoiding peak PEV charging is to measure the distribution of charging in the various time periods. Given that NEM customers have a very unique usage profile, they are segregated from all other EV-A customers groups in Tables PG&E-6, 7 and 8.

- Table PG&E-6 shows the EV-A and EV-B customers share of peak usage by sector, with and without NEM, compared to the peak usage of PG&E's entire residential population. Non-NEM customers on EV-A used an average of 14% less energy than the average PG&E residential customer and NEM customers on EV-A used 22% less energy than the residential population. Likewise non-NEM customers on EV-B used an average of 27% less energy, and NEM customers on EV-B used 16% less than the residential population. As previously noted the small customer population of NEM customers on EV-B detracts from the meaningfulness of results produced by its data. Because the goal of PEV rates is to encourage customers to charge their vehicles during off-peak hours, the fact that PEV rate customers' peak period usage is reasonably below that of non-PEV customers indicates that the rates are not having an adverse effect on PEV customers'

usage. Consequently, the EV TOU rates are achieving their goal among this group of early PEV adopters by avoiding PEV charging during the peak period.

- Table PG&E-7 shows the EV-A and EV-B customers share of off-peak usage by sector, with and without NEM, compared to the off-peak usage of PG&E's entire residential population. Consistent with performance expectations for customers on EV rates, during the study period, non-NEM customers on EV-A used an average of 10% more energy than the average PG&E residential customer and NEM customers on EV-A used 29% more energy than the residential population. Likewise non-NEM customers on EV-B used an average of 35% more energy and NEM customers on EV-B used 23% more than the residential population. Consequently, all groups met the off-peak performance expectations for their EV TOU rate by consuming more energy during this period than non-PEV customers.

- Table PG&E-8 shows the EV-A and EV-B customers share of partial peak usage by sector, with and without NEM, compared to the partial peak usage of PG&E's entire residential population. During the study period non-NEM customers on EV-A used an average of 3% more energy than the average PG&E residential customer, and NEM customers on EV-A used 8% less energy than the residential population. Non-NEM customers on EV-B used an average of 10% less energy and NEM customers on EV-B used 8% less than the residential population. Non-NEM EV-A usage was driven by significantly higher usage in November through January than non-PEV customers which could correspond with increased PEV and household load commensurate with holiday activities. However, these data do not provide sufficient granularity to explain the drivers behind this result. Consequently, although non-NEM customers on EV-A had slightly higher usage than non-PEV customers, the other three groups met the performance expectations for their EV TOU rate by consuming less energy during this period than non-PEV customers.

Collectively, the data Tables PG&E-6, 7, and 8 show that for both EV-A and EV-B customers a smaller percentage of their usage is in on-peak and a larger percentage is in off-peak as compared to customers not on a PEV rate. Furthermore, non-NEM separately-metered EV-B customers are completing 79% of their charging in the off-peak period on average and 4% on average during the on-peak period. This suggests that customers on the PEV rates are responding to the price signal embedded in their rates and charging during the off-peak periods.

Table PG&E-6: Share of On-Peak Usage by Tariff and Customer Type

Year	Month	Total Residential Population*	All Single Metering, excluding NEM	SF Single Metering, excluding NEM	MDU Single Metering, excluding NEM	Single Metering NEM	All Separate Metering excluding NEM	SF Separate Metering, excluding NEM	MDU Separate Metering, excluding NEM	Separate Metering NEM
2013	Sep	32%	19%	19%	18%	10%	7%	7%	7%	20%
2013	Oct	30%	17%	17%	16%	11%	7%	7%	7%	16%
2013	Nov	29%	11%	11%	9%	8%	2%	2%	2%	10%
2013	Dec	29%	11%	12%	9%	8%	1%	0%	1%	8%
2014	Jan	29%	13%	13%	10%	8%	1%	1%	1%	6%
2014	Feb	28%	13%	13%	11%	8%	2%	2%	1%	5%
2014	Mar	28%	14%	15%	12%	7%	2%	2%	1%	8%
2014	Apr	29%	15%	16%	13%	5%	3%	3%	2%	6%
2014	May	31%	19%	19%	18%	8%	6%	7%	6%	19%
2014	Jun	32%	21%	21%	20%	11%	7%	9%	6%	26%
2014	Jul	35%	22%	22%	21%	14%	8%	9%	7%	30%
2014	Aug	35%	22%	22%	22%	15%	8%	10%	6%	23%
Max		**35%**	**22%**	**22%**	**22%**	**15%**	**8%**	**10%**	**7%**	**30%**
Average		**31%**	**17%**	**17%**	**15%**	**9%**	**4%**	**5%**	**4%**	**15%**

*Load data used for the analysis are from January 2013 to December 2013.

Table PG&E-7: Share of Off-Peak Usage by Tariff and Customer Type

Year	Month	Total Residential Population*	All Single Metering, excluding NEM	SF Single Metering, excluding NEM	MDU Single Metering, excluding NEM	Single Metering NEM	All Separate Metering excluding NEM	SF Separate Metering, excluding NEM	MDU Separate Metering, excluding NEM	Separate Metering NEM
2013	Sep	44%	53%	53%	56%	78%	80%	83%	79%	69%
2013	Oct	41%	54%	54%	56%	74%	79%	79%	78%	71%
2013	Nov	47%	54%	53%	55%	64%	78%	79%	77%	59%
2013	Dec	45%	53%	53%	54%	60%	79%	79%	79%	56%
2014	Jan	44%	54%	54%	55%	64%	80%	80%	80%	59%
2014	Feb	46%	55%	55%	56%	68%	80%	80%	80%	66%
2014	Mar	46%	54%	54%	56%	75%	73%	75%	72%	73%
2014	Apr	42%	55%	55%	56%	82%	78%	79%	77%	82%
2014	May	43%	56%	56%	57%	83%	82%	83%	82%	73%
2014	Jun	45%	56%	56%	57%	80%	82%	80%	83%	67%
2014	Jul	40%	54%	54%	56%	75%	80%	78%	83%	61%
2014	Aug	40%	55%	55%	56%	74%	81%	78%	83%	68%
Max		**47%**	**56%**	**56%**	**57%**	**83%**	**82%**	**83%**	**83%**	**82%**
Average		**44%**	**54%**	**54%**	**56%**	**73%**	**79%**	**79%**	**80%**	**67%**

*Load data used for the analysis are from January 2013 to December 2013.

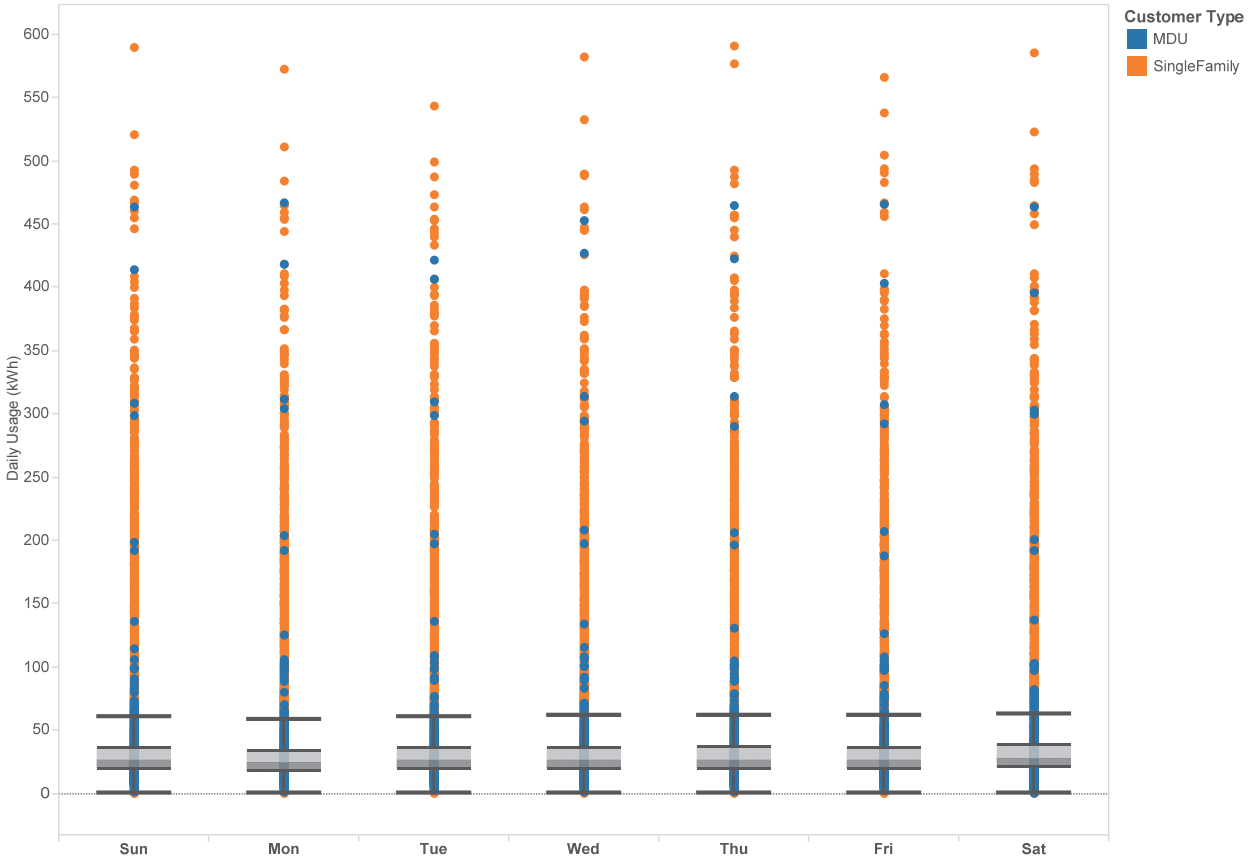
Table PG&E-8: Share of Partial-Peak Usage by Tariff and Customer Type

Year	Month	Total Residential Population*	All Single Metering, excluding NEM	SF Single Metering, excluding NEM	MDU Single Metering, excluding NEM	Single Metering NEM	All Separate Metering excluding NEM	SF Separate Metering, excluding NEM	MDU Separate Metering, excluding NEM	Separate Metering NEM
2013	Sep	24%	28%	28%	27%	12%	12%	10%	13%	10%
2013	Oct	29%	29%	29%	28%	15%	14%	14%	15%	13%
2013	Nov	24%	35%	35%	36%	28%	20%	20%	21%	31%
2013	Dec	26%	36%	35%	37%	32%	20%	20%	20%	35%
2014	Jan	27%	33%	33%	35%	29%	19%	19%	19%	34%
2014	Feb	26%	32%	32%	33%	24%	19%	17%	19%	29%
2014	Mar	27%	31%	31%	33%	18%	25%	23%	27%	19%
2014	Apr	28%	29%	29%	30%	12%	20%	18%	21%	12%
2014	May	26%	25%	25%	25%	9%	11%	11%	12%	9%
2014	Jun	23%	24%	24%	23%	9%	11%	11%	10%	7%
2014	Jul	25%	24%	24%	23%	11%	12%	13%	11%	8%
2014	Aug	25%	23%	24%	23%	11%	12%	13%	11%	9%
Max		**29%**	**36%**	**35%**	**37%**	**32%**	**25%**	**23%**	**27%**	**35%**
Average		**26%**	**29%**	**29%**	**29%**	**18%**	**16%**	**16%**	**17%**	**18%**

*Load data used for the analysis are from January 2013 to December 2013.

Chart PG&E-6 displays a box and whisker plot for PEV energy consumption (kWh) by customer type and data of week. Looking past the outliers with usage above 100 kWh/day, the similarity of the interquartile range values depicted by the "boxes" below demonstrate that daily differentiation between average consumption is minimal with the weekend (Friday to Sunday) demonstrating slightly higher usage patterns than weekdays (Monday to Thursday).

Chart PG&E-6: Box & Whisker Plot for Energy Consumption (kWh) by Customer Type and Day of Week (Sunday through Saturday)



Average Load Profiles for PEV Rates

Depicted below are the average daily load profiles for the EV-A and EV-B rate groups for each sector during the study period. The load profiles demonstrate that for all rates and sectors, high off-peak usage corresponds to the PEV rate price signals, i.e. customers are largely responding to the price signal and charging during off-peak hours (12:00am to 5:00am). This responsiveness is more clearly depicted in the data from the EV-B customers (Charts PG&E-8a and 8b) where the vast majority of the usage occurs during off-peak hours.

Chart PG&E-7a: Average Load Profile for SF Single Metering by Day of the Week

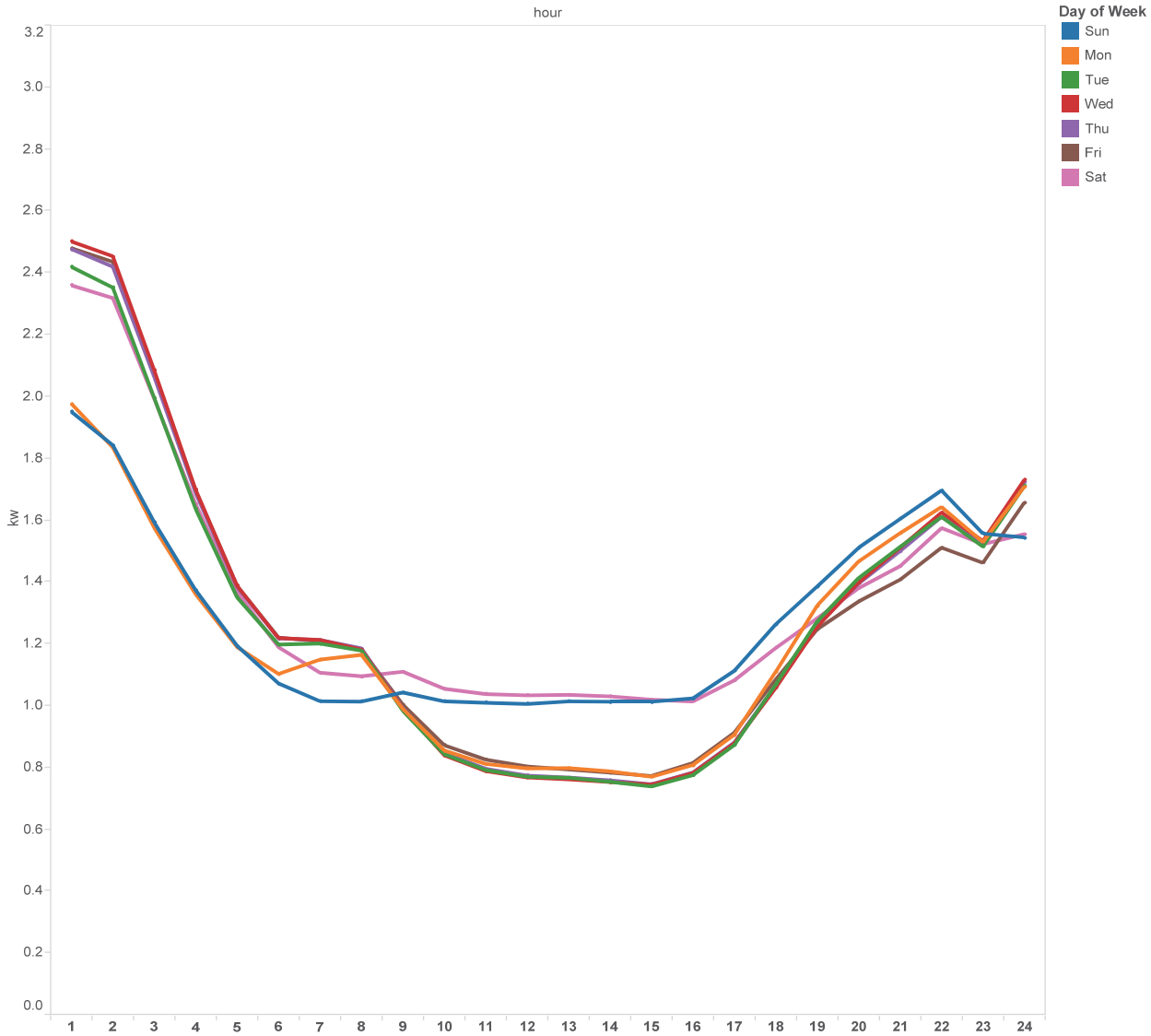


Chart PG&E-7b: Average Load Profile for MDU Single Metering by Day of the Week

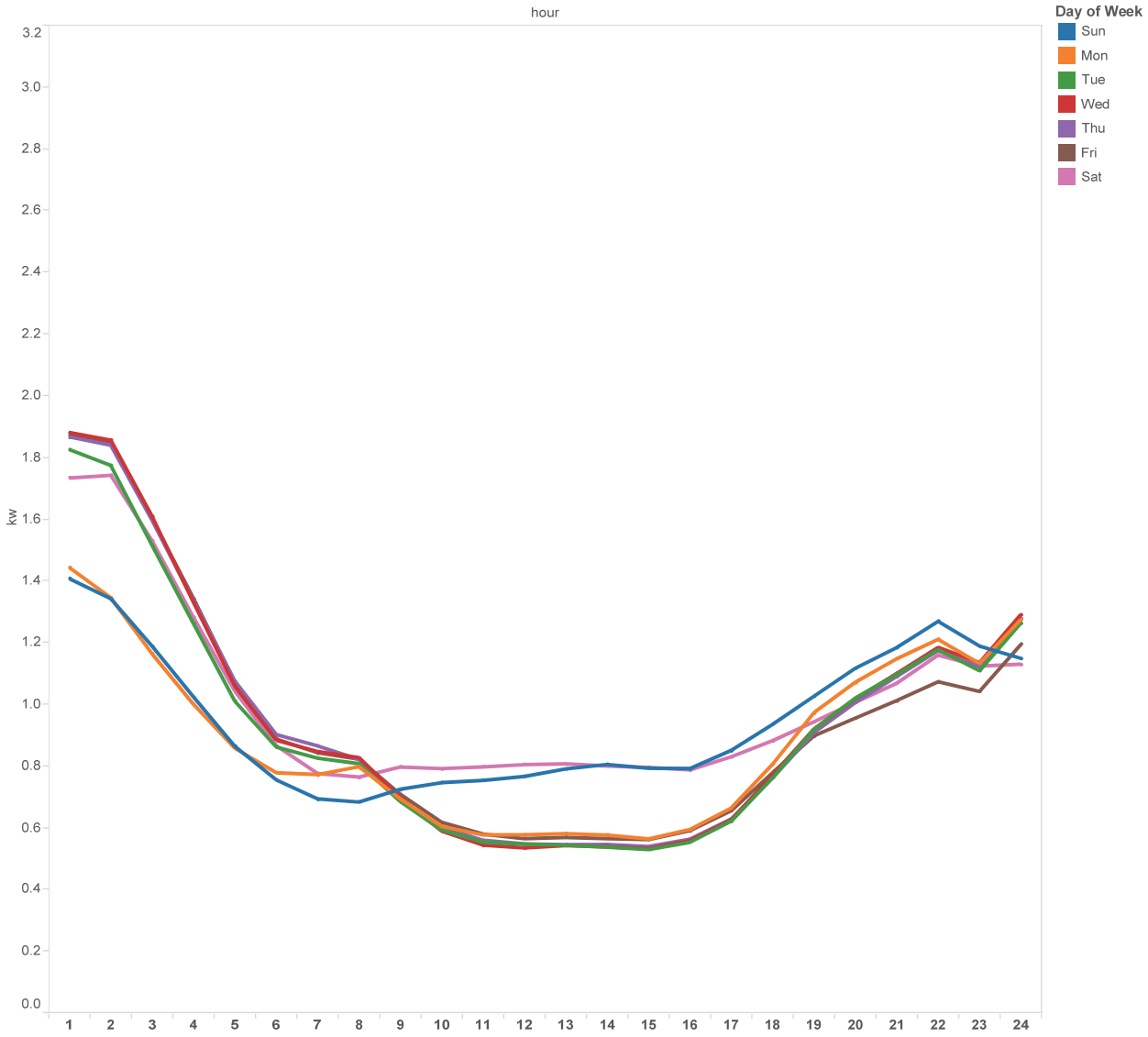


Chart PG&E-8a: Average Load Profile for SF Separate Metering by Day of the Week

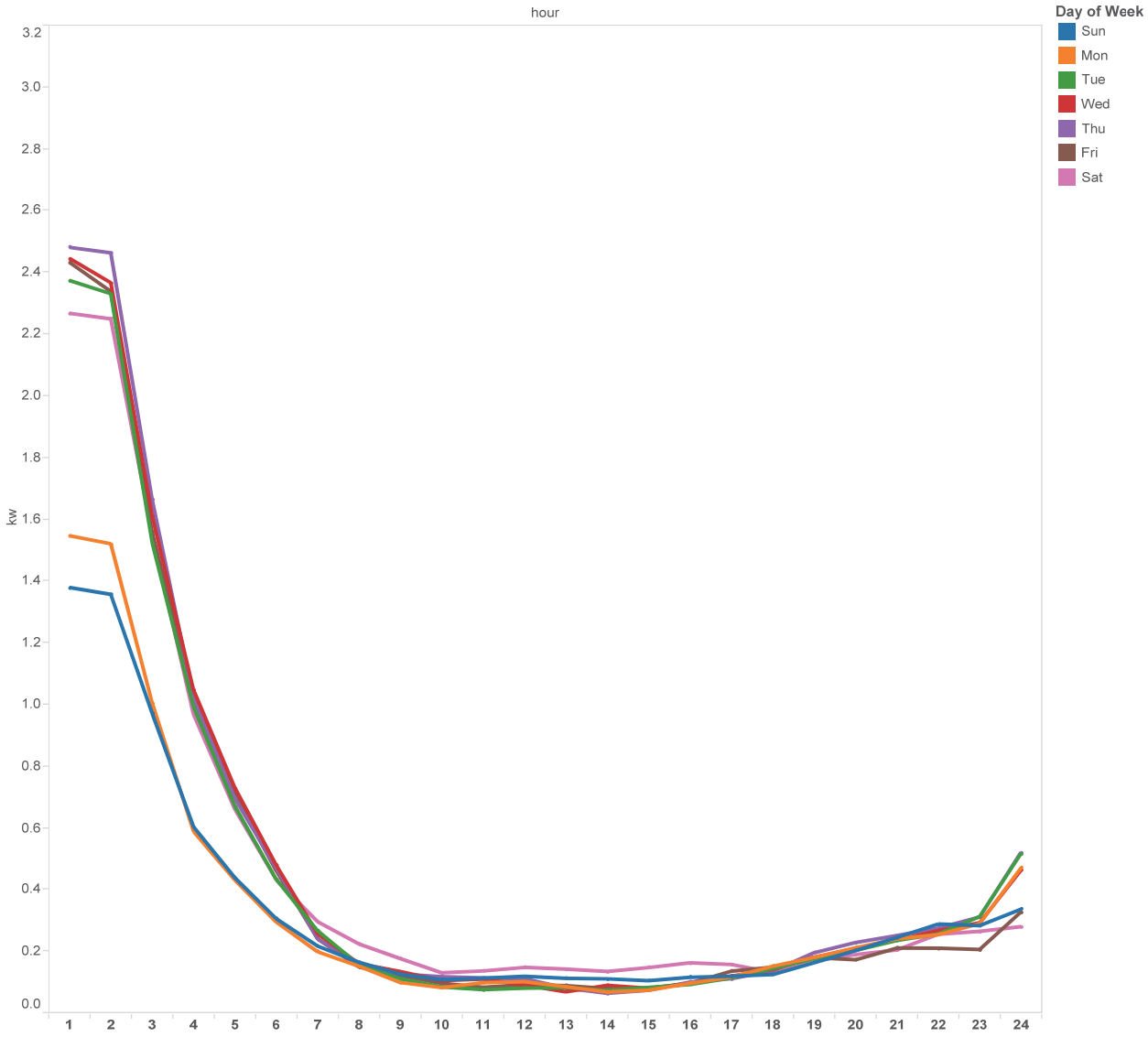


Chart PG&E-8b: Average Load Profile for MDU Separate Metering by Day of the Week

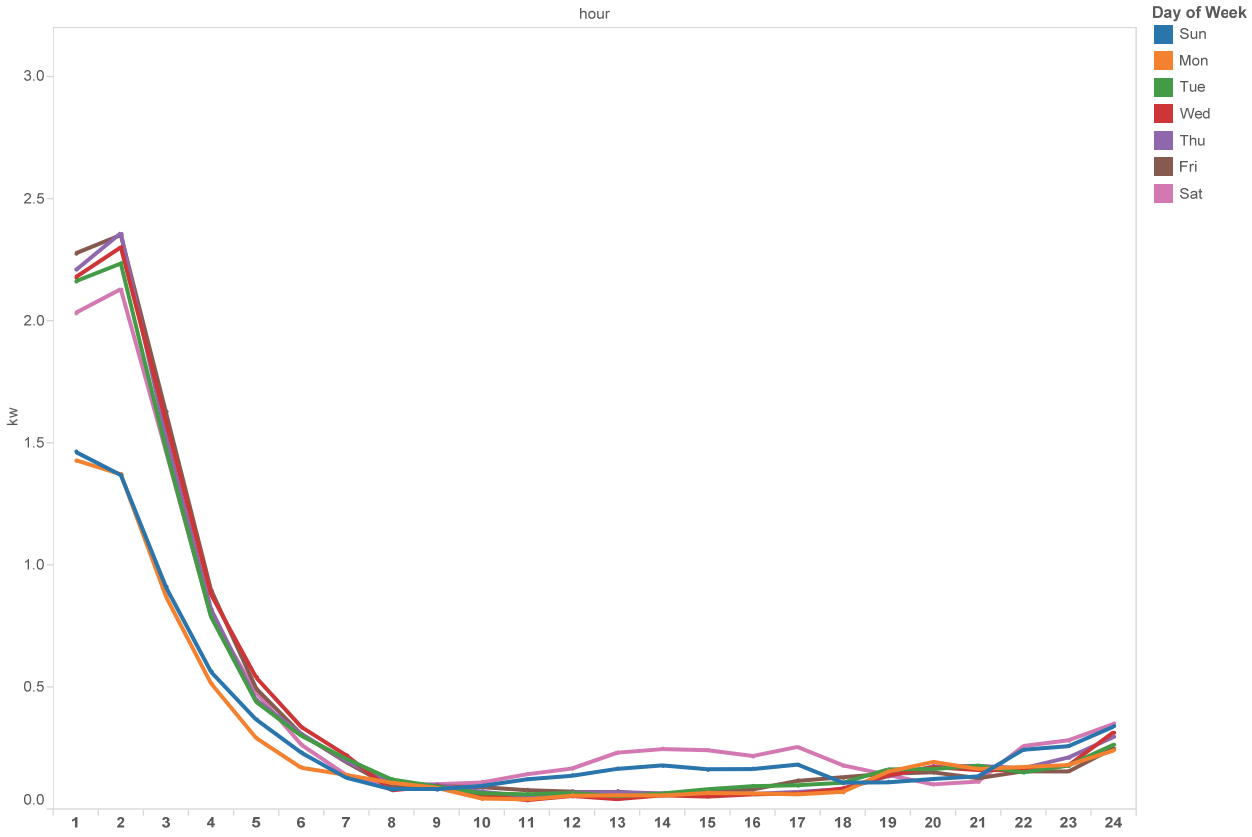


Chart PG&E-9: Average Load Profile for PEV Owners on a Non-EV Rate

Data obtained by PG&E from auto manufacturers and other sources could not be verified by the due date of this report to produce a load analysis for Chart 9 for "PEV Owners on a Non-EV Rate" from Energy Division's reporting requirements. PG&E will seek to include these data in future reports, if feasible. Consequently, the figures in this report only represent the number of PEV customers in PG&E service territory on PEV rates, not all PEV customers.

Non-Coincident Peak Load

Collectively, the data in Table PG&E-9 and Charts 10a, 10b, 11a, and 11b suggest that, despite the fact that charging is primarily occurring in the off-peak hours, the average household with a PEV will have a higher maximum demand that must be accommodated by the electric distribution system as compared to the average household without a PEV.

- Table PG&E-9 shows the monthly comparison of the average non-coincident peak for the EV-A and EV-B customer sectors and the full residential population. The average non-coincident peak was 2.96kW higher for the EV-A group category compared to the average residential peak.[44] This was 3.06kW higher for single family customers and 1.92kW higher for multi-family customers. The average non-coincident peak was 2.36kW higher for the EV-B group category compared to the average residential peak. This was 2.86kW higher for single family customers only during the months of March 2013 to August 2013, and 2.02kW higher for multi-family customers throughout the study period.

- Charts PG&E-10a and 10b display the average monthly non-coincident peak loads for EV-A and EV-B customers, respectively.

- Charts PG&E-11a and 11b display the hour at which the non-coincident peak load occurred for EV-A and EV-B customers, respectively. The accompanying table provides the data points depicted in each chart.

[44] The average non-coincident peak was calculated by denoting the maximum hourly interval for each account within the month. These maximum values were then summed for each category. The average is then calculated by dividing the total by the number of customers. The average non-coincident peak is therefore an approximation of the maximum demand for customer in each stratum.

Table PG&E-9: Monthly Average Non-Coincident Peak Load (kW)

Year	Month	Residential Population*	SF Population	MDU Population	All Single Metering	SF Single Metering	MDU Single Metering	All Separate Metering	SF Separate Metering	MDU Separate Metering
2013	Sep	3.72	4.14	2.75	6.82	6.90	5.98	6.11	*6.63*	5.79
2013	Oct	3.97	4.33	3.15	6.58	6.66	5.69	5.95	*5.89*	*5.99*
2013	Nov	4.22	4.57	3.41	6.90	6.99	5.89	5.42	*6.28*	4.89
2013	Dec	3.99	4.35	3.15	7.33	7.43	6.23	*6.05*	*7.06*	*5.41*
2014	Jan	4.00	4.33	3.23	7.00	7.08	6.08	6.39	*6.58*	*6.27*
2014	Feb	3.61	3.90	2.94	6.89	6.98	5.88	6.97	*7.44*	*6.68*
2014	Mar	3.77	4.08	3.04	6.76	6.85	5.77	6.38	*6.52*	6.30
2014	Apr	3.97	4.35	3.08	6.78	6.87	5.80	6.66	*7.29*	6.25
2014	May	4.37	4.88	3.19	6.99	7.08	5.93	6.58	*7.27*	6.10
2014	Jun	4.69	5.30	3.26	7.30	7.41	6.13	6.86	*7.53*	6.37
2014	Jul	4.27	4.80	3.03	7.43	7.56	6.07	*6.76*	*7.30*	6.37
2014	Aug	4.00	4.46	2.94	7.37	7.48	6.16	6.74	*7.18*	6.42
Average		**4.05**	**4.46**	**3.10**	**7.01**	**7.11**	**5.97**	**6.41**	**6.91**	**6.07**

* Load data used for the analysis are from January 2013 to December 2013.

** Italicized fields are estimates with a precision greater than +/- 10% at a 90% confidence interval.

Chart PG&E-10a: Average Non-Coincident Peak Load (kW) for Single Metering by Customer Type by Month

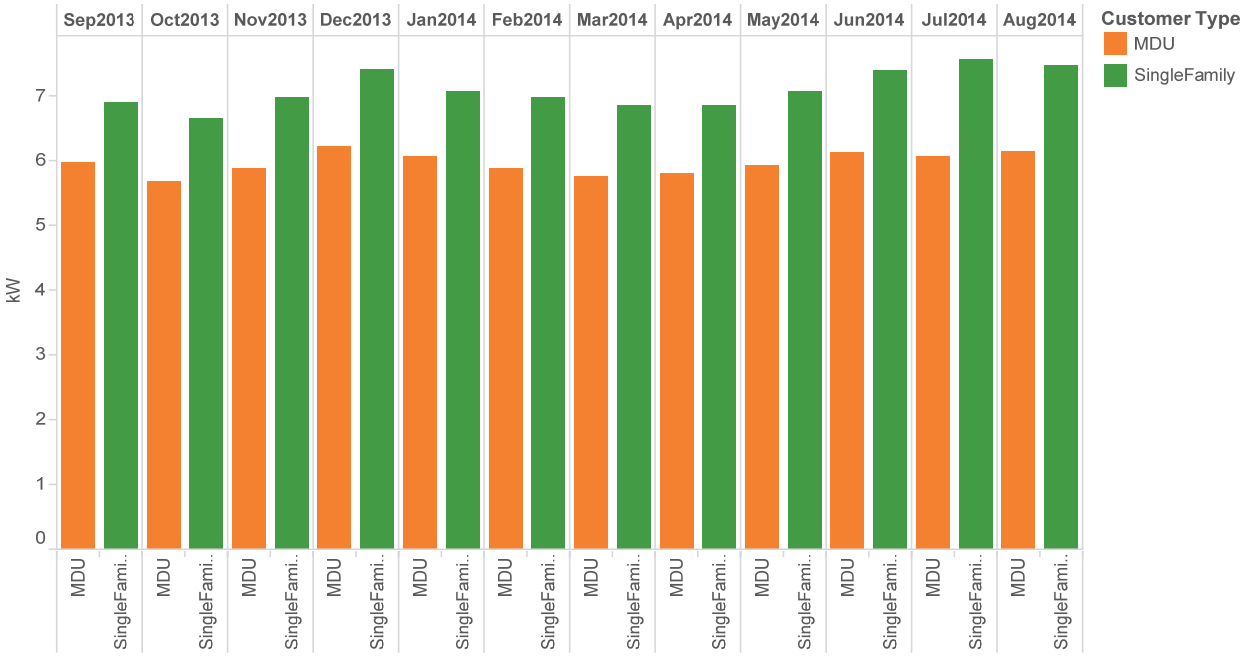


Chart PG&E-10b: Average Non-Coincident Peak Load (kW) for Separate Metering by Customer Type by Month

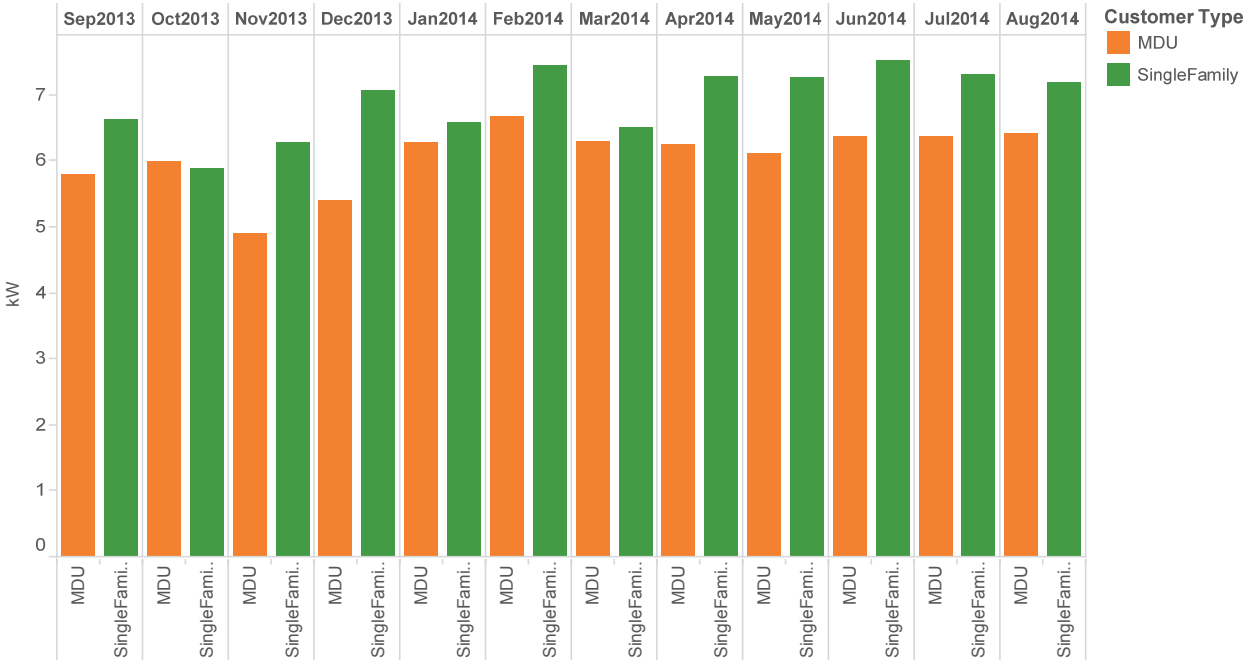


Chart PG&E-11a: Histogram of the Hour at which the Non-Coincident Peak Load Occurred for Single Metering by Customer Type

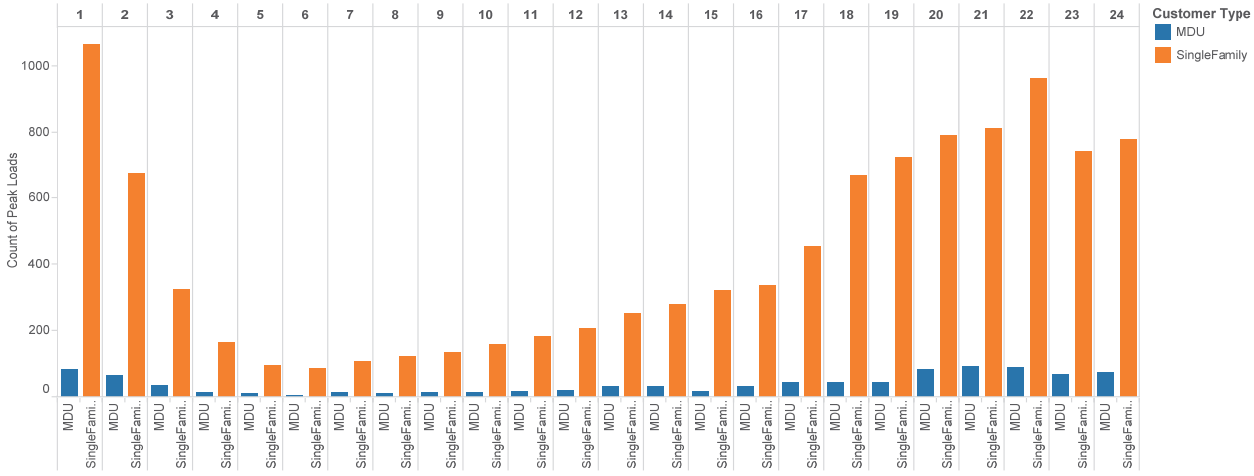
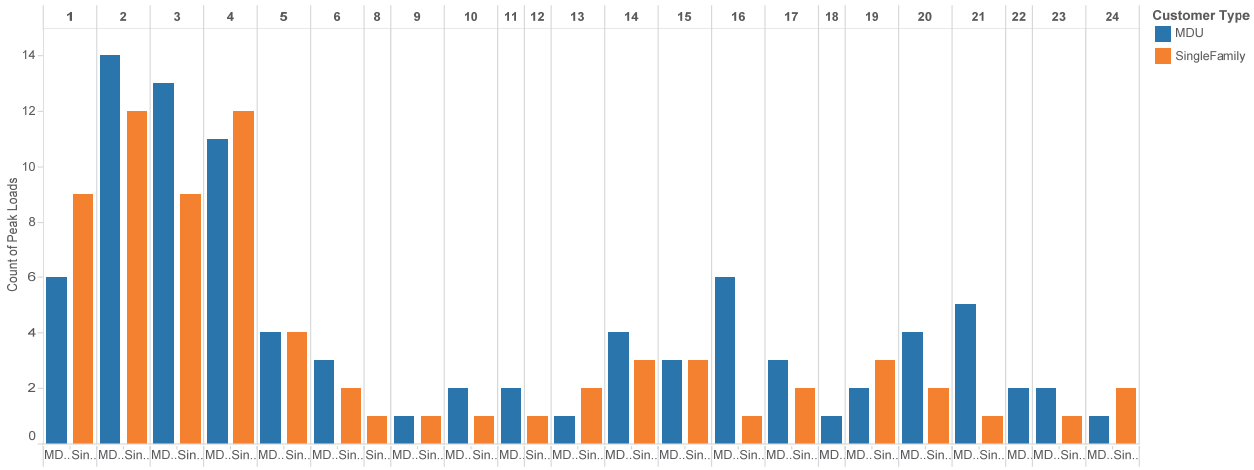


Chart PG&E-11b: Histogram of the Hour at which the Non-Coincident Peak Load Occurred for Separate Metering by Customer Type



Data Accompanying Charts PG&E 11a and 11b

Peak Hour	Residential Population	SF Pop	MDU Pop	All Single Metering	SF Single Metering	MDU Single Metering	All Separate Metering	SF Separate Metering	MDU Separate Metering
1	1%	1%	2%	10%	10%	9%	9%	13%	7%
2	1%	0%	1%	6%	6%	7%	16%	17%	16%
3	0%	0%	1%	3%	3%	4%	14%	13%	14%
4	0%	0%	1%	2%	2%	2%	14%	17%	12%
5	0%	0%	1%	1%	1%	1%	5%	6%	4%
6	0%	0%	0%	1%	1%	1%	3%	3%	3%
7	1%	1%	1%	1%	1%	1%	0%	0%	0%
8	1%	1%	2%	1%	1%	1%	1%	1%	0%
9	2%	2%	2%	1%	1%	1%	1%	1%	1%
10	2%	2%	2%	2%	2%	1%	2%	1%	2%
11	3%	3%	3%	2%	2%	2%	1%	0%	2%
12	3%	3%	4%	2%	2%	2%	1%	1%	0%
13	3%	3%	3%	3%	2%	3%	2%	3%	1%
14	4%	4%	4%	3%	3%	3%	4%	4%	4%
15	5%	5%	4%	3%	3%	2%	4%	4%	3%
16	6%	7%	5%	3%	3%	3%	4%	1%	7%
17	8%	9%	6%	4%	4%	5%	3%	3%	3%
18	11%	11%	9%	6%	6%	5%	1%	0%	1%
19	13%	13%	12%	7%	7%	5%	3%	4%	2%
20	12%	11%	13%	8%	8%	9%	4%	3%	4%
21	9%	9%	10%	8%	8%	10%	4%	1%	6%
22	8%	7%	8%	9%	9%	9%	1%	0%	2%
23	4%	4%	4%	7%	7%	7%	2%	1%	2%
24	2%	2%	3%	8%	7%	8%	2%	3%	1%

Diversified Peak Load

The time of diversified peak load gives the time that the group peaks as a whole. The time of diversified (or group) peak load is generally the same for all categories of EV-A and EV-B customers. Table PG&E-10 shows that the diversified peak load occurs between midnight and 2:00 am for all categories in all months for both rates. This suggests that the early adopter group of customers on the PEV rates is charging during the off-peak periods thereby achieving the intent of the rate designs.

Table PG&E-10: Time and Associated Demand of Diversified Peak Load – Entire Residential Population

Year	Month	Residential Population Demand*	Residential Population Hour	SF Population Demand	SF Population Hour	MDU Population Demand	MDU Population Hour
2013	Sep	1.44	18	1.72	18	0.83	20
2013	Oct	1.14	20	1.30	20	0.78	20
2013	Nov	1.20	19	1.38	19	0.83	20
2013	Dec	1.36	20	1.55	20	0.93	20
2014	Jan	1.28	19	1.45	19	0.91	20
2014	Feb	1.12	20	1.26	20	0.80	20
2014	Mar	1.08	20	1.23	20	0.73	20
2014	Apr	1.22	21	1.41	21	0.77	21
2014	May	1.36	19	1.61	19	0.81	19
2014	Jun	2.02	18	2.45	18	1.02	19
2014	Jul	1.78	19	2.16	17	0.97	20
2014	Aug	1.56	19	1.86	19	0.87	19

Table PG&E-10 (cont'd): Time and Associated Demand of Diversified Peak Load – Single Meter EV

Year	Month	Single Metering Demand	Single Metering Hour	SF Single Metering Demand	SF Single Metering Hour	MDU Single Metering Demand	MDU Single Metering Hour
2013	Sep	2.29	2	2.33	2	1.98	1
2013	Oct	2.42	2	2.46	2	2.00	2
2013	Nov	2.54	2	2.58	2	2.17	2
2013	Dec	2.65	2	2.71	2	2.12	2
2014	Jan	2.53	1	2.58	1	2.12	1
2014	Feb	2.53	1	2.59	1	1.99	2
2014	Mar	2.48	1	2.53	1	2.03	1
2014	Apr	2.50	1	2.55	1	2.03	1
2014	May	2.67	1	2.72	1	2.18	1
2014	Jun	2.66	1	2.73	1	1.90	1
2014	Jul	2.72	1	2.79	1	2.02	1
2014	Aug	2.81	1	2.88	1	2.10	1

Table PG&E-10 (cont'd): Time and Associated Demand of Diversified Peak Load – Separate Meter EV

Year	Month	Separate Metering Demand	Separate Metering Hour	SF Separate Metering Demand	SF Separate Metering Hour	MDU Separate Metering Demand	MDU Separate Metering Hour
2013	Sep	*3.33*	2	*4.21*	1	*3.23*	1
2013	Oct	*3.01*	2	*3.44*	2	*2.90*	2
2013	Nov	*3.04*	2	*4.27*	2	*3.01*	1
2013	Dec	*3.08*	1	*4.40*	1	*3.26*	2
2014	Jan	*3.48*	2	*3.88*	1	*3.33*	2
2014	Feb	*2.89*	1	*3.45*	1	*3.04*	2
2014	Mar	*2.85*	2	*3.31*	1	*3.34*	2
2014	Apr	*2.43*	2	*2.78*	1	*2.64*	1
2014	May	*3.06*	2	*3.53*	1	*3.20*	2
2014	Jun	*2.34*	1	*2.61*	2	*2.70*	2
2014	Jul	*2.26*	2	*2.65*	2	*2.43*	2
2014	Aug	*2.54*	2	*3.33*	2	*2.35*	2

* Load data used for the analysis are from January 2013 to December 2013.

** Italicized fields are estimates with a precision greater than +/- 10% at a 90% confidence interval.

Taken together, Table PG&E-10 and Data Accompanying Charts PG&E 11a and 11b suggest that although the early adopter PEV customers may have a higher average maximum demand, those customers on the PEV rates tend to hit their maximum demand while non-PEV customers are at their lowest usage. Thus, there is a diversity benefit created by the TOU rates. However, at the most local service assessment level perspective (i.e. a single household or set of households serviced by a single transformer), the value of this diversity is limited by the fact that the distribution system must still be prepared to accommodate PEV charging during the peak period since these customers can, and occasionally do, charge during those times.

Average Load Coincident with System Peak

The average load coincident with system peak is the average load occurring at the same time that the system peak occurs. The system peak days and times were used to extract the appropriate hourly load at the time of system peak. The average group load coincident with system peak was calculated taking the total group load and dividing by the number of customers.

The average load coincident with system peak amongst the general population is very similar to that of each EV-A category (See Table PG&E – 11). This suggests that, for this particular group of early adopters, customers on a PEV rate are not doing a substantial amount of charging during the on-peak period.

Table PG&E-11: Average Load Coincident with System Peak (kW/customer)

Year	Month	Residential Population*	SF Population	MDU Population	All Single Metering	SF Single Metering	MDU Single Metering	All Separate Metering	SF Separate Metering	MDU Separate Metering
2013	Sep	1.25	1.49	0.70	1.21	1.24	0.93	*0.01*	*0.01*	*0.01*
2013	Oct	1.01	1.16	0.67	1.20	1.22	0.96	*0.06*	*0.13*	*0.01*
2013	Nov	1.02	1.17	0.67	1.25	1.28	0.93	*0.05*	*0.06*	*0.04*
2013	Dec	1.28	1.47	0.86	1.73	1.77	1.31	*0.18*	*0.21*	*0.16*
2014	Jan	1.19	1.35	0.83	1.48	1.52	1.07	*0.23*	*0.42*	*0.11*
2014	Feb	1.03	1.17	0.71	1.46	1.50	1.07	*0.20*	*0.20*	*0.19*
2014	Mar	0.98	1.11	0.66	1.64	1.67	1.31	*0.24*	*0.17*	*0.29*
2014	Apr	0.98	1.15	0.59	1.11	1.14	0.84	*0.10*	*0.22*	*0.03*
2014	May	1.13	1.35	0.64	1.43	1.46	1.08	*0.05*	*0.10*	*0.01*
2014	Jun	1.72	2.09	0.88	1.62	1.66	1.21	*0.21*	*0.24*	*0.18*
2014	Jul	1.63	1.97	0.82	1.49	1.53	1.09	*0.19*	*0.15*	*0.22*
2014	Aug	1.42	1.70	0.79	1.54	1.58	1.10	*0.11*	*0.18*	*0.06*

* Load data used for the analysis are from January 2013 to December 2013.

** Italicized fields are estimates with a precision greater than +/- 10% at a 90% confidence interval.

Geographic Concentration of PEVs

The following tables and figures illustrate the geographic concentrations of PEVs in PG&E's service territory. Tables PG&E-12a and 12b as well as Figure PG&E-2 demonstrate that PEV customers are predominantly located in the San Francisco Bay Area and Central Coast (California Energy Commission Climate Zones 3 and 4[45]). Furthermore, dual participating NEM and PEV rate customers are highly concentrated in the Bay Area per Figure PG&E-3.

Table PG&E-12a: Geographic Concentration of PEVs by Climate Zone

Climate Zone	% Single Metering	% Separate Metering	%Residential Population
Z01	1%	0%	1%
Z02	9%	5%	8%
Z03	38%	41%	31%
Z04	31%	32%	13%
Z05	1%	0%	3%
Z06	0%	0%	0%
Z09	0%	0%	0%
Z11	2%	2%	7%
Z12	16%	16%	21%
Z13	2%	3%	13%
Z16	0%	0%	1%
Total	100%	100%	100%

Table PG&E-12b: Geographic Concentration of PEVs (Top 5 Zip Codes by Rate)

Rate	Zip Code	Customers	% Total
Single Meter	94539	371	3.02%
	95120	292	2.38%
	95014	249	2.03%
	95070	236	1.92%
	94582	201	1.63%
Separate Meter	94022	10	3.72%
	94024	10	3.72%
	94010	9	3.35%
	94070	8	2.97%
	95125	8	2.97%

[45] California Energy Commission (2013). California Building Climate Zones with 2012 Zip Codes. Retrieved from: http://www.energy.ca.gov/maps/renewable/Climate_Zones_Zipcode.pdf

Figure PG&E-2: Electric Vehicles on EV Rates in the PG&E Service Territory as of August 2014 – Single (EV-A) vs. Separate (EV-B) Meter

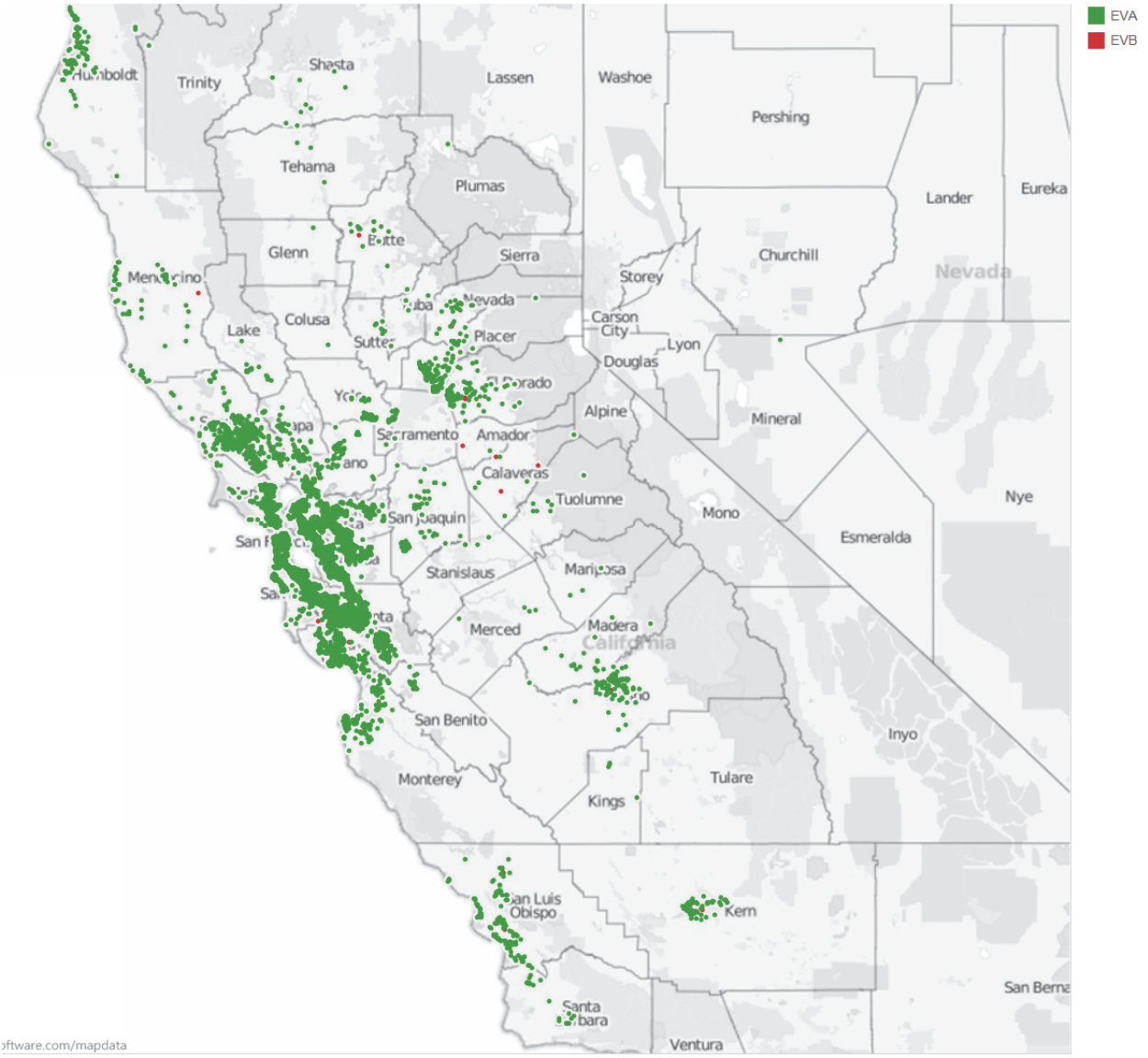
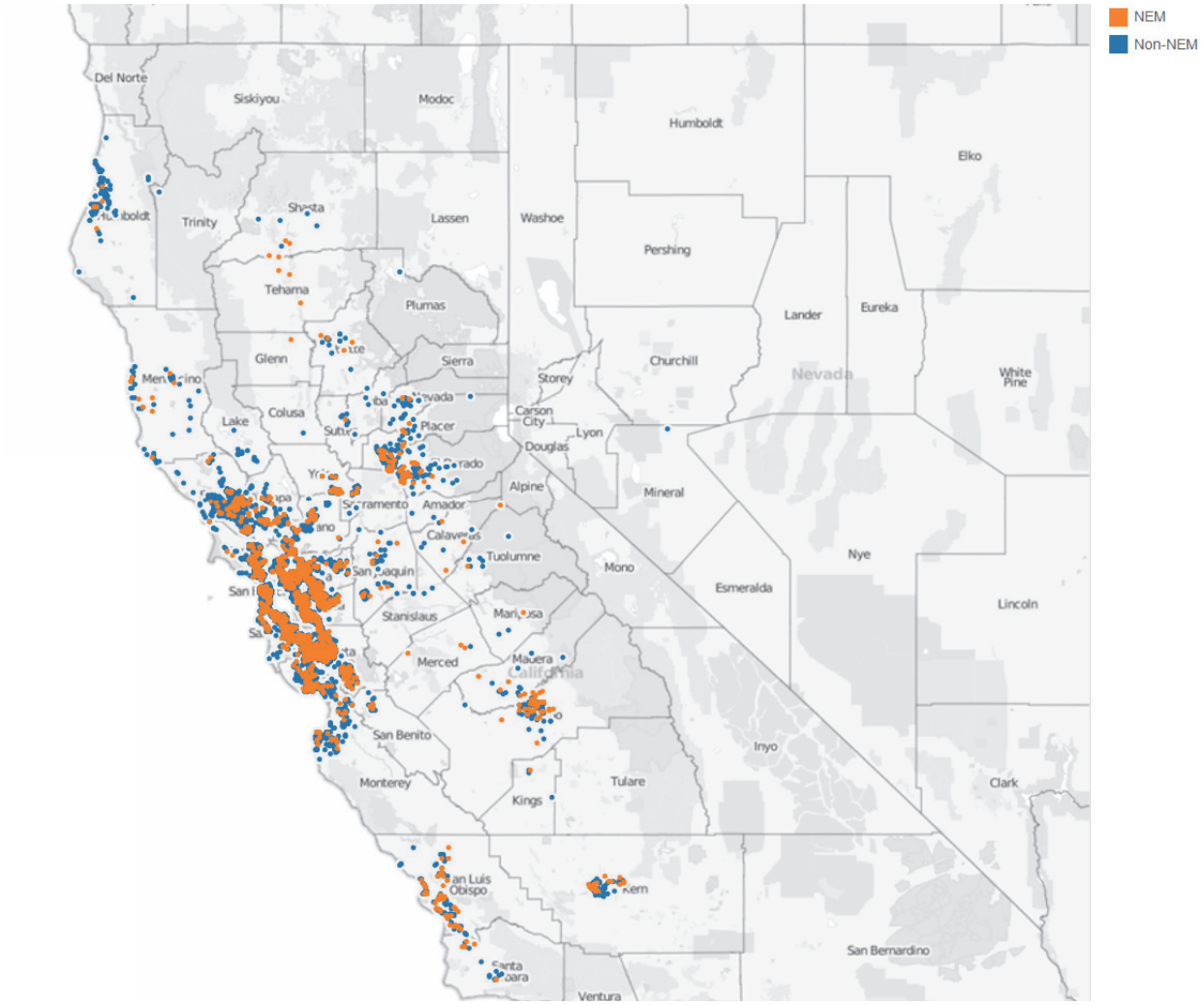


Figure PG&E-3: Electric Vehicles on EV Rates in the PG&E Service Territory as of August 2014 – NEM vs. Non-NEM



Southern California Edison

SCE currently offers residential[46] customers two rates designed to facilitate the charging of PEVs. Both of these rates are time-of-use (TOU) rates where price per kilowatt hour varies depending on the time of day electricity is used. The following analysis will use load data occurring under these two rates for a year beginning in September 2013 and going through August 2014.

One rate, TOU-D-TEV, is based on a single meter for residential customers who wish to measure both their regular household load and their PEV load with the same meter. The second rate option, TOU-EV-1, requires a separate meter dedicated to measuring electricity used at the PEV charger. Residential PEV customers may also choose to remain on their current rate, likely the Schedule D (domestic rate plan). SCE believes the majority of the PEV owners in their service territory choose to remain on the domestic rate plan.

Single-Metered Whole House Rate

The single-metered TOU-D-TEV rate plan uses baseline allocations and a tiered structure similar to the standard residential rate. Currently, this plan has two pricing tiers whereas the standard residential rate has four tiers. As with the standard rate plan, the price per kWh increases as pre-determined thresholds of consumption during that billing period are surpassed and the next tier is reached. With this rate plan, rates change seasonally. These rates are listed in Table SCE – 1a. The TOU-D-TEV rate offers energy prices which vary by TOU periods and includes an off-peak period where generation and distribution charges have been set near their marginal cost floor levels. The structure of the single meter TOU periods are defined as follows:[47]

On-peak	10:00 a.m. - 6:00 p.m., weekdays all year, except holidays.
Off-peak	12:00 (midnight) - 6:00 a.m., daily
Mid-peak	All other hours.

In 2015 the TOU-D-TEV rate will be superseded by a new TOU rate as a result of the 2013 Rate Design Window (RDW) application[48] ordered in D.11-07-029. While the final details are still pending a final decision by the California Public Utilities Commission (CPUC), the future structure will eliminate the two tiers and the TOU periods will change. Additionally, the new rate structure, while designed to better accommodate electric vehicle charging, will be available to the broader residential rate group as a whole.

Because of the current tiered structure of the single-metered PEV rate, the price during any given hour of the day will depend on the previous amount of consumption during the current billing period. The tiers of the TOU-D-TEV rate are denoted as Level I and Level II which correspond to the tiers in the

[46] SCE also offers two PEV TOU rates for commercial customers: TOU-EV-3 and TOU-EV-4. As of the beginning of August 2014, there were 18 TOU-EV-3 accounts and 32 TOU-EV-4 accounts.

[47] The language of SCE's TOU-D-TEV tariff identifies the off-peak period as "super off-peak" and the mid-peak as "off-peak". In this report the more conventional on-, mid- and off-peak nomenclature is used.

[48] 2013 Rate Design Window application (Proceeding: A1312015) http://docs.cpuc.ca.gov/SearchRes.aspx?DocFormat=ALL&DocID=84187517

regular domestic rate; Tiers 1 and 2 of the domestic rate are collapsed into Level I and Tiers 3 and 4 into Level II. The rates under this structure were updated five times during the period covered in by this report to reflect other decisions reached by the CPUC. Table SCE – 1a presents the rates that were effective as of January 1st, 2014 as these rates were current for the largest portion of the reporting timeframe. The additional iterations of the TOU-D-TEV rate, including the current rates, can be found in Appendix A, Table A (1a-1d).

Table SCE – 1a: Single Meter (TOU-D-TEV) Tariff[49] ($/kWh) – Effective 1/1/2014

Clock	Winter				Summer			
Hour	Weekday		Weekend		Weekday		Weekend	
Ending	Level I	Level II	Level I	Level II	Level I	Level II	Level I	Level II
1	0.10	0.10	0.10	0.10	0.09	0.09	0.09	0.09
2	0.10	0.10	0.10	0.10	0.09	0.09	0.09	0.09
3	0.10	0.10	0.10	0.10	0.09	0.09	0.09	0.09
4	0.10	0.10	0.10	0.10	0.09	0.09	0.09	0.09
5	0.10	0.10	0.10	0.10	0.09	0.09	0.09	0.09
6	0.10	0.10	0.10	0.10	0.09	0.09	0.09	0.09
7	0.11	0.29	0.11	0.29	0.13	0.31	0.13	0.31
8	0.11	0.29	0.11	0.29	0.13	0.31	0.13	0.31
9	0.11	0.29	0.11	0.29	0.13	0.31	0.13	0.31
10	0.11	0.29	0.11	0.29	0.13	0.31	0.13	0.31
11	0.17	0.35	0.11	0.29	0.28	0.47	0.13	0.31
12	0.17	0.35	0.11	0.29	0.28	0.47	0.13	0.31
13	0.17	0.35	0.11	0.29	0.28	0.47	0.13	0.31
14	0.17	0.35	0.11	0.29	0.28	0.47	0.13	0.31
15	0.17	0.35	0.11	0.29	0.28	0.47	0.13	0.31
16	0.17	0.35	0.11	0.29	0.28	0.47	0.13	0.31
17	0.17	0.35	0.11	0.29	0.28	0.47	0.13	0.31
18	0.17	0.35	0.11	0.29	0.28	0.47	0.13	0.31
19	0.11	0.29	0.11	0.29	0.13	0.31	0.13	0.31
20	0.11	0.29	0.11	0.29	0.13	0.31	0.13	0.31
21	0.11	0.29	0.11	0.29	0.13	0.31	0.13	0.31
22	0.11	0.29	0.11	0.29	0.13	0.31	0.13	0.31
23	0.11	0.29	0.11	0.29	0.13	0.31	0.13	0.31
24	0.11	0.29	0.11	0.29	0.13	0.31	0.13	0.31

[49] https://www.sce.com/wps/portal/home/regulatory/tariff-books

Table SCE – 2a: Single-Metered PEV Rate (TOU-D-TEV) Price Ratios

	Summer On-peak : Mid-peak : Off-peak	Winter On-peak : Mid-peak : Off-peak
Level I	3.1 : 1.4 : 1.0	1.7 : 1.1 : 1.0
Level II	5.2 : 3.4 : 1.0	3.5 : 2.9: 1.0

Separately-Metered PEV Rate

The TOU-EV-1 rate is designed for residential customers who have a separate meter exclusively for PEV charging. Therefore, the TOU-EV-1 rate only reflects the customer's charging load. The second meter is provided and installed at no additional cost, however the home's electrical infrastructure needs to be upgraded with a second panel and wiring to the charging location. Any costs related to the changes to the home's electrical infrastructure are the responsibility of the customer. For this rate plan, lower rates apply during off-peak hours of 9:00 p.m. to 12:00 noon, and rates change seasonally. For usage between noon and 9 p.m., rates are higher in summer. The following are the TOU periods for the separately-metered rate:

On-peak	12:00 noon – 9:00 p.m., daily
Off-peak	All other hours.

As with the TOU-D-TEV rates, the TOU-EV-1 underwent rate changes multiple times during the reporting period. The most relevant rates are presented subsequently in Table SCE – 1b. Other applicable rates for the TOU-EV-1 rate structure are listed in Appendix A, Table B (1a-1e).

Table SCE – 1b: Separate Meter (TOU-EV-1) Tariff ($/kWh) – Effective 1/1/2014

Clock Hour Ending	Winter Weekday	Winter Weekend	Summer Weekday	Summer Weekend
1	0.11	0.11	0.10	0.10
2	0.11	0.11	0.10	0.10
3	0.11	0.11	0.10	0.10
4	0.11	0.11	0.10	0.10
5	0.11	0.11	0.10	0.10
6	0.11	0.11	0.10	0.10
7	0.11	0.11	0.10	0.10
8	0.11	0.11	0.10	0.10
9	0.11	0.11	0.10	0.10
10	0.11	0.11	0.10	0.10
11	0.11	0.11	0.10	0.10
12	0.11	0.11	0.10	0.10
13	0.24	0.11	0.34	0.10
14	0.24	0.11	0.34	0.10
15	0.24	0.11	0.34	0.10
16	0.24	0.11	0.34	0.10
17	0.24	0.11	0.34	0.10
18	0.24	0.11	0.34	0.10
19	0.24	0.11	0.34	0.10
20	0.24	0.11	0.34	0.10
21	0.24	0.11	0.34	0.10
22	0.11	0.11	0.10	0.10
23	0.11	0.11	0.10	0.10
24	0.11	0.11	0.10	0.10

Table SCE – 2b: Separately-Metered PEV Rate (TOU-EV-1) Price Ratios

Summer On-peak : Off-peak	Winter On-peak : Off-peak
3.4 : 1.0	2.2 : 1.0

Program Enrollment

Net Energy Metering (NEM) participants remained a consistent proportion of the PEV owners on the TOU-D-TEV rate. During the 12 month reporting period, NEM customers comprised about 25% of the single-metered group as shown in Table SCE 3a.

Table SCE – 3a: NEM Program Enrollment for Single Metering by Customer Type

Month	NEM Customers with Single Metering	NEM as % Single Metering	NEM as % SF Single Metering	NEM as % MDU Single Metering
Sep. 2013	764	28%	30%	14%
Oct. 2013	817	27%	30%	13%
Nov. 2013	871	27%	30%	12%
Dec. 2013	909	26%	29%	12%
Jan. 2014	957	26%	29%	12%
Feb. 2014	1006	25%	28%	12%
Mar. 2014	1052	25%	28%	12%
Apr. 2014	1117	26%	28%	12%
May 2014	1164	25%	28%	12%
Jun. 2014	1190	25%	28%	11%
Jul. 2014	1228	25%	27%	11%
Aug. 2014	1257	25%	27%	11%

The prevalence of single-meter accounts participating in a Demand Response (DR) program is shown in Table SCE 4. The number of single-metered accounts participating in a DR program increased at the same rate as the growth in single-metered TOU accounts and remains a steady 20% of the accounts.

Single-family accounts with a single meter participate in NEM or DR at roughly twice the rate of as MDU accounts with a single meter.

Table SCE – 4: DR Program Enrollment for Single Metering by Customer Type

Month	DR Customers with Single Metering	DR as % Single Metering	DR as % SF Single Metering	DR as % MDU Single Metering
Sep. 2013	543	20%	21%	13%
Oct. 2013	585	20%	21%	13%
Nov. 2013	639	20%	21%	13%
Dec. 2013	681	20%	21%	12%
Jan. 2014	723	20%	21%	12%
Feb. 2014	774	20%	21%	12%
Mar. 2014	815	20%	21%	12%
Apr. 2014	850	19%	21%	12%
May 2014	902	20%	21%	12%
Jun. 2014	937	20%	21%	12%
Jul. 2014	980	20%	21%	13%
Aug. 2014	1001	20%	21%	13%

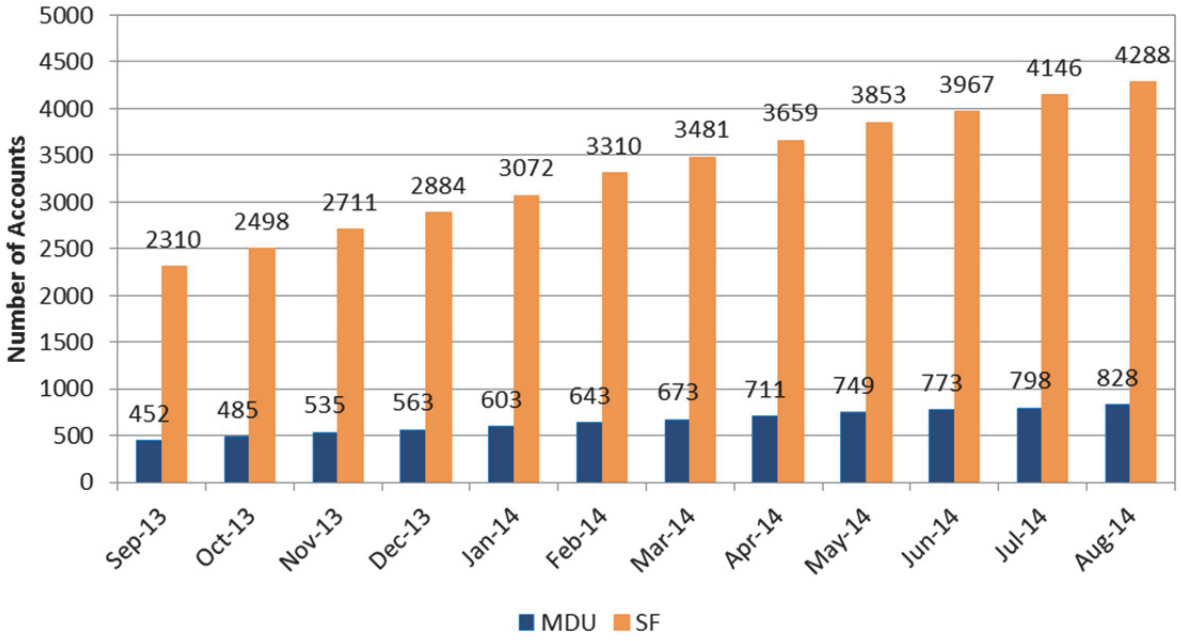
NEM and DR are associated with the energy use of the whole house and as such are attached to the meter recording the whole house usage, therefore there are no separately-metered (TOU-EV-1) NEM and DR customers (i.e., Table 3b: NEM Program Enrollment by Separate Metering and Table 5: DR Program Enrollment by Separate Metering are not applicable).

Number of PEV Time-of-Use Accounts

While there has been constant growth in the number of PEV owners opting for one of the two rates designed for PEV charging, it still appears that this group has yet to expand into the broader population. It is still considered that the following results pertain to early adopters who are likely to differ in behavior from the general population.

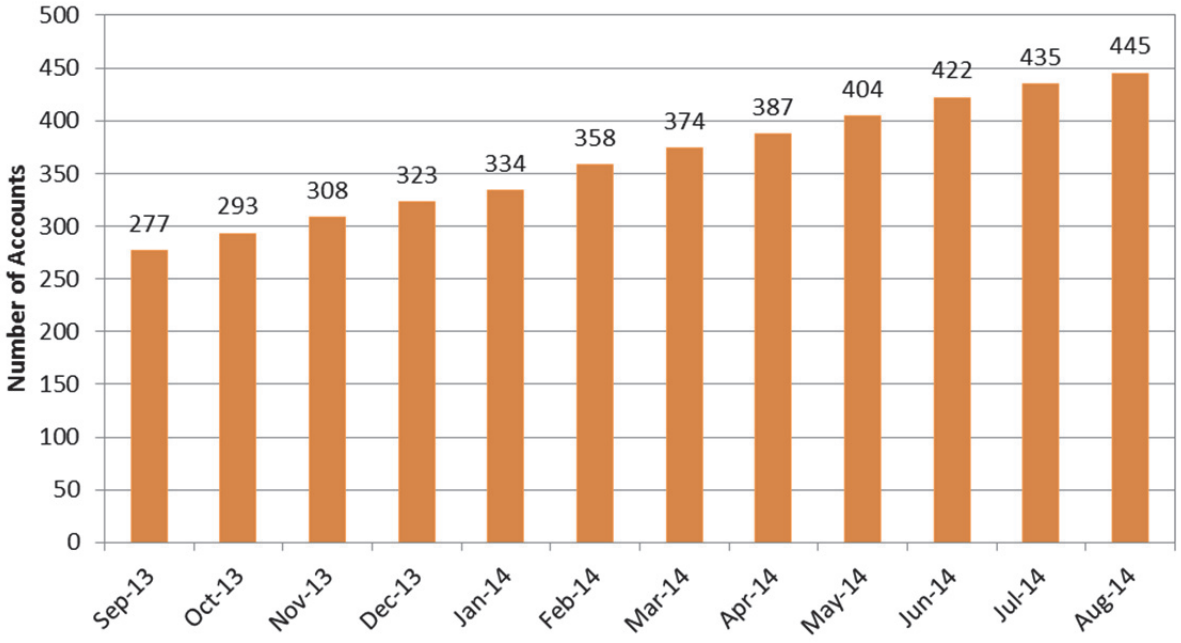
From September 2013 to August 2014 the number of single-metered accounts increased by 2,354. Chart SCE – 1 shows the number of accounts at the beginning of each month. There was constant growth in the number of accounts of both customer types of single-metered household load over the period reported. The number of single-metered accounts in aggregate increased about 85%.

Chart SCE – 1: Single Meter (TOU-D-TEV) - Number of Accounts by Customer Type at the Beginning of Each Month



During the study period, separately-metered accounts increased by 168. While single-metered accounts grew by almost 85%, the number of accounts with an additional separate meter increased nearly 60% from the first month of the reporting period (See Chart SCE – 2). As seen in the previous report, the growth rate of the separately metered accounts continues to lag single-metered accounts. When considering the total population of TOU accounts for PEVs, separately-metered accounts consistently remained just under 10% of all accounts.

Chart SCE – 2: Separate Meter (TOU-EV-1) - Number of Accounts at the Beginning of Each Month



Average Monthly Usage for TOU Accounts with a PEV

Some load profile and demand metrics for the average residential customer are also provided to serve as a comparison to the single-metered PEV customers. This data is derived from SCE's 2013 Domestic Rate Group Load Study which is based on the 2013 calendar year. Because of this when residential data is displayed below, note that it appears by month and is not chronological (i.e. for the months January – August the data for the broad residential population if from 2013 rather than 2014 as indicated).

For each month, the average monthly usage for both customer types with single-metered household load was computed. As expected, multi-family customers have lower average monthly usage compared to single-family units. Both customer types exhibit average usage increases from May through the summer and begin tapering in October; the usage is roughly 30% greater in September than in April. Because it is an aggregate household load of which the majority is not the result of a PEV, this effect likely reflects seasonal demands of the household.

The average monthly usage is quite high for both the single- and multi-family customers who own PEV comparing to the general population and remains almost the same when NEM accounts are excluded. Average monthly usage of the NEM accounts would need to significantly differ in order for those accounts to impact the general group averages.

Chart SCE – 3: Single Meter (TOU-D-TEV) – Average Monthly Usage (kWh) by Customer Type including NEM

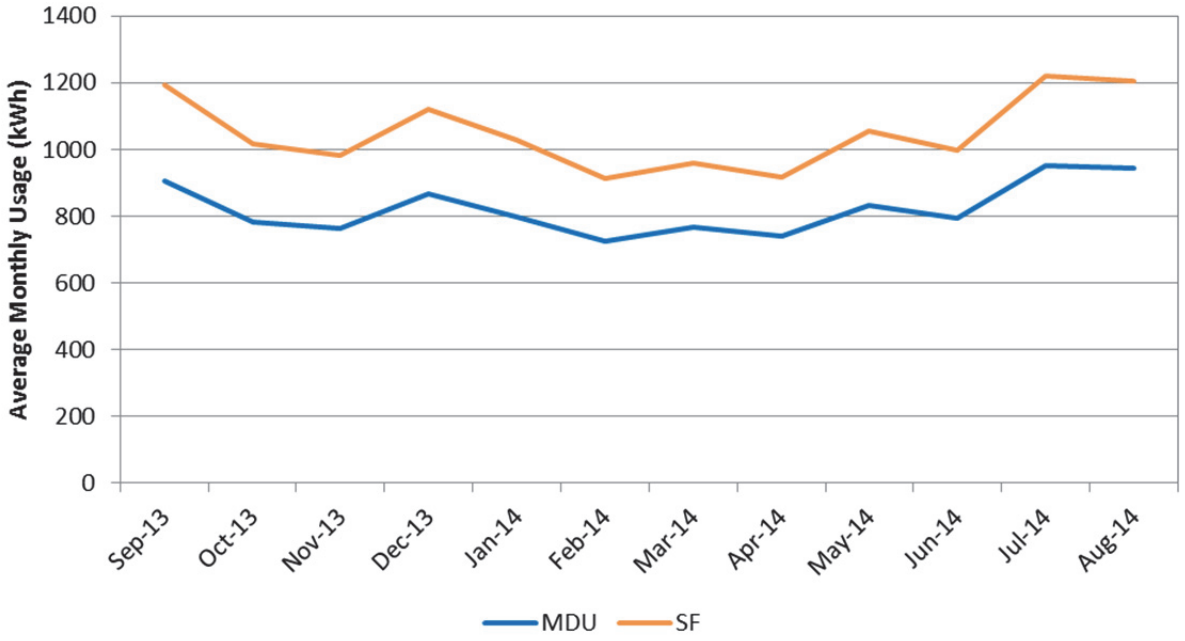
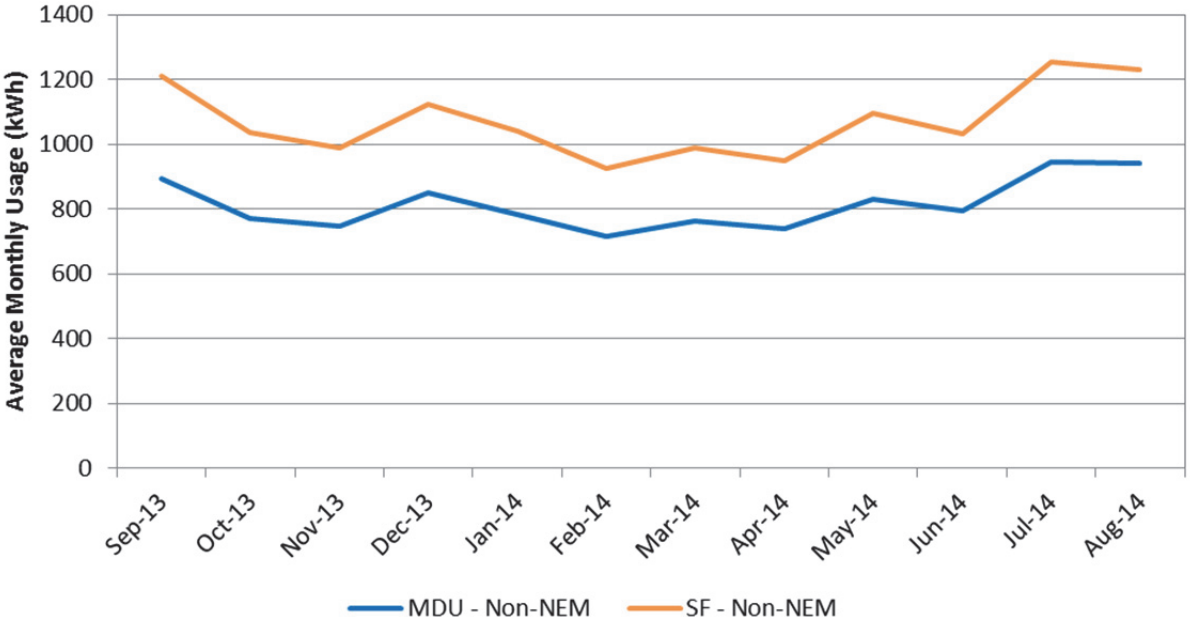
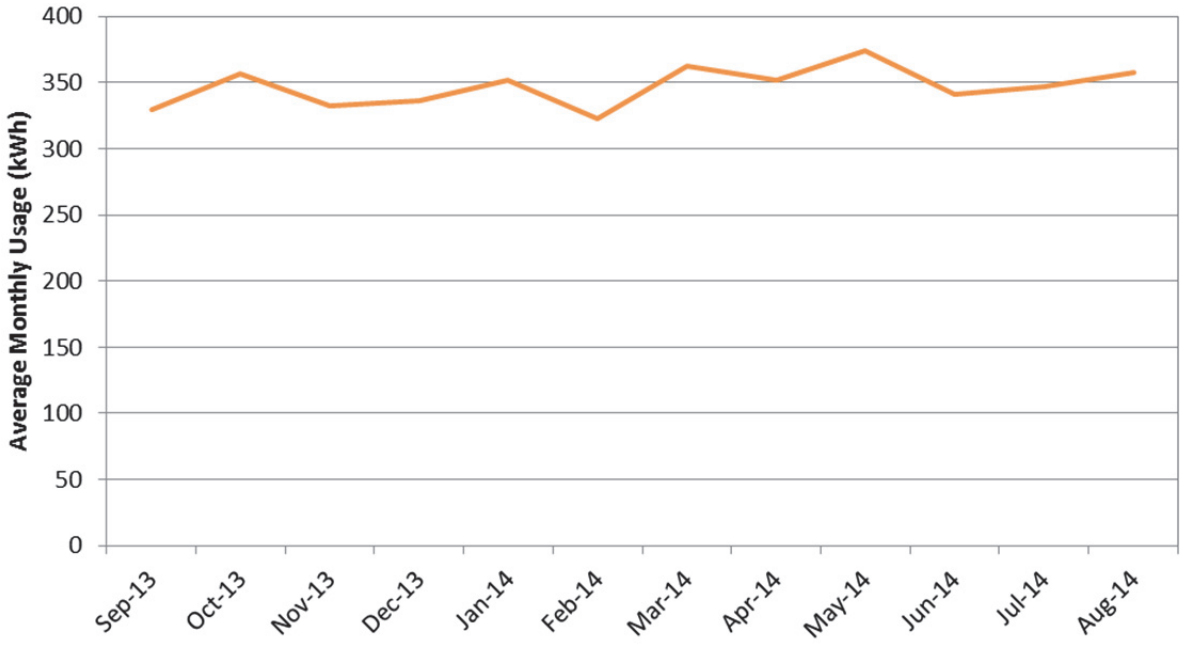


Chart SCE – 4: Single Meter (TOU-D-TEV) – Average Monthly Usage (kWh) by Customer Type excluding NEM



Usage for separately-metered PEVs was consistently about 350 kWh/month as displayed in Chart SCE – 5. Assuming other variables such as place of charging and battery size remained constant among this group of PEV owners, this would indicate consistent driving patterns throughout the year.

Chart SCE – 5: Separate Meter (TOU-EV-1) - Average Monthly Usage



Average Usage during Time-of-Use Periods

When considering usage within a TOU period, it is important to remember that most residential customers are on rate plans where pricing does not vary by the time of day and therefore have no explicit TOU period. Thus, when the usage of accounts on a TOU rate is compared with the usage of the aggregate residential customer, observed discrepancies could be the result of not only the distinct consumption patterns of the self-selected group of PEV owners but possibly the different pricing structure encountered by each group.

Notably, the off-peak period household usage is roughly 10-20% more than on-peak usage for single-metered households on a TOU rate. The opposite is observed with regular residential customers where usage during the off-peak hours is 0-15% less than the on-peak hours. This would indicate PEV owners respond to the time-of-use rate which offers considerably cheaper energy prices during the off-peak period as compared to the on-peak period; presumably charging their vehicles during this time.

As shown in Table SCE – 8, the greatest proportion of residential usage occurs in the mid-peak period. This amounts to 50-60% of usage, which is not surprising given that this includes the periods 6:00 p.m. to midnight during the week and 6:00 a.m. to midnight on the weekends. These are times during the day when the most activity would be expected to occur in residential units. The whole residential population consistently consumes about 60% of its electricity during this period, while each of the PEV groups consumes somewhat less, around 50%.

The effect of NEM can be seen through the fact that these customers have lower on-peak usage than any non-NEM customer type. This is likely the result of their consumption of self-generated electricity during that period. This makes their off-peak usage a greater percentage of their overall metered usage.

Table SCE – 6a: Single Meter (TOU-D-TEV) – On Peak* TOU Distribution

Month	All Residential	Single: Non-NEM	SF: Non-NEM	MDU: Non-NEM	NEM
Sep. 2013	24.6%	17.2%	17.4%	16.1%	10.0%
Oct. 2013	24.4%	16.7%	16.9%	15.8%	8.5%
Nov. 2013	21.0%	14.9%	15.1%	14.3%	10.8%
Dec. 2013	20.7%	15.9%	16.0%	15.5%	11.0%
Jan. 2014	21.8%	16.2%	16.3%	15.6%	10.3%
Feb. 2014	20.8%	14.9%	15.0%	14.3%	8.4%
Mar. 2014	21.8%	14.7%	14.8%	14.0%	5.4%
Apr. 2014	24.3%	16.7%	16.8%	16.0%	5.4%
May-14	25.2%	17.1%	17.3%	16.0%	6.9%
Jun. 2014	24.3%	17.3%	17.4%	16.3%	6.2%
Jul. 2014	28.1%	19.6%	19.8%	18.4%	9.5%
Aug. 2014	28.1%	18.3%	18.6%	17.0%	8.2%

* On-peak period is defined as 10:00 a.m. - 6:00 p.m., weekdays all year, except holidays.

Table SCE – 7: Single Meter (TOU-D-TEV) – Mid-peak* TOU Distribution

Month	All Residential	Single: Non-NEM	SF: Non-NEM	MDU: Non-NEM	NEM
Sep. 2013	59.0%	52.7%	52.7%	52.7%	52.2%
Oct. 2013	57.4%	49.0%	49.0%	48.8%	48.3%
Nov. 2013	60.6%	51.7%	51.8%	51.5%	49.2%
Dec. 2013	59.7%	52.2%	52.3%	51.3%	51.1%
Jan. 2014	58.2%	49.9%	50.0%	49.7%	48.6%
Feb. 2014	59.4%	50.1%	50.2%	49.8%	48.6%
Mar. 2014	59.1%	49.8%	49.8%	49.4%	49.2%
Apr. 2014	57.5%	47.4%	47.4%	47.1%	47.1%
May-14	57.3%	49.4%	49.4%	49.4%	48.3%
Jun. 2014	59.0%	48.9%	49.0%	48.9%	48.4%
Jul. 2014	55.4%	49.6%	49.7%	49.2%	51.1%
Aug. 2014	55.7%	50.7%	50.8%	50.2%	51.9%

* Mid-peak period is defined as all other hours that are not On-peak or Off-peak.

Table SCE – 8: Single Meter (TOU-D-TEV) – Off-peak* TOU Distribution

Month	All Residential	Single: Non-NEM	SF: Non-NEM	MDU: Non-NEM	NEM
Sep. 2013	16.5%	30.1%	29.9%	31.2%	37.8%
Oct. 2013	18.2%	34.3%	34.1%	35.4%	43.2%
Nov. 2013	18.5%	33.3%	33.1%	34.2%	40.0%
Dec. 2013	19.6%	31.9%	31.7%	33.2%	38.0%
Jan. 2014	19.9%	33.9%	33.7%	34.7%	41.0%
Feb. 2014	19.9%	35.0%	34.8%	35.9%	43.0%
Mar. 2014	19.1%	35.6%	35.4%	36.5%	45.4%
Apr. 2014	18.3%	35.9%	35.8%	36.9%	47.5%
May-14	17.5%	33.5%	33.3%	34.7%	44.8%
Jun. 2014	16.7%	33.8%	33.6%	34.8%	45.4%
Jul. 2014	16.5%	30.8%	30.5%	32.4%	39.4%
Aug. 2014	16.2%	30.9%	30.6%	32.8%	39.9%
* Off-peak period is defined as 12:00 (midnight) - 6:00 a.m., daily.					

Table 6b demonstrates the separately-metered customers are highly responsive to the cheaper off-peak period and respond to the lower price by charging their vehicles nearly 90% of the time during the off-peak hours from 9:00 p.m. to 12:00 noon. This is not surprising given PEV load is easy to manipulate and the off-peak period occurs during hours that are convenient for charging a PEV driven during the day.

It is interesting to note that the off-peak charging percentage continues to rise with the increasing number of accounts on this rate. This observed trend could be attributed to any number of factors including an increased awareness of TOU pricing, the changing attributes of customers choosing a separate meter to charge their PEV or even customers attracted to greater savings from off-peak charging as the result of increased usage. It should also be noted that many models of PEVs have chargers which can be programmed to commence charging at set hours regardless of the choice of rate.

Table SCE – 6b: Separate Meter (TOU-EV-1) - Usage during Time-of-Use Periods

Month	On-peak	Off-peak
Sep. 2013	12.2%	87.8%
Oct. 2013	11.7%	88.3%
Nov. 2013	11.9%	88.1%
Dec. 2013	12.7%	87.3%
Jan. 2014	12.1%	87.9%
Feb. 2014	12.5%	87.5%
Mar. 2014	11.4%	88.6%
Apr. 2014	10.5%	89.5%
May-14	11.1%	88.9%
Jun. 2014	10.7%	89.3%
Jul. 2014	10.4%	89.6%
Aug. 2014	10.4%	89.6%

Charts SCE – 6a for SF with a single meter, 6b for MDU with a single meter, and 6c for separately-metered PEVs illustrate the dispersion of individual average consumption for each day of the week. The average consumption for each account was calculated for each day of the week and then the distribution of all accounts for each day is displayed. What is most notable for both rates and both SF and MDU accounts is the prevalence of accounts with extremely high average usage. Within the single-metered group, the MDU accounts do not have any accounts that average more than 150kWh for any day of the week, whereas the SF customers have a handful of accounts with average consumption greater than 150kWh and up to about 450kWh per day.

The following three charts, Chart SCE – 6a-6c, show boxplots[50] depicting the distribution of average daily usage for individual accounts. The median average usage for individual accounts and the inter-quartile range are quite similar for each day of the week for the single-metered groups. The separately-metered PEV median usage shown in Chart SCE – 6c is lower on Saturday and Sunday. Monday appears to have individual average consumption that is somewhat lower than the other weekdays, but a bit higher than the weekend. This will be further examined in the subsequent load profiles.

[50] Rectangular boxes represent the range of the middle 50% of the accounts by size (inter-quartile range), where the middle value (median) is denoted by a line and separates the upper and lower halves of the distribution. The whiskers extend 1.5 times the inter-quartile range above the 75th percentile and below the 25th percentile. Points farther than the whisker from the interquartile range are commonly considered outliers and are plotted.

Chart SCE – 6a: Single Meter (TOU-D-TEV), SF - Box-and-Whisker Plot of Individual Average Daily Consumption(kWh) by Day of the Week

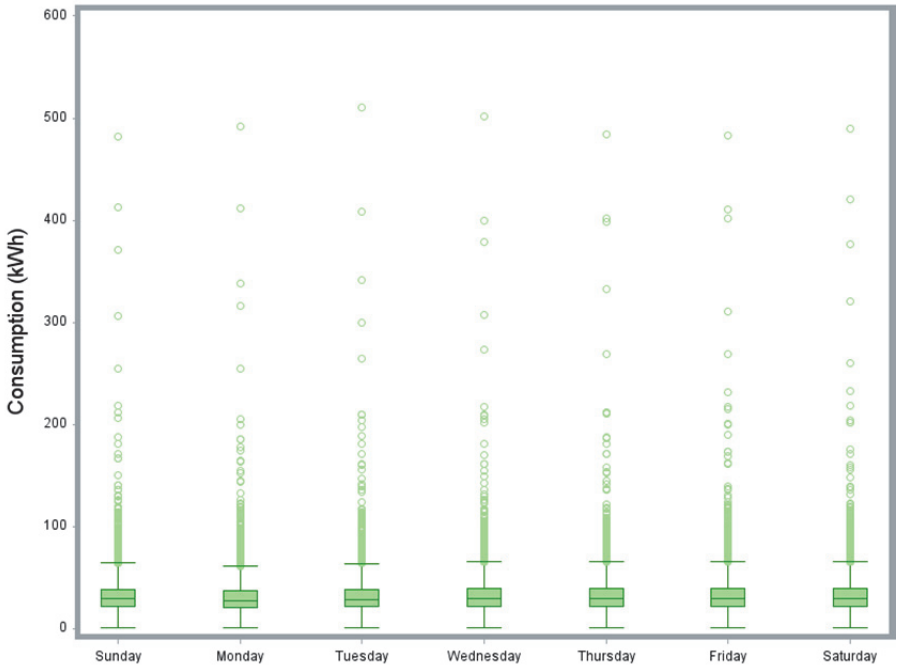


Chart SCE – 6b: Single Meter (TOU-D-TEV), MDU - Box-and-Whisker Plot of Individual Average Daily Consumption(kWh) by Day of the Week

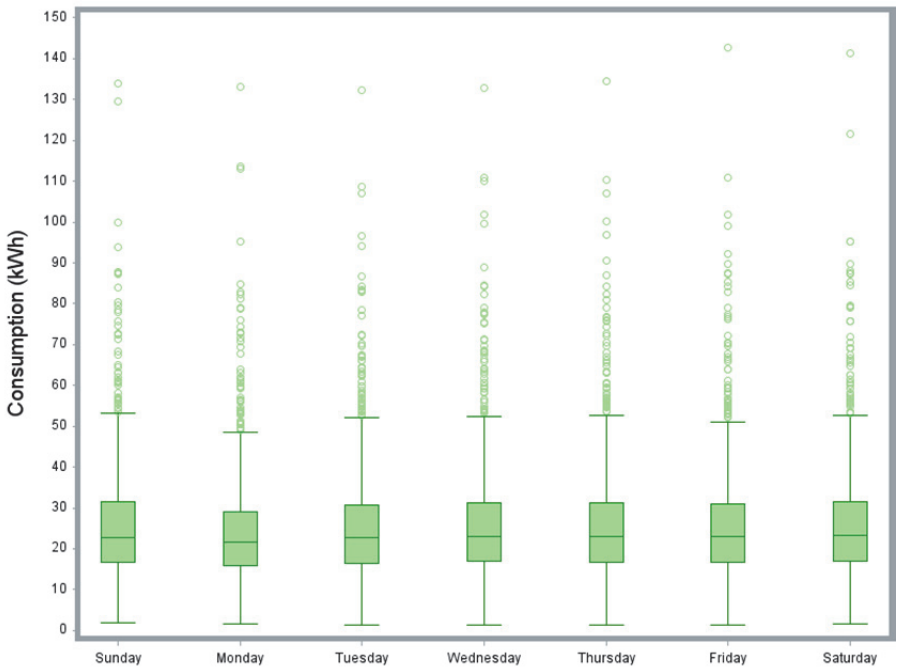
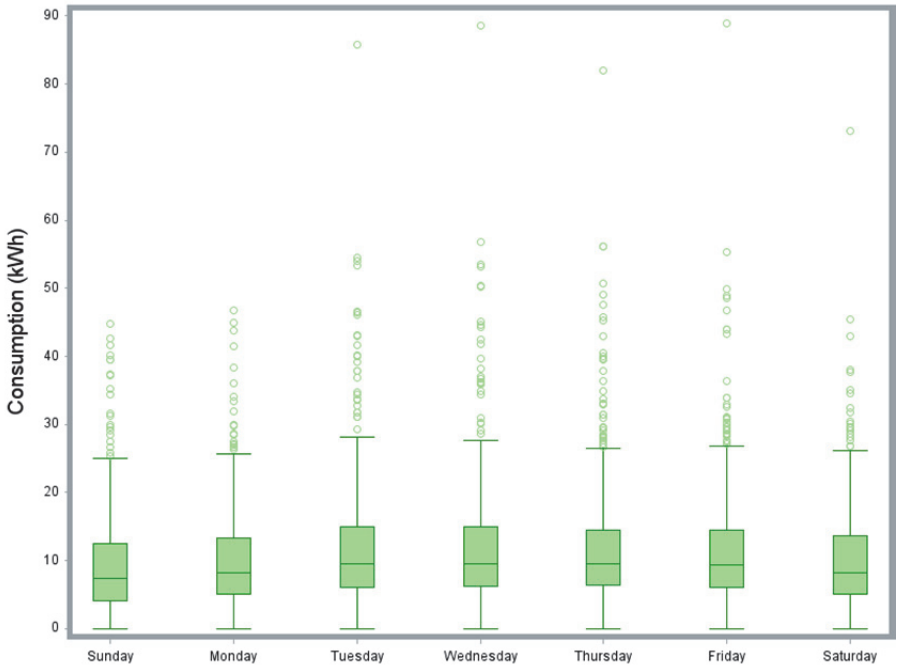


Chart SCE - 6c: Separate Meter (TOU-EV-1), SF - Box-and-Whisker Plot of Individual Average Daily Consumption(kWh) by Day of the Week



Average Load Profiles

The hourly load profiles allow for a more granular examination of the enegy use of PEV owners during time-of-use periods.

Charts SCE – 7a & b show the average load profile for both single meter customer types described previously. The increase in load occuring in the late afternoon hours is likely due to customers returning home from work. The load profiles for both the SF and MDU accounts also show abrupt increases in load around 12 a.m. during the off-peak period. The usage occuring in the off-peak period (12 midnight – 6:00 a.m.) is more concentrated and peaks about 25% higher than the traditional early evening peak. It is plausible that the usage occuring during this period is dominated by PEV charging. On average, customers seem to respond to time-of-use pricing signals.

Multi-family accounts have a similar load shape as single-family accounts however multi-family demand is lower throughout the day. Whereas the SF off-peak demand reaches about 2.5 kW, demand for MDU units is about 2.1 during this period.

These load profile charts for single-metered TOU accounts also show Saturday and Sunday to have a muted second spike in demand at 12:00 a.m. when compared to weekdays. This pattern is consistent with previous reports and reaffirms the notion that PEVs are primarily used for commuting to work and are driven more for this purpose. The load curves also show higher midday demands on the weekends than those seen during the week. While it could be that the lower off-peak demand occuring on the weekend is due to more charging of PEVs during the middle of the day, the price signals seem strong

enough to incentivize charging during the off-peak period. Additionally, households are more likely to be home during the middle of the day on weekends and therefore require more energy for other purposes.

Chart SCE – 7a: Single Meter (TOU-D-TEV), SF - Average Hourly Load Profile for Each Day of the Week

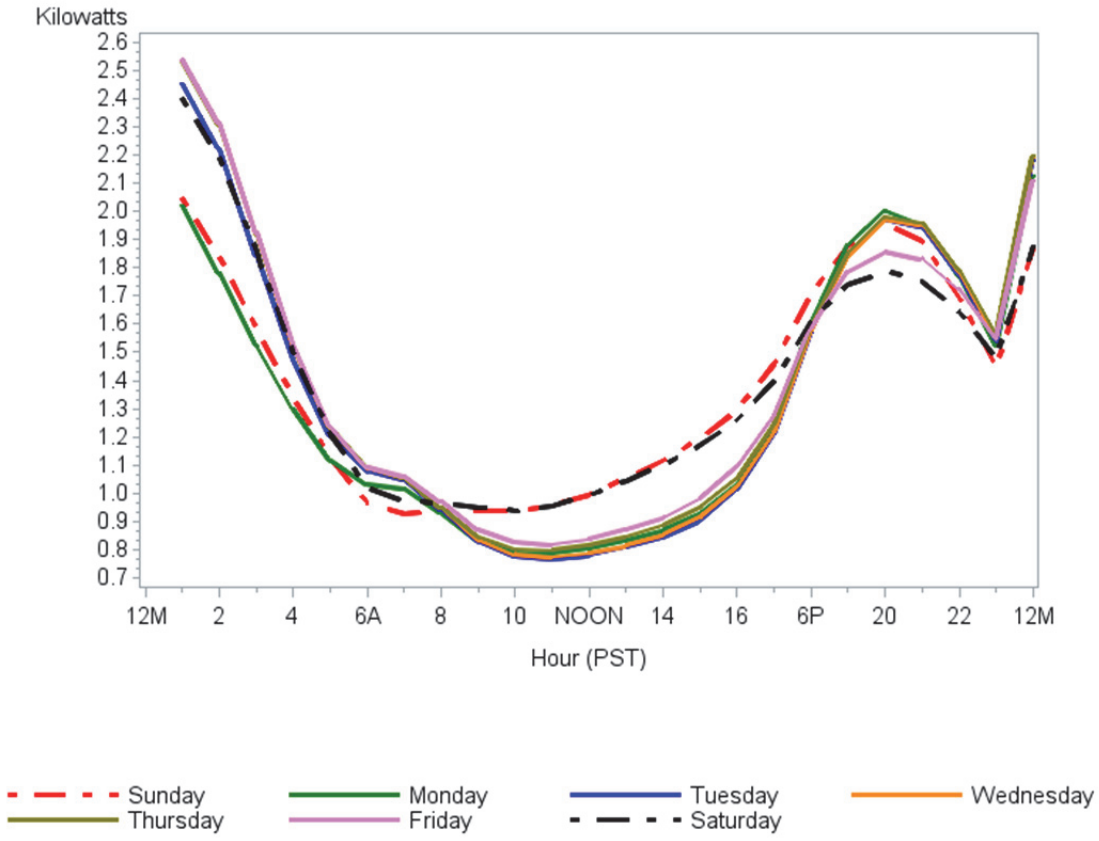
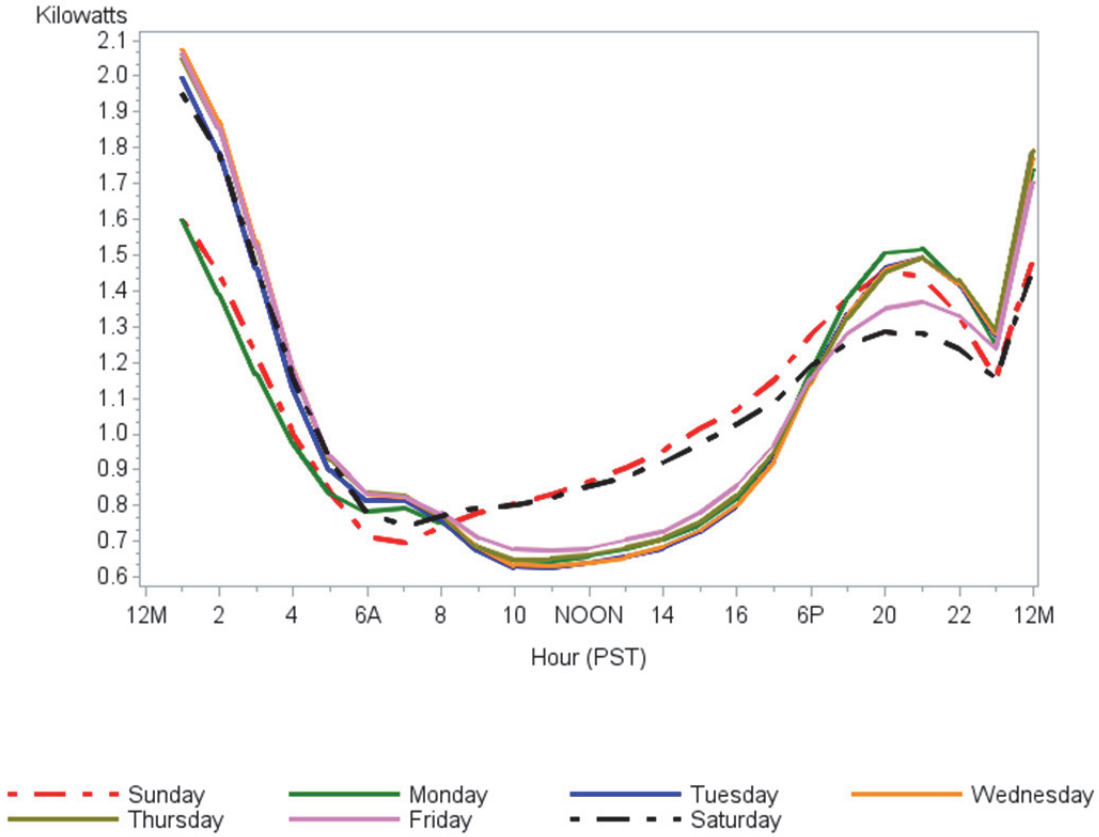


Chart SCE – 7b: Single Meter (TOU-D-TEV), MDU – Average Hourly Load Profile for Each Day of the Week



In Chart SCE – 8, separately-metered accounts have a spike in PEV load around 10 p.m., suggesting that customers are very cogniziant that off-peak charging times begin at 9 p.m. and the vast majority begin charging at this time. Charging continues during the off-peak time and is largely completed between 6:00-7:00 a.m. Again, as with the early morning peak present in the single-metered profle, the peak for separatly metered PEVs is about 0.4 kW lower on Saturday and Sunday than on weekdays. The lower peak occuring Sunday evening tapers into the early morning hours of Monday, which produces the lower usage on Mondays shown in Chart SCE – 6c.

Chart SCE – 8: Separate Meter (TOU-EV-1) - Average Hourly Load Profile for Each Day of the Week

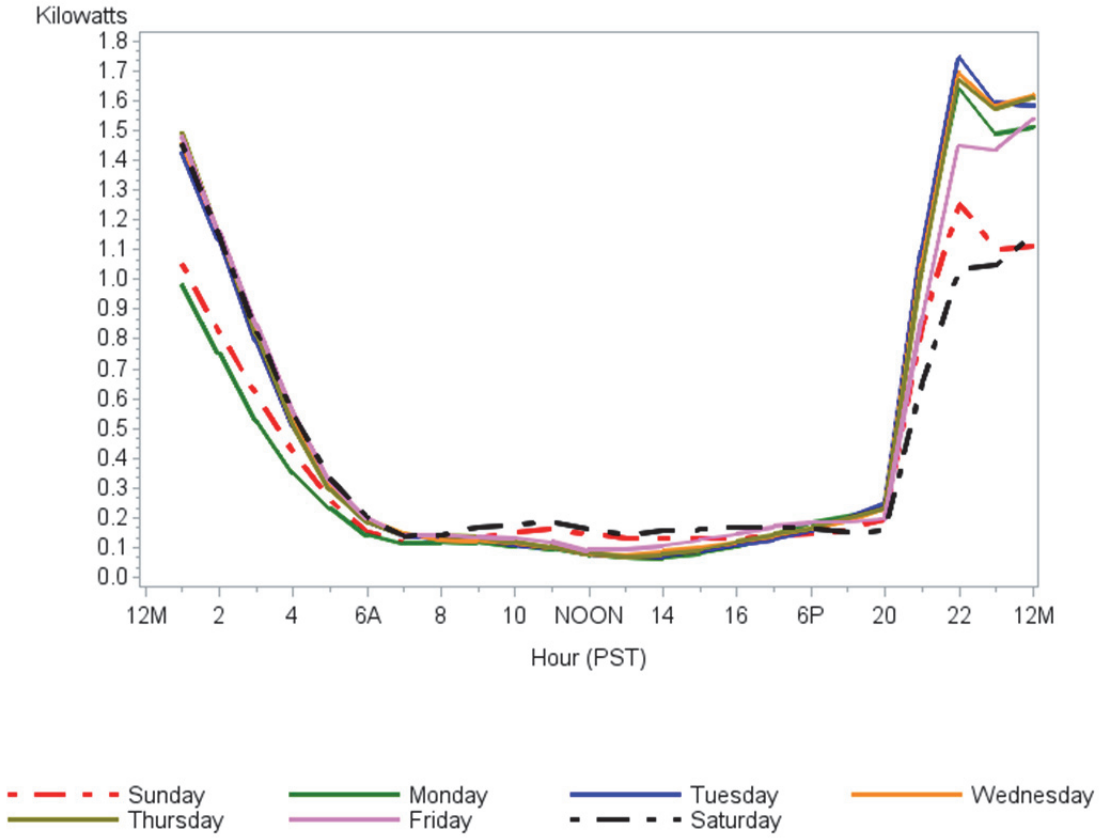


Chart SCE – 9: Single Meter PEV Owners on a Non-TOU Rate – Average Hourly Load Profile for Each Day of the Week

Data obtained by SCE on regular tiered residential accounts that belong to PEV owners is not complete enough to produce load profiles for Chart 9 for "PEV Owners on a Non-EV Rate" from Energy Division's reporting requirements. SCE will seek to include this information in future reports, if feasible. Consequently, the figures in this report only represent the number of PEV customers in SCE service territory on PEV rates, not all PEV customers.

Average Non-Coincident Peak Load

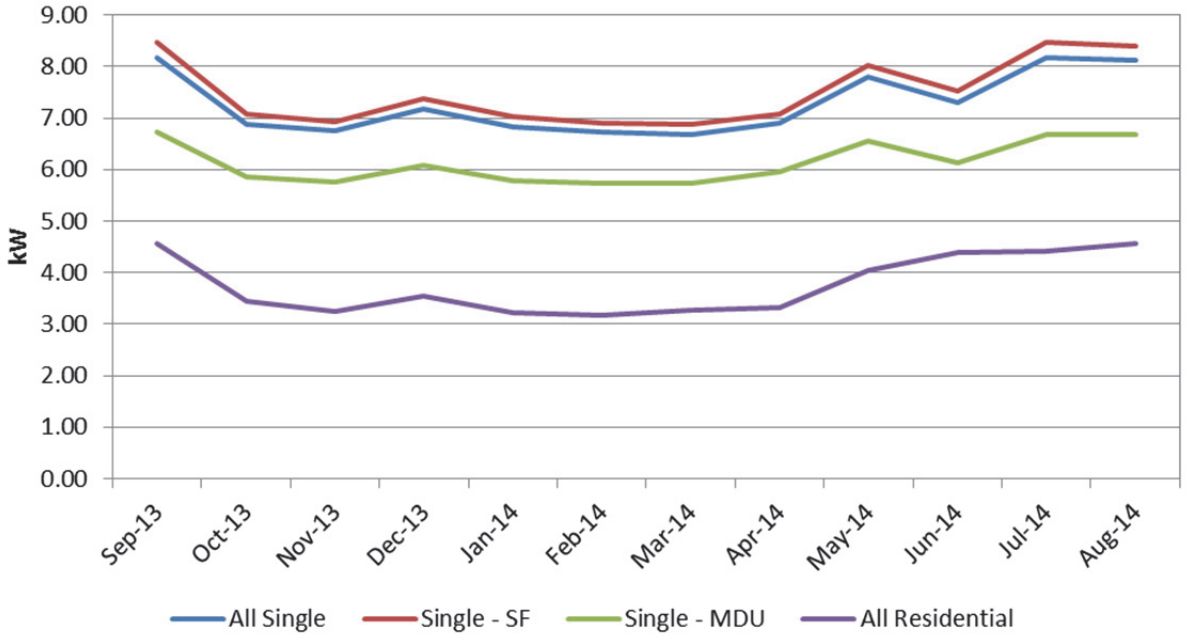
Table SCE – 9a shows the average non-coincident peak was approximately 2.5kW higher for the single-metered TOU group compared to the average residential peak.[51] Similar to the monthly average usage, average non-coincident peak demands are lower from October through April.
These patterns are present in both single- and multiple-dwelling units and, as with the residential population at large, multiple-dwelling units have a lower non-coincident peak on average. Chart SCE – 10a plots the average non-coincident peaks for the reported time frame and it can be seen that, while the seasonal trend appears similar, the general residential population has a much lower peak load than that of single-metered accounts with PEVs.

Table SCE – 9a: Single Meter (TOU-D-TEV) - Monthly Average Non-Coincident Peak Load (kW)

Month	Residential Pop.	SF Pop.	MDU Pop.	All Single Metering	SF Single Metering	MDU Single Metering
Sep. 2013	4.57	5.32	3.35	8.18	8.46	6.73
Oct. 2013	3.45	3.81	2.85	6.89	7.08	5.86
Nov. 2013	3.25	3.54	2.76	6.74	6.94	5.76
Dec. 2013	3.54	3.82	3.06	7.17	7.38	6.09
Jan. 2014	3.21	3.41	2.85	6.82	7.02	5.79
Feb. 2014	3.16	3.37	2.80	6.72	6.91	5.73
Mar. 2014	3.28	3.52	2.86	6.69	6.87	5.74
Apr. 2014	3.32	3.62	2.82	6.89	7.08	5.95
May 2014	4.05	4.63	3.09	7.79	8.02	6.56
Jun. 2014	4.40	5.10	3.23	7.30	7.53	6.13
Jul. 2014	4.42	5.13	3.24	8.18	8.47	6.67
Aug. 2014	4.57	5.33	3.33	8.11	8.39	6.68

[51] The average non-coincident peak was calculated by denoting the maximum hourly interval for each account within the month. These maximum values were then summed for each category. The average is then calculated by dividing the total by the number of customers. The average non-coincident peak is therefore an approximation of the maximum demand of customers in each stratum.

Chart SCE – 10a: Single Meter (TOU-D-TEV) - Monthly Average Non-Coincident Peak Load (kW)



The average non-coincident peak (or average maximum demand) was approximately 7.2 kW for separately-metered PEVs. This results in Table SCE – 9b corroborates with those in Chart SCE - 5. Average maximum demand increased over the period observed and seems to have stabilized from May to August 2014.

Table SCE – 9b: Separate Meter (TOU-EV-1) - Monthly Average Non-Coincident Peak Load (kW)

Month	Separate Metering
Sep. 2013	6.79
Oct. 2013	6.80
Nov. 2013	6.93
Dec. 2013	7.08
Jan. 2014	7.30
Feb. 2014	7.21
Mar. 2014	7.18
Apr. 2014	7.25
May 2014	7.51
Jun. 2014	7.43
Jul. 2014	7.45
Aug. 2014	7.40

Chart SCE – 10b: Separate Meter (TOU-EV-1) - Monthly Average Non-Coincident Peak Load (kW)

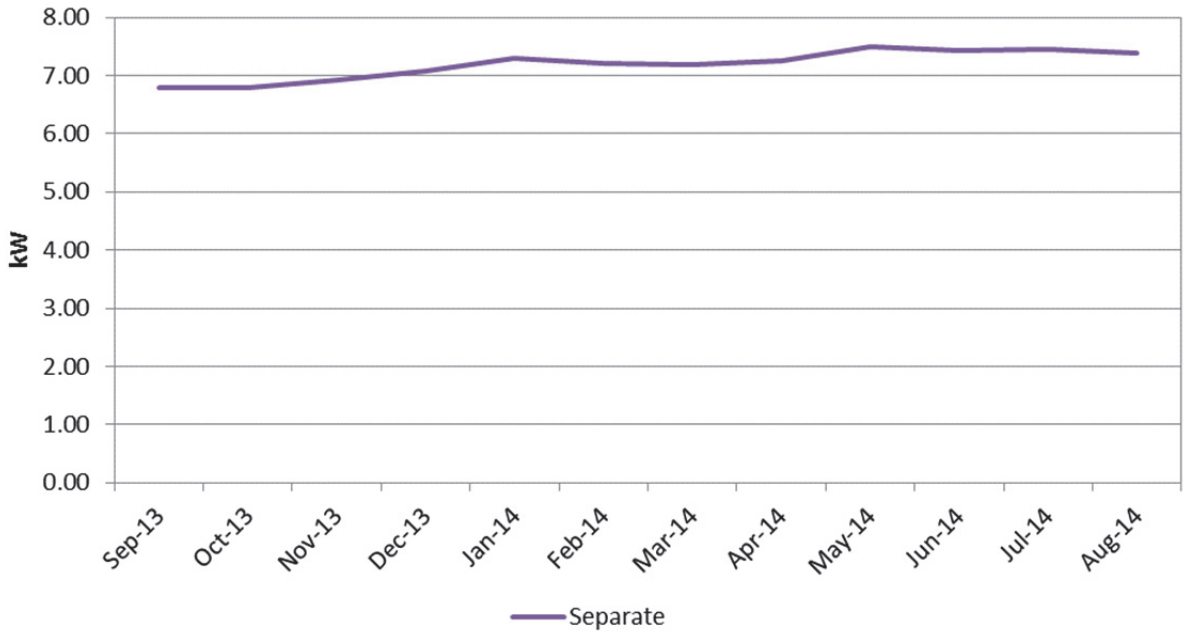
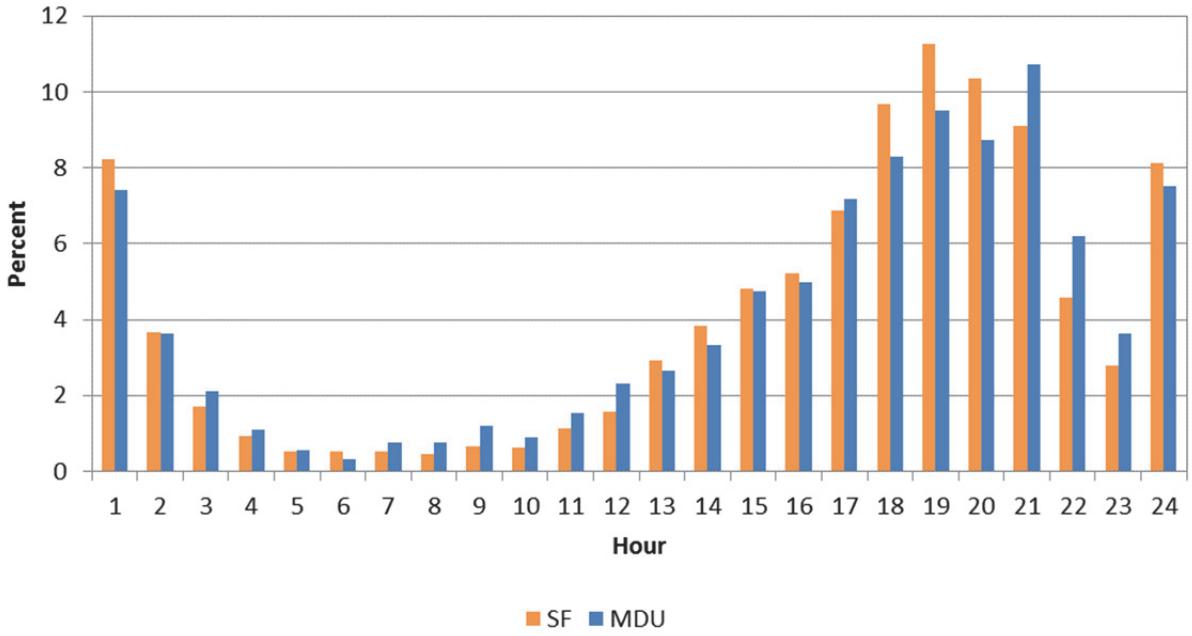


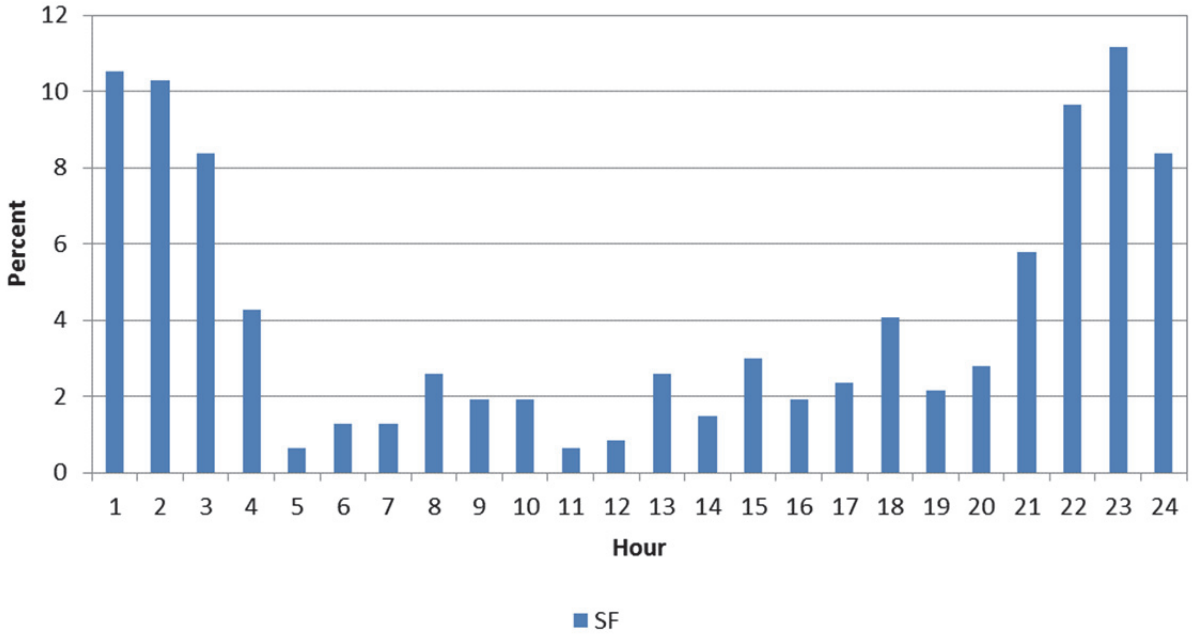
Chart SCE – 11a shows the distribution of the hour at which non-coincident peak load occurs during the year for each of the single-metered TOU accounts. This chart presents the number of accounts peaking in each hour as a percentage to allow for a better comparison between the numerically smaller MDU group and the more prevalent SF group. The general distributions for single meter accounts are quite similar; however as was observed previously, multi-dwelling units peak in slightly greater proportion later in the evening from 8 p.m. to 11 p.m. whereas the single-family units have a larger proportion of accounts peaking earlier from 6 p.m. to 8 p.m.

Chart SCE – 11a: Single Meter (TOU-D-TEV) - Histogram of Hour of Non-Coincident Peak Load Occurrence for Each Account by Customer Type



For the separately-metered PEV load, about 2 percent of the accounts can be seen in Chart SCE – 11b to be charging during the daylight hours with a drop off in charging during the morning commute and the lunch hours. Peak demands begin occurring for a greater number of accounts around 9 p.m. in the evening. The number of accounts reaching peak demand remains high through the early morning hours until about 4 a.m. where it begins steeply declining into the morning commute time.

Chart SCE – 11b: Separate Meter (TOU-EV-1) - Histogram of Hour of Non-Coincident Peak Load Occurrence for Each Account by Customer Type



Data Accompanying Chart SCE – 11a, b

Hour	Residential Pop.	SF Pop.	MDU Pop.	All Single Metering	SF Single Metering	MDU Single Metering	Separate Metering
1	2%	2%	2%	8%	8%	7%	11%
2	1%	1%	1%	4%	4%	4%	10%
3	1%	1%	1%	2%	2%	2%	8%
4	0%	1%	0%	1%	1%	1%	4%
5	1%	1%	1%	1%	1%	1%	1%
6	1%	1%	1%	0%	1%	0%	1%
7	2%	2%	2%	1%	1%	1%	1%
8	3%	2%	3%	0%	0%	1%	3%
9	3%	3%	4%	1%	1%	1%	2%
10	3%	3%	4%	1%	1%	1%	2%
11	4%	4%	4%	1%	1%	2%	1%
12	3%	3%	4%	2%	2%	2%	1%
13	3%	3%	3%	3%	3%	3%	3%
14	3%	3%	3%	4%	4%	3%	2%
15	3%	2%	3%	5%	5%	5%	3%
16	3%	3%	3%	5%	5%	5%	2%
17	4%	4%	4%	7%	7%	7%	2%
18	10%	11%	8%	9%	10%	8%	4%
19	15%	16%	13%	11%	11%	9%	2%
20	12%	13%	11%	10%	10%	9%	3%
21	9%	10%	9%	9%	9%	11%	6%
22	7%	7%	8%	5%	5%	6%	10%
23	4%	4%	5%	3%	3%	4%	11%
24	2%	2%	3%	8%	8%	8%	8%

Time and Average Diversified Peak Load

As displayed in the following table (Tables SCE – 10a) the general residential populations as a whole display greater seasonal variability in their diversified (or group) peak demands than do the TOU accounts with PEVs. Also the demands for the TOU groups are greater, generally being above 2.5 kW for the combined group whereas the normal residential customers typically have a group peak load below 2 kW. Further, the discrepancy between single and multi-family units is proportionally larger for the regular residential population than for the PEV owners. This suggests that the PEV charging load may be dominating the regular household peak loads.

The time of diversified group peak load is the time that the peak occurs for the aggregated demands of the group. For regular residential customers, the hour of diversified peak load occurs in the late afternoon for the summer months of May through October and later in the evening during the winter months of November through April. The occurrence of diversified peak load for the single-metered PEV owners however is consistent across all months. The group peak occurs between midnight and 1:00 am for all categories where the difference likely results from the Daylight Savings time shift. This would indicate that on average one single-metered customer type is not more responsive than another to a time-of-use rate. It also shows that these customers are responsive to the off-peak rate which begins at

12:00 midnight. For single-metered customers, the off-peak rate provides the lowest rate for charging purposes.

Table SCE – 10a: Single Meter (TOU-D-TEV) - Time and Average Diversified Peak Load

Month	Residential Demand (kW)	Hour of Residential Demand	SF Population Demand (kW)	Hour of SF Population Demand	MDU Population Demand (kW)	Hour of MDU Population Demand
Sep. 2013	2.13	17	2.63	17	1.29	18
Oct. 2013	1.16	17	1.37	19	0.80	17
Nov. 2013	1.01	20	1.20	19	0.70	20
Dec. 2013	1.31	21	1.50	20	0.96	21
Jan. 2014	1.28	20	1.43	20	1.00	21
Feb. 2014	1.13	20	1.30	20	0.86	20
Mar. 2014	1.01	20	1.17	20	0.72	20
Apr. 2014	1.09	20	1.28	20	0.75	20
May 2014	1.74	17	2.10	17	1.11	18
Jun. 2014	2.06	16	2.54	16	1.24	17
Jul. 2014	1.90	18	2.32	18	1.18	18
Aug. 2014	2.05	16	2.50	16	1.28	16

Table SCE – 10a cont'd: Single Meter (TOU-D-TEV) - Time and Average Diversified Peak Load

Month	Single Metering Demand (kW)	Hour of Single Metering Demand	SF Single Metering Demand (kW)	Hour of SF Single Metering Demand	MDU Single Metering Demand (kW)	Hour of MDU Single Metering Demand
Sep. 2013	2.78	24	2.87	24	2.35	24
Oct. 2013	2.58	24	2.66	1	2.18	24
Nov. 2013	2.49	1	2.57	1	2.08	1
Dec. 2013	2.56	1	2.64	1	2.18	1
Jan. 2014	2.55	1	2.63	1	2.13	1
Feb. 2014	2.58	1	2.66	1	2.16	1
Mar. 2014	2.49	1	2.56	1	2.09	1
Apr. 2014	2.50	1	2.58	1	2.11	1
May 2014	2.61	1	2.70	1	2.15	1
Jun. 2014	2.58	24	2.67	24	2.12	1
Jul. 2014	2.79	24	2.89	24	2.28	24
Aug. 2014	2.72	24	2.81	24	2.27	1

Separately-metered customers peak as a group between 10:00 p.m. – 12:00 p.m. Thus, separately-metered customers also seem to respond to time-of-use periods and charge during off-peak times which begin at 9:00 p.m. Comparing these demands to the non-coincident peak demand in Table SCE-9b, one might infer that on any given night, only a subset (perhaps about one in four) customers is charging.

Table SCE – 10b: Separate Meter (TOU-EV-1) - Time and Average Diversified Peak Load

Month	Separate Metering Demand (kW)	Hour of Separate Metering Demand
Sep. 2013	1.51	22
Oct. 2013	1.61	22
Nov. 2013	1.53	23
Dec. 2013	1.44	23
Jan. 2014	1.61	23
Feb. 2014	1.60	23
Mar. 2014	1.63	22
Apr. 2014	1.65	22
May 2014	1.67	22
Jun. 2014	1.56	22
Jul. 2014	1.56	24
Aug. 2014	1.64	24

Average Load Coincident with System Peak

The average load coincident with system peak is the average load occurring at the same time that the system peak occurs. The system peak days and times were used to extract the appropriate hourly load at the time of system peak. The average group load coincident with system peak was calculated taking the total group load and dividing by the number of customers.

Table SCE – 11 shows that the average load coincident with system peak does not seem to have much seasonal fluctuation except for the NEM accounts, which appear to have a relatively lower average load coincident with system peak during the summer months compared to winter months, a result most likely due to on-site generation in the summer. At the time of system peak, monthly average demand for multiple-dwelling units is lower than for single-family units. This result is the same for residential customers regardless of PEV ownership.

Table SCE –11a: Single Meter (TOU-D TEV) - Average Load Coincident with System Peak (kW/customer)

Month	Residential Population	SF Population	MDU Population	All Single Metering	SF Single Metering	MDU Single Metering
Sep. 2013	1.99	1.41	1.18	2.25	2.36	1.66
Oct. 2013	0.87	1.27	0.62	0.97	1.01	0.75
Nov. 2013	0.89	1.08	0.61	1.43	1.50	1.08
Dec. 2013	1.27	0.91	0.90	2.17	2.27	1.63
Jan. 2014	1.25	1.41	0.95	1.67	1.75	1.26
Feb. 2014	1.10	1.27	0.79	1.53	1.60	1.17
Mar. 2014	0.95	1.08	0.70	1.54	1.60	1.21
Apr. 2014	0.79	0.91	0.57	1.10	1.14	0.87
May 2014	1.67	2.02	1.07	2.12	2.22	1.59
Jun. 2014	1.79	2.20	1.08	1.16	1.20	0.96
Jul. 2014	1.81	2.22	1.11	2.24	2.36	1.62
Aug. 2014	1.95	2.39	1.19	1.63	1.70	1.29

Table SCE –11a- cont'd: Single Meter (TOU-D TEV) - Average Load Coincident with System Peak (kW/customer)

Month	NEM	DR
Sep. 2013	1.92	1.99
Oct. 2013	0.71	0.86
Nov. 2013	1.67	1.31
Dec. 2013	2.48	2.00
Jan. 2014	1.91	1.51
Feb. 2014	1.77	1.42
Mar. 2014	1.75	1.43
Apr. 2014	0.57	0.91
May 2014	1.56	2.01
Jun. 2014	0.68	1.04
Jul. 2014	2.16	2.45
Aug. 2014	1.02	1.74

The average load coincident with system peak is very small for separately-metered customers. This result is anticipated as we have seen previously that this load is very responsive to TOU pricing and is very highly concentrated in off-peak hours due to the structure of the rate. Table SCE – 11b shows the distribution of the average load coincident with system peak which fluctuates only slightly by month.

Table SCE –11b: Separate Meter (TOU-EV-1) - Average Load Coincident with System Peak (kW/customer)

Month	Separate Metering
Sep. 2013	0.09
Oct. 2013	0.11
Nov. 2013	0.15
Dec. 2013	0.20
Jan. 2014	0.16
Feb. 2014	0.25
Mar. 2014	0.15
Apr. 2014	0.09
May 2014	0.17
Jun. 2014	0.10
Jul. 2014	0.12
Aug. 2014	0.10

The geographic distribution of customers who own a PEV and opt for one of the TOU rates within the service territory is shown in Table SCE – 12a. As has been observed in previous reports, there is an outsized representation of PEVs on TOU rates in mild climate zones which is mostly comprised of coastal zones. Although only 45% of the overall residential accounts are in one of the mild zones, 62% of the single-metered PEV accounts and 58% of the separately metered PEV accounts in these zones

Table SCE –12a: Percentage of PEV Customers on TOU Rates by Zone[52] as Compared to Residential Population

Climate	Zone(s)	Residential Population*	Single Meter	Separate Meter
mild	5, 6, 8, 16	45%	62%	58%
moderate/hot	9, 10, 13, 14, 15	55%	38%	42%

*Percentages are based on residential customers at the end of October 2014.

This geographical distribution has remained mostly unchanged from the previous year. One can continue to make the same observations regarding the characteristics of these early adopters of PEVs:

- Their socio-demographic attributes such as income, education, and housing type correlate with those of coastal dwellers.
- Coastal dwellers have less air conditioning load, which may make them less resistant to TOU rates and their higher on-peak prices.
- Residents in the more densely populated zones such as zones 6, 8, and 9 may have shorter commutes that are within the range of PEVs, allowing easier adoption.

[52] SCE's baseline information can be found at: http://www.sce.com/NR/sc3/tm2/pdf/ce63map.pdf.

Table SCE –12b: Top Five Most Populous Zip Codes with PEVs by Tariff

Rate Type	Zip Code(s)*	City of Zip Code	Total Number of Accounts with PEV
Single Meter	90266	Manhattan Beach	112
	90275	Rancho Palos Verdes	89
	90274	Palos Verdes Peninsula	87
	92648	Huntington Beach	79
	90278	Redondo Beach	75
Separate Meter	90402	Santa Monica	21
	91354, 90720	Valencia, Los Alamitos	17
	91011, 90266	La Canada Flintridge, Manhattan Beach	15

The dispersion of PEVs on a time-of-use rate in SCE's territory is illustrated on the maps in Figures SCE – 3 and 4. Table SCE – 13 show zip codes ranked by frequency of electric vehiles on TOU. Most of these zip codes belong to cities which are along the coast.

Figure SCE – 3: Geographic Location PEV TOU Accounts by Tariff Type

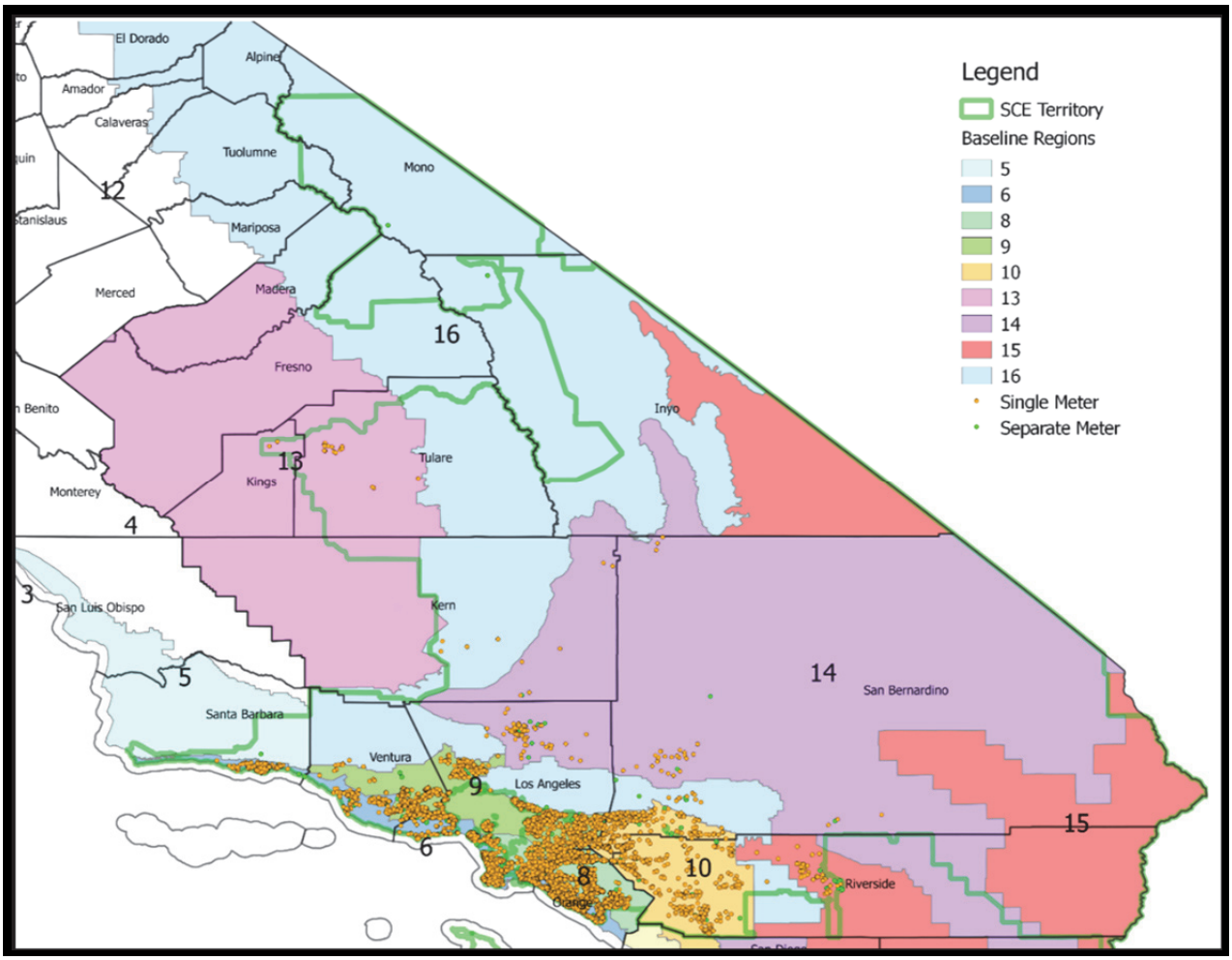
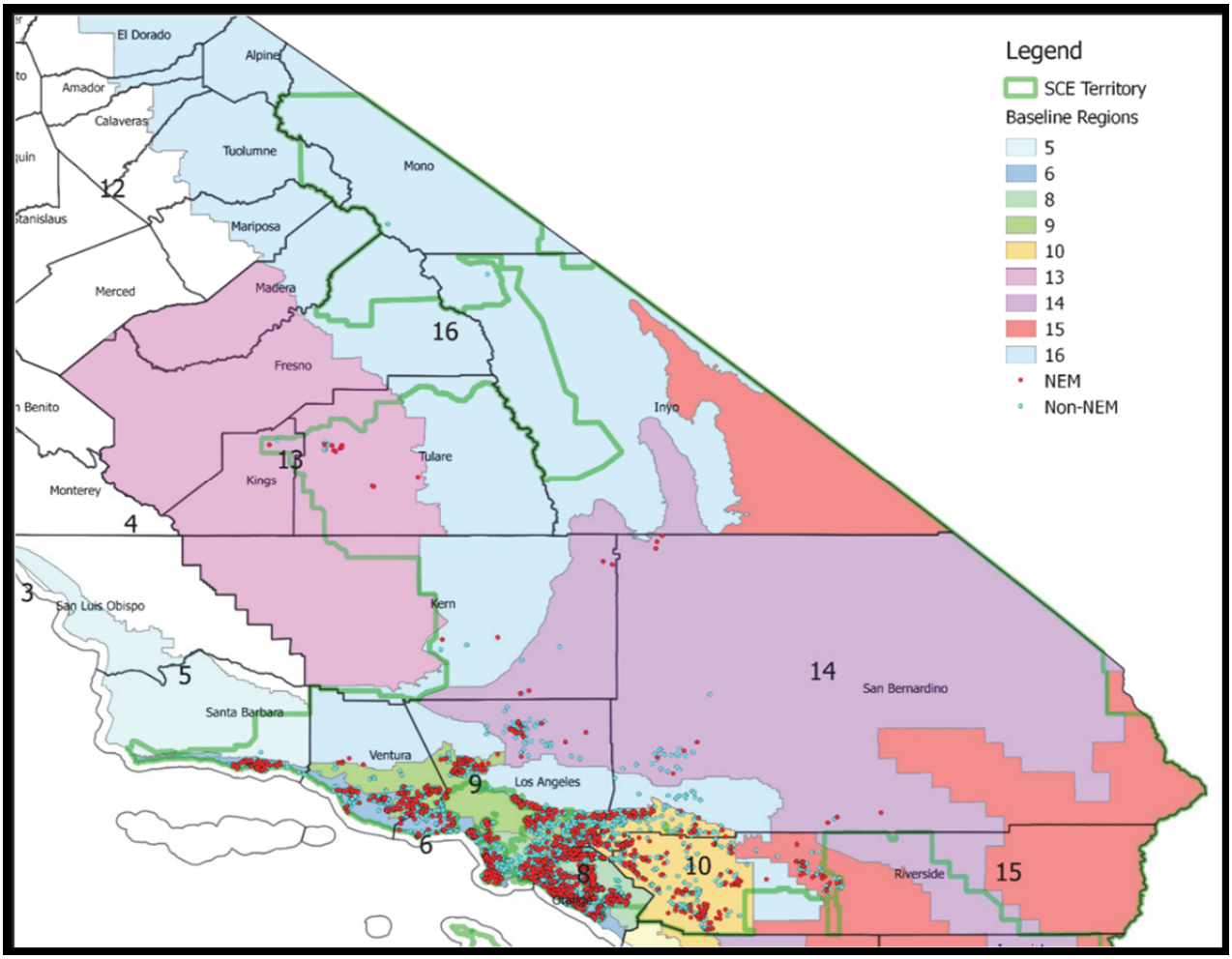


Figure SCE – 4: Geographic Location PEV TOU Accounts by NEM Designation



San Diego Gas and Electric

SDG&E offers residential customers five rates within two different meter configurations for PEV owners. First, a single-meter rate (EVTOU-2) captures load associated with both the PEV and the whole house. Second, there are four separately-metered rates (EVTOU, EPEV-X, EPEV-Y, and EPEV-Z) which capture load associated with EV charging only. The rates provided below were effective May 1, 2014 through July 31, 2014 and were effective for the majority of the period for which the data was collected. SDG&E does not currently offer a commercial EV rate option. Table 1a provides the TOU periods for each rate and their respective seasonal prices per kWh.

SDG&E Table 1a: Tariff (¢/kWh)

Tariff	TOU	Hour Beginning	Winter Weekday	Winter Weekend	Summer Weekday	Summer Weekend
EVTOU	Super Off Peak	Midnight to 5am	17.2	17.2	16.1	16.1
	On Peak	Noon to 8pm	20.2	20.2	44.0	44.0
	Off Peak	All other	19.2	19.2	20.3	20.3
EVTOU-2	Super Off Peak	Midnight to 5am	17.2	17.2	16.1	16.1
	On Peak	Noon to 6pm	19.8	19.8	44.1	44.1
	Off Peak	All other	19.5	19.5	20.6	20.6
EPEV-X	Super Off Peak	Midnight to 5am	17.7	17.7	17.6	17.6
	On Peak	Noon to 8pm	21.9	21.9	35.3	35.3
	Off Peak	All other	21.1	21.1	21.5	21.5
EPEV-Y	Super Off Peak	Midnight to 5am	14.4	14.4	14.0	14.0
	On Peak	Noon to 8pm	43.7	43.7	53.6	53.6
	Off Peak	All other	29.2	29.2	33.7	33.7
EPEV-Z	Super Off Peak	Midnight to 5am	13.2	13.2	12.9	12.9
	On Peak	Noon to 8pm	63.9	63.9	73.8	73.8
	Off Peak	All other	25.6	25.6	29.5	29.5

Table 1b provides the price ratios between the different TOU periods for each rate. The separate-metered rate, EPEV-Z, has the largest difference between on-peak and super off-peak prices. The on-peak price per kWh for EPEV-Z was 381% and 471% greater than the super off-peak price during the winter and summer respectively.

SDG&E Table 1b: Price Ratios

Tariff	Winter		Summer	
	Off-Peak and Super Off Peak	On-Peak and Super Off-Peak	Off-Peak and Super Off Peak	On-Peak and Super Off-Peak
EVTOU	1:1	1:1	1:1	3:1
EVTOU-2	1:1	1:1	1:1	3:1
EPEV-X	1:1	1:1	1:1	2:1
EPEV-Y	2:1	3:1	2:1	4:1
EPEV-Z	2:1	5:1	2:1	6:1

SDG&E Single-Meter PEV Rate (EVTOU-2):

The EVTOU-2 rate option is designed for residential customers that have both their household load and PEV load on the same meter. Service under this optional rate is specifically limited to residential customers who require service for charging of a currently registered motor vehicle which is: 1) a battery electric vehicle (BEV) or plug-in hybrid vehicle (PHEV) recharged via a recharging outlet at the customer's premise; or, 2) a natural gas vehicle (NGV) refueled via a home refueling appliance (HRA) at the customer's premise. The on-peak period is 12:00 – 18:00 daily (excluding holidays), the off-peak period is 05:00 – 12:00 and 18:00 – 24:00 daily, and the super off-peak period is 24:00 – 05:00 daily.

Please note that the current information drawn from this subgroup is preliminary and any judgments and/or policy decisions made from this information would be premature. Additionally, SDG&E cautions readers from drawing any major conclusions from any of the PEV rate information that has been provided over this past year. As can be seen form the information presented in this document, the number of customers taking service under a PEV rate is continuing rapid growth and the demand/energy data may not be stable enough to draw any major conclusions. Since September 2013, the number of customers taking service under EVTOU-2 has grown 149%

SDG&E Table 2: NEM and DR Program Enrollment for Single-Meter Rate

Month	Total Customers on Single-Metering	Total Customers on NEM	NEM as a % of Single-Metering	Total Customers on DR	DR as a % of Single-Metering
Sep 13	1,531	252	16.46%	66	4.31%
Oct 13	1,753	287	16.37%	70	3.99%
Nov 13	2,040	330	16.18%	85	4.17%
Dec 13	2,219	361	16.27%	89	4.01%
Jan 14	2,433	411	16.89%	97	3.99%
Feb 14	2,677	467	17.44%	106	3.96%
Mar 14	2,887	495	17.15%	117	4.05%
Apr 14	3,097	536	17.31%	123	3.97%
May 14	3,331	574	17.23%	457	13.72%
Jun 14	3,477	604	17.37%	542	15.59%
Jul 14	3,635	646	17.77%	632	17.39%
Aug 14	3,806	689	18.10%	828	21.76%

The preliminary research presented herein analyzes usage patterns of early adopter customers whose characteristics (including consumption patterns) are often markedly different from the general population. One characteristic in particular is the penetration of PV systems. Currently PV owners are over represented in the PEV rates class. The residential population in SDG&E's service territory consists of approximately 3% NEM customers while NEM customers represent 16%-18% of the single-meter PEV rate class as seen in Table 2. SDG&E believes that customers with PV systems tend to be more affluent with higher monthly consumption and greater awareness/desire to modify usage behavior when compared to the general residential population. We cannot conjecture what the penetration of NEM will be in the future as the adoption of PEVs continues to grow. From September to April, demand response (DR) enrollment was less than 5% of single-meter PEV customers; however, in May DR enrollment jumped to almost 14% reflecting more aggressive recruitment strategies.

SDG&E Separate-Meter PEV Rate (EVTOU, EPEV-X, EPEV-Y, and EPEV-Z):

EVTOU:

The EVTOU rate option is designed for residential customers that have their PEV load on a dedicated meter. This is an optional rate to domestic service for charging of a currently registers motor vehicle which is one of the following: 1) a battery electric vehicle (BEV) or plug-in hybrid electric vehicle (PHEV) recharged via a recharging outlet at the customer's premise; or, 2) a natural gas vehicle (NGV) refueled via a home refueling appliance (HRA) at the customer's premise. The point of service must contain facilities to separately meter PEV or CNG charging. The on-peak period for this rate is 12:00 – 20:00 daily.

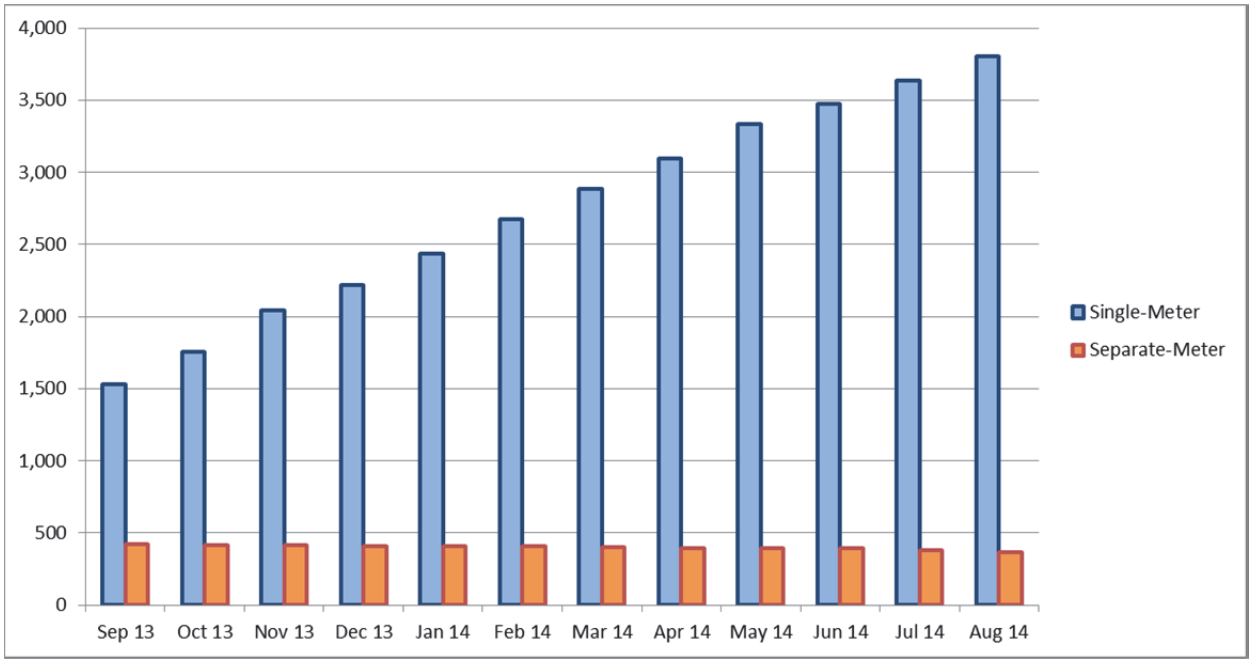
EPEV-X, -Y, and –Z:

These rates are experimental bundled services schedules available to selected residential customers exclusively for charging a PEV. The PEV must be a currently registered motor vehicle, as defined by the California Motor Vehicle code. This schedule is not available to customers with a conventional charge sustaining (battery recharged solely from the vehicle's on-board generator) hybrid electric vehicle (HEV). These rates are designed with an on-peak period of 12:00 – 20:00 daily and an off-peak period of 05:00 – 12:00 and 20:00 – 24:00. The ratios from on-peak to super off-peak are 2:1, 4:1, and 6:1 for EPEV-X, EPEV-Y, and EPEV-Z respectively. These rate options were developed with different on-peak ratios specifically for an electric vehicle pricing study. The study recruited Nissan Leaf and Chevy Volt owners and randomly assigned one of the three experimental rates. Each customer participating in the study received an EVSE (charger) with a timer which was funded by the DOE and CEC. This technology enables customers to plug in the PEV at their convenience but utilize the timer to schedule the majority of their charging during the super-off peak time period. Most of the charging was conducted this way and therefore there is little variation in consumption patterns and charging behaviors. The average monthly consumption was between 200 and 250 kWh with approximately 78% of the consumption occurring during the super off-peak time period.

SDG&E Table 3: NEM and DR Program Enrollment for Separate-Meter Rates

Month	Total Customers on Separate-Metering	Total Customers on NEM	NEM as a % of Separate-Metering	Total Customers on DR	DR as a % of Separate-Metering
Sep 13	423	119	28.13%	35	8.27%
Oct 13	414	118	28.50%	34	8.21%
Nov 13	414	119	28.74%	34	8.21%
Dec 13	407	116	28.50%	34	8.35%
Jan 14	407	119	29.24%	35	8.60%
Feb 14	406	121	29.80%	35	8.62%
Mar 14	402	120	29.85%	33	8.21%
Apr 14	397	122	30.73%	31	7.81%
May 14	394	125	31.73%	61	15.48%
Jun 14	391	126	32.23%	60	15.35%
Jul 14	381	122	32.02%	57	14.96%
Aug 14	368	115	31.25%	59	16.03%

SDG&E Chart 1: Number of PEV Customers over Time by Meter Configuration



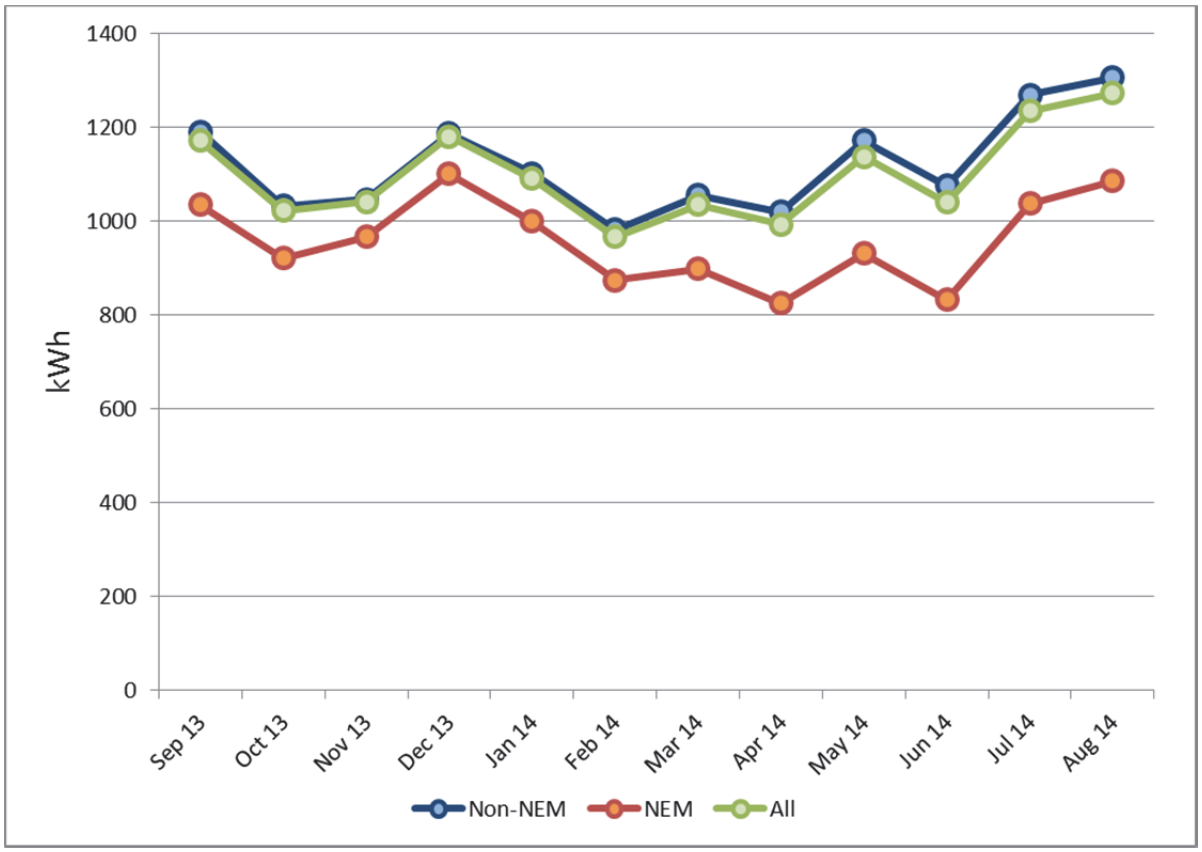
Looking at Table 3 and Chart 1, we can see that the number of customers taking service under these separate-metered rates have remained relatively constant over the past 12 months. The disparity in growth rates between single- and separate-meter customers can be attributed to three factors: (1) only customers who purchased Nissan Leafs or Chevy Volts were eligible for the EPEV rates, (2) the EPEV rates were originally scheduled to close at the end of 2013, and (3) the EPEV rates were closed to new customers in the 2nd quarter of 2013.

NEM penetration is higher in the separately-metered rates compared to single-meter customers. Roughly 30% of separate-meter EV customers had solar generation on their house meter compared to

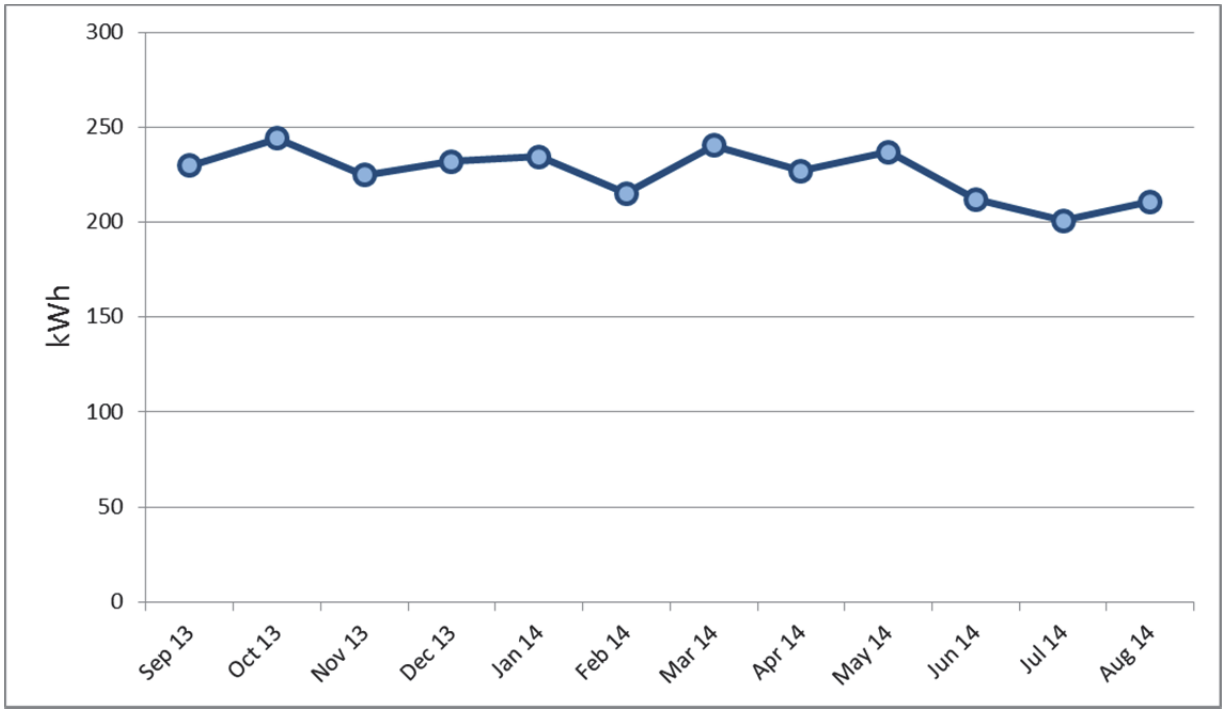
18% for single-meter customers. From September through April, DR enrollment was approximately 8% and then jumped to 15% in May coinciding with increased recruitment efforts.

The average monthly usage follows similar seasonal patterns when comparing NEM and non-NEM single-meter PEV customers. Assuming the car load is approximately 220-260 kWh, the household load for customers on EVTOU-2 is a little less than double the average residential customer load of 485 kWh per month. For comparison purposes, Chart 4 is included in Chart 5.

SDG&E Chart 3: Average Monthly Usage for Single-Meter Customers



SDG&E Chart 5: Average Monthly Usage for Separate-Meter Customers



Time of Use Analysis of Single- and Separate-Meter Customers

SDG&E Table 6: Percentage of On-Peak Usage by Meter Configuration

Year	Month	Single-Metering Non-NEM	Single-Metering NEM	Single-Metering	Separate-Metering
2013	9	23.08%	11.19%	21.36%	10.55%
2013	10	19.62%	8.56%	18.02%	10.06%
2013	11	19.09%	13.63%	18.27%	9.18%
2013	12	20.44%	15.20%	19.61%	10.15%
2014	1	19.17%	12.31%	18.08%	9.83%
2014	2	19.18%	10.41%	17.82%	10.14%
2014	3	19.94%	6.87%	17.98%	10.41%
2014	4	20.37%	5.18%	18.19%	10.25%
2014	5	22.15%	7.98%	20.15%	10.97%
2014	6	22.10%	6.25%	19.86%	10.63%
2014	7	23.09%	9.79%	21.09%	8.70%
2014	8	24.04%	10.58%	21.96%	8.71%

One of the questions attempted to be answered by the PEV Pricing Experiment relate to whether the EV rates act as effective signal to deter on-peak charging. The load shapes provided in Charts 7 and 8 suggest that customers respond to differences in prices and charge their vehicles when electricity is the cheapest. Tables 6, 7, and 8 below provide the percentage share of monthly kWh for single- and separate-meter rates. Single-Meter customers as a class consume about 50% of their energy during the off-peak TOU period and split the rest evenly between on-peak and super-off peak at 25% each; however, single-meter customers with NEM consume between 5% and 15% of their monthly energy

during the on-peak TOU period reflecting usage that is offset by generation. Separate-Meter customers respond well to the signal created by the TOU price differential and consume 78% of their energy during the super-off peak TOU period.

SDG&E Table 7: Percentage of Off-Peak Usage by Meter Configuration

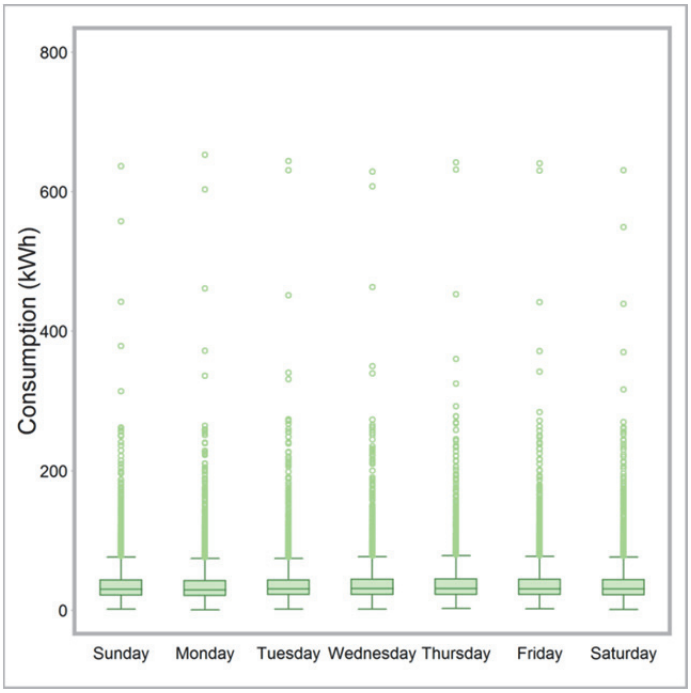
Year	Month	Single-Metering Non-NEM	Single-Metering NEM	Single-Metering	Separate-Metering
2013	9	52.27%	53.03%	52.38%	11.18%
2013	10	53.05%	52.05%	52.90%	11.09%
2013	11	54.92%	50.78%	54.30%	12.03%
2013	12	54.89%	51.97%	54.43%	11.57%
2014	1	54.71%	51.44%	54.19%	11.64%
2014	2	54.26%	51.66%	53.86%	11.46%
2014	3	53.17%	53.41%	53.20%	12.13%
2014	4	52.61%	52.88%	52.65%	11.57%
2014	5	52.28%	52.60%	52.32%	11.79%
2014	6	51.52%	52.07%	51.60%	11.67%
2014	7	52.19%	53.59%	52.40%	10.92%
2014	8	51.32%	52.35%	51.48%	10.42%

SDG&E Table 8: Percentage of Super Off-Peak Usage by Meter Configuration

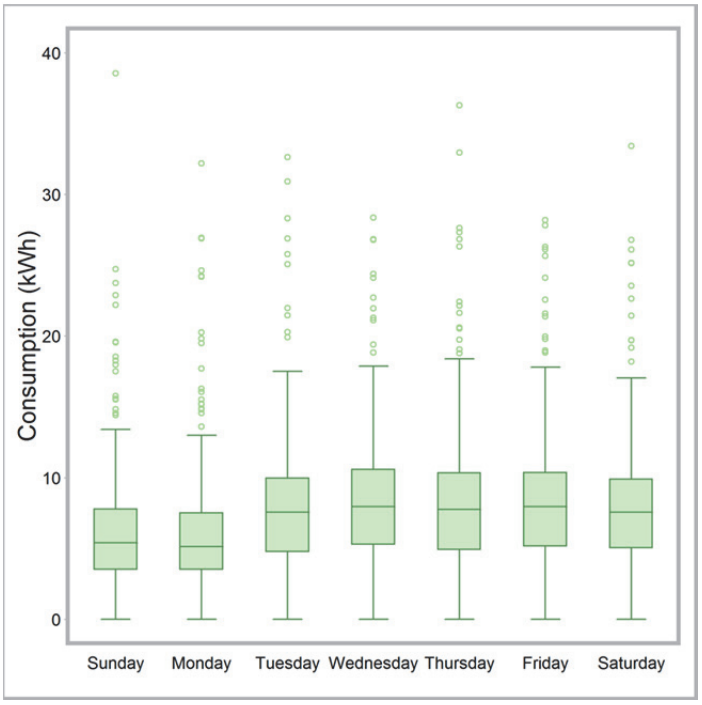
Year	Month	Single-Metering Non-NEM	Single-Metering NEM	Single-Metering	Separate-Metering
2013	9	24.66%	35.78%	26.26%	78.27%
2013	10	27.33%	39.39%	29.08%	78.85%
2013	11	25.99%	35.59%	27.44%	78.79%
2013	12	24.67%	32.83%	25.96%	78.28%
2014	1	26.12%	36.25%	27.74%	78.53%
2014	2	26.56%	37.94%	28.33%	78.40%
2014	3	26.89%	39.72%	28.82%	77.45%
2014	4	27.02%	41.94%	29.16%	78.18%
2014	5	25.57%	39.43%	27.53%	77.24%
2014	6	26.37%	41.68%	28.54%	77.69%
2014	7	24.72%	36.63%	26.51%	80.38%
2014	8	24.64%	37.07%	26.57%	80.88%

The box and whisker plots in Charts 6a and 6b show the distribution of customers' average daily usage by day of the week. As you can see, there is a lot of variation in the single-meter rate but not in the separate-meter rates. We would expect this since there are fewer factors that can affect consumption on a meter solely designated for PEV charging compared to consumption for a whole house. It is clear to see in Chart 6b, that Sunday and Monday have lower kWh on average than the rest of the week. We further explore this finding in the load profiles for each meter type in Chart 7 and 8 below.

SDG&E Chart 6a: Box & Whisker Plot for Single-Meter Energy Consumption by Day of the Week



SDG&E Chart 6b: Box & Whisker Plot for Separate-Meter Energy Consumption by Day of the Week



Average Load Profiles

Chart 7 looks at the average load profile for each day of the week for single-meter PEV customers. The load shapes remain relatively flat during the day with an increase in evening consumption. This behavior is similar to a typical residential load profile except that we see a large spike in the early morning (super off-peak) hours. This is the effect of customers taking advantage of the super off-peak

pricing to charge their vehicles. You'll notice that Sundays and Mondays exhibit similar charging patterns. Since customers change their behavior to take advantage of super off-peak pricing, charging occurs in the early morning on the day after the vehicle was used (presumable driving to work Monday – Friday). If the electric vehicle sits idle during the weekend (Saturday and Sunday) significant charging is not conducted on Sunday and Monday.

SDG&E Chart 7: Average Load Profile for Single-Meter Customers by Day of the Week

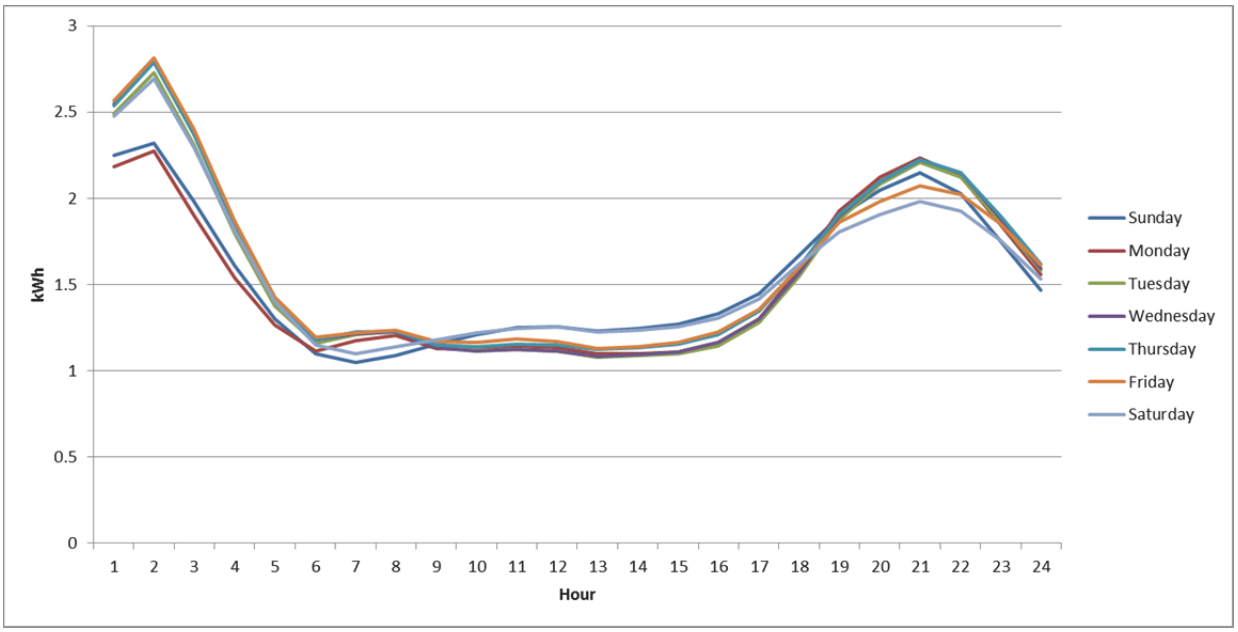
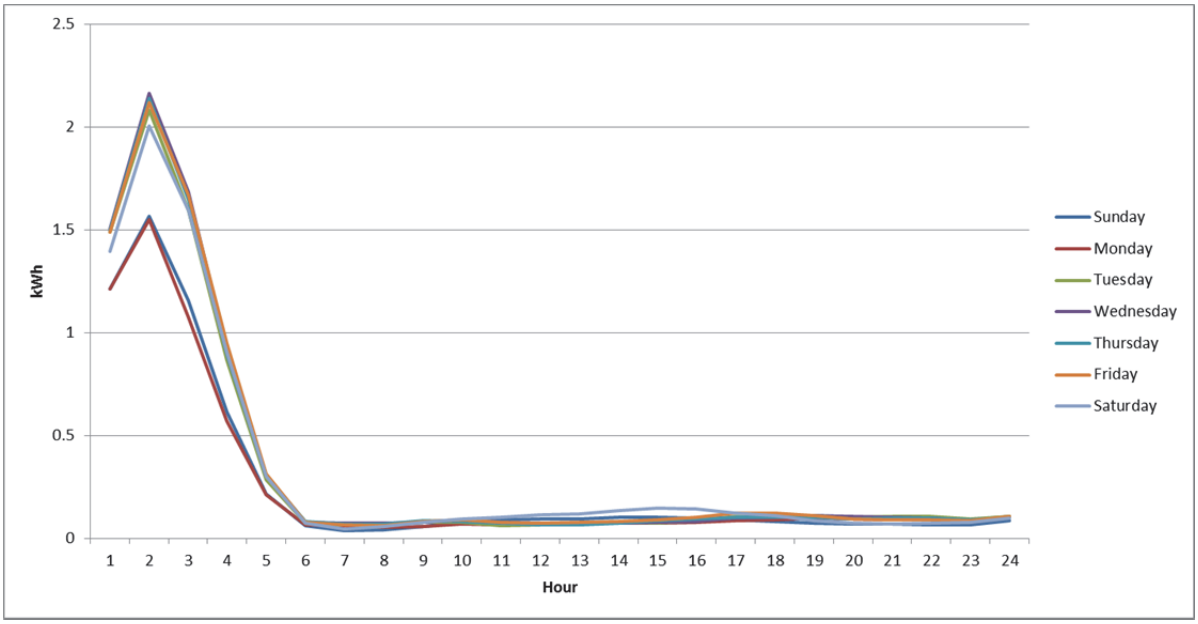


Chart 8 takes the same approach except for separate-meter PEV customers. These accounts peak in the 01:00 – 02:00 hours and have virtually zero consumption during the rest of the day. This would indicate that the rates and enabling technology are extremely successful in encouraging charging during super off-peak hours. This chart also shows that consumption on Sundays and Mondays is substantially lower than the rest of the week. Again, Sunday and Monday exhibit similar charging patterns that are consistent with the single-meter customers.

SDG&E Chart 8: Average Load Profile for Separate-Meter Customers by Day of the Week



SDG&E Chart 9: Average Load Profile for PEV Owners on a Non-PEV Rate by Day of the Week

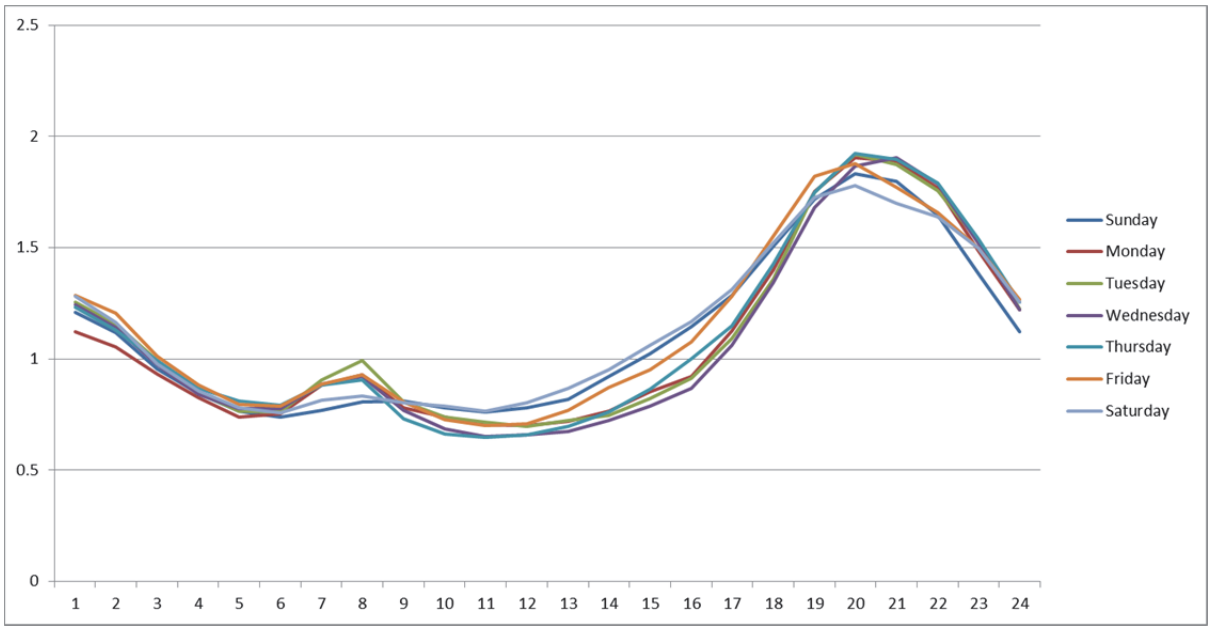


Chart 9 shows the same daily load profiles for customers who we believe to own a PEV, but are not currently taking service under one of the aforementioned PEV rates. We do not have a way to verify whether or not these customers actually own a PEV, but SDG&E has developed an algorithm to attempt to identify PEV owners. Since we cannot definitively say that all of these customers own a PEV, we should use caution when making inferences about the data presented in Chart 9.

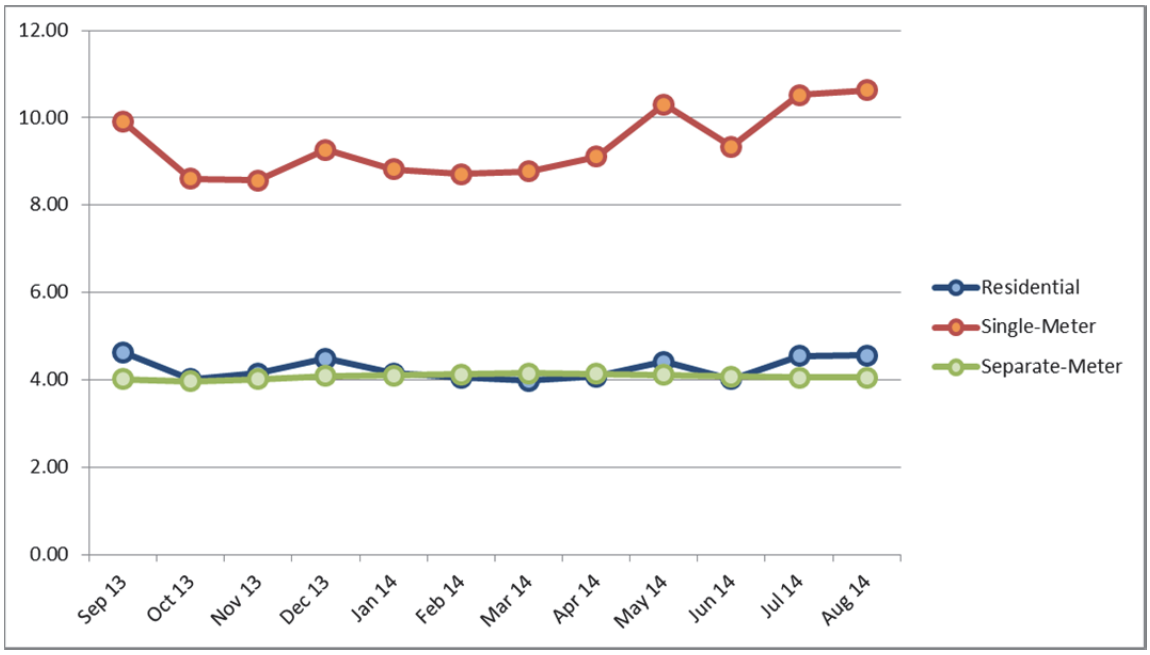
Average Non-Coincident Peak Load

Table 9 shows that the average non-coincident peak load for separate-meter customers is nearly constant at 4.10 kW as this is roughly the max setting on the Leaf EVSEs. Single-Meter customers have a non-coincident demand more than twice that of the average residential customer.

SDG&E Table 9: Monthly Average Non-Coincident Peak Load (kW)

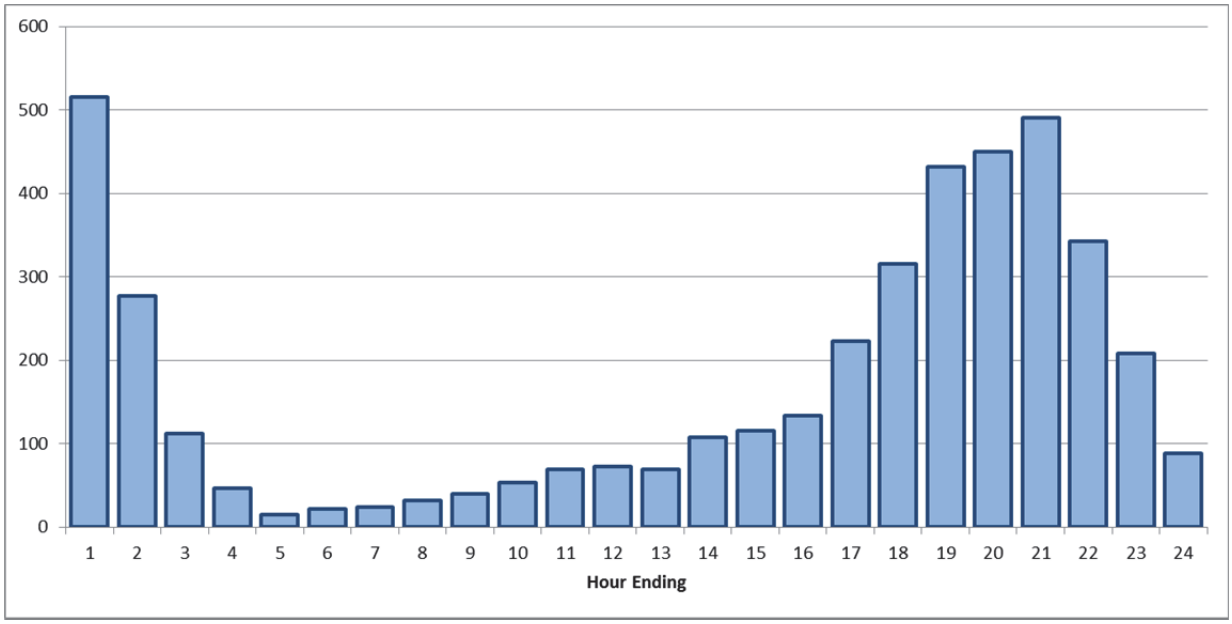
Month	Residential Pop.	Single-Meter	Separate-Meter
Sep 13	4.63	9.92	4.01
Oct 13	4.02	8.60	3.97
Nov 13	4.15	8.57	4.02
Dec 13	4.49	9.26	4.09
Jan 14	4.15	8.82	4.10
Feb 14	4.05	8.71	4.13
Mar 14	3.98	8.77	4.14
Apr 14	4.08	9.11	4.14
May 14	4.42	10.31	4.11
Jun 14	4.02	9.34	4.08
Jul 14	4.55	10.52	4.06
Aug 14	4.55	10.63	4.05

SDG&E Chart 10: Average Non-Coincident Peak Load (kW) by Customer Type and Month



The histogram in Chart 11 provides a distribution of the hours in which single-meter customers' non-coincident peak demand occurs. As you can see, the majority of peaks for single-meter customers occur in the super off-peak TOU period, but 33% of the peaks still occur between 19:00 and 21:00.

SDG&E Chart 11: Hourly Occurrence of Non-Coincident Peak Load for Single-Meter Customers



Time and Average Diversified Peak Load

SDG&E Table 10: Time and Associated Demand of Diversified Peak Load

Month	Resdiential		Single-Meter		Separate-Meter	
	Time	kW	Time	kW	Time	kW
Sep 13	4:00 PM	1.50	1:15 AM	3.63	1:30 AM	2.47
Oct 13	7:30 PM	1.05	1:30 AM	3.00	1:30 AM	2.43
Nov 13	6:15 PM	0.98	1:30 AM	3.02	1:30 AM	2.47
Dec 13	7:15 PM	1.28	1:30 AM	3.29	1:45 AM	2.53
Jan 14	6:30 PM	1.04	1:15 AM	3.06	1:30 AM	2.51
Feb 14	6:45 PM	1.03	1:15 AM	3.11	1:30 AM	2.50
Mar 14	7:00 PM	0.98	1:30 AM	3.12	1:45 AM	2.45
Apr 14	8:30 PM	1.05	1:30 AM	3.17	1:45 AM	2.51
May 14	6:15 PM	1.36	8:45 PM	3.69	1:30 AM	2.35
Jun 14	8:45 PM	0.92	1:30 AM	3.22	1:30 AM	2.26
Jul 14	6:15 PM	1.27	1:30 AM	3.62	1:30 AM	2.32
Aug 14	5:54 PM	1.27	1:30 AM	3.72	1:30 AM	2.33

With the exception of single-meter customers in May, both single-meter and separate-meter customers peak as a class around 01:15 and 01:45 driven by PEV charging behavior. The residential class peaks in the early evening hours.

Table Accompanying Chart 11

Hour	Count	%
1	515	12%
2	277	7%
3	112	3%
4	47	1%
5	15	0%
6	22	1%
7	24	1%
8	32	1%
9	40	1%
10	53	1%
11	69	2%
12	73	2%
13	69	2%
14	108	3%
15	116	3%
16	134	3%
17	223	5%
18	316	7%
19	432	10%
20	450	11%
21	491	12%
22	343	8%
23	208	5%
24	88	2%

Average Load Coincident with System Peak

SDG&E Table 11: Average Load Coincident with System Peak

Month	Residential	Single-Meter	Separate-Meter
Sep 13	1.47	2.82	0.16
Oct 13	0.82	1.76	0.12
Nov 13	0.89	1.89	0.07
Dec 13	1.22	2.54	0.08
Jan 14	0.89	2.03	0.08
Feb 14	1.01	2.37	0.18
Mar 14	0.93	2.22	0.12
Apr 14	0.93	1.97	0.12
May 14	1.31	2.87	0.10
Jun 14	0.75	1.41	0.10
Jul 14	1.20	2.31	0.07
Aug 14	1.16	2.16	0.05

Separate-Meter customers have extremely low demand coincident with system peak because this is when their cost per kWh is the highest. Single-Meter customers on the other hand more than double the coincident demand of the average residential customers.

Geographic Concentration of PEV Owners

SDG&E Table 12a: Geographic Concentration of PEVs (Top 5 Zip Codes by Meter Configuration)

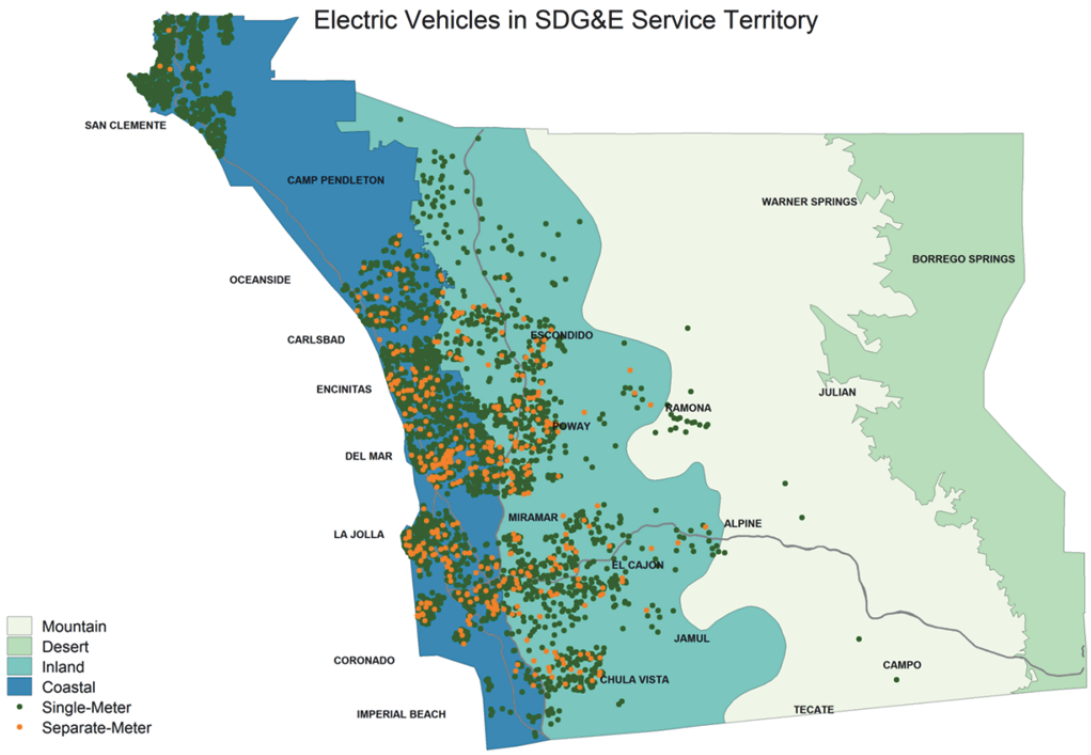
Rate	Zip Code	Area	Number of Customers	Percent of Total
Single-Meter	92130	Carmel Valley	232	5%
	92037	La Jolla	208	5%
	92024	Encinitas	177	4%
	92067	Rancho Santa Fe	176	4%
	92127	Rancho Bernardo	163	4%
Separate-Meter	92130	Carmel Valley	40	9%
	92024	Encinitas	27	6%
	92129	Rancho Penasquitos	23	5%
	92037	La Jolla	18	4%
	92127	Rancho Bernardo	16	3%

SDG&E Table 12b: Geographic Concentration of PEVs by Climate Zone and Meter Configuration

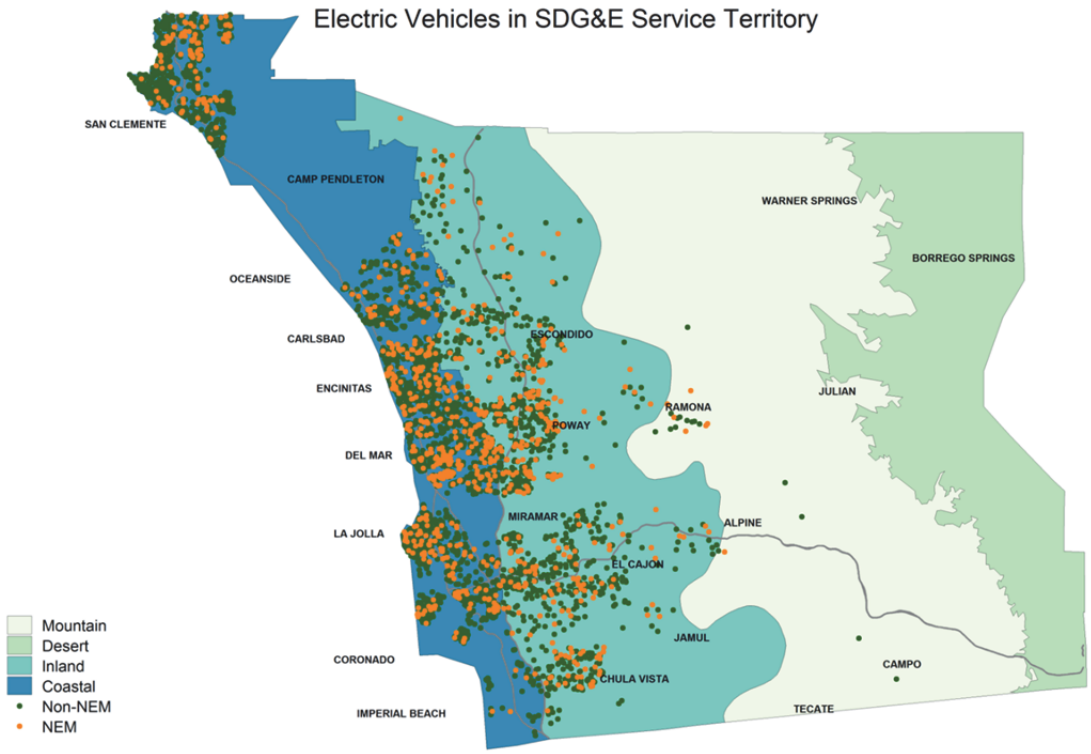
Climate Zone	Single-Meter	Separate-Meter	Total	Percent of Total
Coastal	3,023	276	3,299	70%
Mountain/Desert	22		22	0%
Inland	1,222	187	1,409	30%

70% of PEV owners are located in the coastal climate zone with the remaining 30% located in the inland zone. The results presented in Table 12a, Chart 12a, and Chart 12b show that PEV ownership is heavily concentrated in more affluent areas in the service territory (La Jolla, Rancho Santa Fe, etc.)

SDG&E Figure 1: Geographic Concentration of PEVs by Meter Configuration



SDG&E Figure 2: Geographic Concentration of PEVs by NEM



Conclusions and Observations

PG&E

- While the data collected are illustrative of the behaviors of early PEV adopters, one cannot conclude that these behavior patterns will hold as PEV technology matures, charging technology and charging behaviors evolve, and PEVs achieve greater market adoption beyond the early adopter phase. Consequently, data that is sufficiently reliable for policymaking can only be obtained via an appropriately funded and carefully designed study that controls for the above issues.
- There is evidence that, amongst this group of early adopters and for this current composition of vehicles, customers on TOU PEV rates are charging during off-peak periods: all EV-A customers use a lower percentage of energy in the on-peak period and a higher percentage in the off-peak period as compared to the residential population; non-NEM EV-B customers do 79% of their PEV charging in the off-peak period and just 4% in the on-peak period; and the diversified peak for customers on EV-A or EV-B occurs between 12am – 2am.
- On average, the PEV early adopters have a higher maximum demand that must be accommodated by the electric distribution system as compared to the average household without a PEV.
- Although the early adopter PEV customers may have a higher average maximum demand, those customers on the PEV rates tend to hit their maximum demand while non-PEV customers are at their lowest usage. Thus, there appears to be a diversity benefit created by the TOU rates. However, from the most local service assessment level perspective (i.e. a single household or set of households serviced by a single transformer), the value of this diversity is limited by the fact that the distribution system must still be prepared to accommodate PEV charging during the peak period since these customers can, and occasionally do, charge during those times.
- All of the above conclusions are subject to change as the mix of customers and vehicles changes over time. During the study timeframe, the rapidly changing nature of PEV ownership was clearly evident in the changes that occurred in the mix of customers who own PEVs and types of PEVs available. These changes will need to be considered in ratemaking and cost allocation policymaking. Therefore, California will need to continue to be flexible and adaptable with respect to PEV policies.

SCE

- The number of PEV accounts on time-of-use rates has continued to grow at a steady rate. As of the beginning of August 2014 there were 5,116 accounts. An average of 196 accounts were added each month from September 2013 to August 2014. In the prior twelve months an average of 134 accounts were added per month.
- On average, as the number of residential PEV owners who are on a TOU rate continues to grow they continue to charge predominantly during the off-peak period.
- The most marked change in behavior occurred in the separately metered group of PEV owners. Monthly usage was generally higher, maintaining about 350 kWh/month for the entire period of this current report. In the previous report this group had maintained approximately 260 kWh/month for the first six months before jumping to 300 kWh/month.
- Non-coincident peak demand for the separately metered PEVs also increased from the prior reported year. From September 2013 to August 2014 non-coincident peak demand was

between 6.79 and 7.51 kW whereas the preceding year saw non-coincident peak demand range from 4.63 to 6.58 kW. Fifty-eight percent of the annual non-coincident peak demands during the current reporting period occurred in the six hours from 10 p.m. to 4a.m.

- Charging continues to appear concentrated in the off-peak TOU period for single-metered PEV customers. The percent of overall household load for the single family non-NEM accounts increased marginally 1 to 4% for each month. For the separately metered PEVs, off-peak charging increased a few percent of the total charging so that just under 90% occurs between 9 p.m. and noon.
- The single meter time-of-use rate represents about 90% of our TOU accounts with a known PEV. As a result of D.11-07-029 requiring updates to PEV rates, SCE proposed to close the TOU-D-TEV time-of-use rate and replace it with two options of a TOU-D time-of-use rate, which is designed to further accommodate PEV charging and will not be limited to customers with PEVs. SCE does not expect to know about every PEV customer that will enroll on one of the new TOU options.
- The statistics and metrics found in this report are based on a relatively small population of early adopters in a very dynamic environment. As fuel and materials costs fluctuate, vehicle options expand, and technology continues to adapt to customer needs, the observed behavior is expected to change. If the population of PEV owners continues to grow, the future population may have different characteristics than the current group. Therefore, it may be difficult to assess continuing longer term trends.

SDG&E

- Current Time-of-use (TOU) rates coupled with charging timers result in super off-peak PEV charging.
- Customers with PEVs that stay on SDG&E's typical residential non-TOU rate tend to show less usage during the super off peak period and increased usage during the afternoon-evening hours relative to those on PEV rates.
- Net-Energy-Metering (NEM) customers with PEVs respond to TOU rates.
- Demand and usage levels for these early PEV adopters are nearly double that of the average residential customer.
- Peak times for PEV Demands are typically in the early morning hours compared to evenings for typical residential customers.
- Sundays & Mondays have the lowest daily kWh consumed, for PEV customers on TOU rates.
- EV-TOU-2 (SDG&E's whole-house TOU rate) customer growth has increased 149% from September 2013 to August 2014, which may cause instability in current Load Research results.

Next Steps

The IOUs will file one more load research report in December 2015, as ordered in the Extension Decision.

A Proposed Decision adopting a settlement in A.13-12-015, SCE's 2013 Rate Design Window, was issued on December 5, 2014. Assuming the PD is approved, SCE will implement its new TOU rates in Q1 of 2015 and anticipates closing the TOU-D-TEV, whole house PEV option, in early 2015 once all customers on TOU-D-TEV are migrated. As the TOU-D rate will be open to all residential customers, SCE will attempt to track customers with PEVs enrolling on this rate at the time of enrollment. In subsequent PEV load research reports, SCE will use the data from the customers transitioned from the TEV rate and customers identified as PEV owners to produce its findings.

In November 2013, the Commission opened a new Rulemaking (New AFV OIR), R.13-11-007, to consider Alternative-Fueled Vehicle Programs, Tariffs, and Policies. The new AFV OIR contemplates a track to address AFV rate design policy.

On January 31, 2014, SDG&E filed its 2015 Rate Design Window Application,[53] which includes testimony in compliance with the Phase 2 Decision.[54]

[53] See A.14-01-027.

[54] Ordering paragraph 3 of D.11-07-029 required EV rate analysis in SDG&E's next Rate Design Window application.

Appendix A: Additional Rates for the TOU-D-TEV tariff offered by Southern California Edison from September 2013 to August 2014

Table A – 1a: Single Meter (TOU-D-TEV) Tariff ($/kWh) – Effective 10/1/2013

Clock Hour Ending	Winter				Summer			
	Weekday		Weekend		Weekday		Weekend	
	Level I	Level II	Level I	Level II	Level I	Level II	Level I	Level II
1	0.10	0.10	0.10	0.10	0.09	0.09	0.09	0.09
2	0.10	0.10	0.10	0.10	0.09	0.09	0.09	0.09
3	0.10	0.10	0.10	0.10	0.09	0.09	0.09	0.09
4	0.10	0.10	0.10	0.10	0.09	0.09	0.09	0.09
5	0.10	0.10	0.10	0.10	0.09	0.09	0.09	0.09
6	0.10	0.10	0.10	0.10	0.09	0.09	0.09	0.09
7	0.11	0.29	0.11	0.29	0.12	0.31	0.12	0.31
8	0.11	0.29	0.11	0.29	0.12	0.31	0.12	0.31
9	0.11	0.29	0.11	0.29	0.12	0.31	0.12	0.31
10	0.11	0.29	0.11	0.29	0.12	0.31	0.12	0.31
11	0.16	0.35	0.11	0.29	0.28	0.47	0.12	0.31
12	0.16	0.35	0.11	0.29	0.28	0.47	0.12	0.31
13	0.16	0.35	0.11	0.29	0.28	0.47	0.12	0.31
14	0.16	0.35	0.11	0.29	0.28	0.47	0.12	0.31
15	0.16	0.35	0.11	0.29	0.28	0.47	0.12	0.31
16	0.16	0.35	0.11	0.29	0.28	0.47	0.12	0.31
17	0.16	0.35	0.11	0.29	0.28	0.47	0.12	0.31
18	0.16	0.35	0.11	0.29	0.28	0.47	0.12	0.31
19	0.11	0.29	0.11	0.29	0.12	0.31	0.12	0.31
20	0.11	0.29	0.11	0.29	0.12	0.31	0.12	0.31
21	0.11	0.29	0.11	0.29	0.12	0.31	0.12	0.31
22	0.11	0.29	0.11	0.29	0.12	0.31	0.12	0.31
23	0.11	0.29	0.11	0.29	0.12	0.31	0.12	0.31
24	0.11	0.29	0.11	0.29	0.12	0.31	0.12	0.31

Table A – 1b: Single Meter (TOU-D-TEV) Tariff ($/kWh) – Effective 11/22/2013

Clock Hour Ending	Winter				Summer			
	Weekday		Weekend		Weekday		Weekend	
	Level I	Level II	Level I	Level II	Level I	Level II	Level I	Level II
1	0.10	0.10	0.10	0.10	0.09	0.09	0.09	0.09
2	0.10	0.10	0.10	0.10	0.09	0.09	0.09	0.09
3	0.10	0.10	0.10	0.10	0.09	0.09	0.09	0.09
4	0.10	0.10	0.10	0.10	0.09	0.09	0.09	0.09
5	0.10	0.10	0.10	0.10	0.09	0.09	0.09	0.09
6	0.10	0.10	0.10	0.10	0.09	0.09	0.09	0.09
7	0.11	0.30	0.11	0.30	0.12	0.32	0.12	0.32
8	0.11	0.30	0.11	0.30	0.12	0.32	0.12	0.32
9	0.11	0.30	0.11	0.30	0.12	0.32	0.12	0.32
10	0.11	0.30	0.11	0.30	0.12	0.32	0.12	0.32
11	0.16	0.36	0.11	0.30	0.28	0.48	0.12	0.32
12	0.16	0.36	0.11	0.30	0.28	0.48	0.12	0.32
13	0.16	0.36	0.11	0.30	0.28	0.48	0.12	0.32
14	0.16	0.36	0.11	0.30	0.28	0.48	0.12	0.32
15	0.16	0.36	0.11	0.30	0.28	0.48	0.12	0.32
16	0.16	0.36	0.11	0.30	0.28	0.48	0.12	0.32
17	0.16	0.36	0.11	0.30	0.28	0.48	0.12	0.32
18	0.16	0.36	0.11	0.30	0.28	0.48	0.12	0.32
19	0.11	0.30	0.11	0.30	0.12	0.32	0.12	0.32
20	0.11	0.30	0.11	0.30	0.12	0.32	0.12	0.32
21	0.11	0.30	0.11	0.30	0.12	0.32	0.12	0.32
22	0.11	0.30	0.11	0.30	0.12	0.32	0.12	0.32
23	0.11	0.30	0.11	0.30	0.12	0.32	0.12	0.32
24	0.11	0.30	0.11	0.30	0.12	0.32	0.12	0.32

Table A – 1c: Single Meter (TOU-D-TEV) Tariff ($/kWh) – Effective 6/1/2014

Clock Hour Ending	Winter				Summer			
	Weekday		Weekend		Weekday		Weekend	
	Level I	Level II	Level I	Level II	Level I	Level II	Level I	Level II
1	0.10	0.08	0.10	0.08	0.09	0.07	0.09	0.07
2	0.10	0.08	0.10	0.08	0.09	0.07	0.09	0.07
3	0.10	0.08	0.10	0.08	0.09	0.07	0.09	0.07
4	0.10	0.08	0.10	0.08	0.09	0.07	0.09	0.07
5	0.10	0.08	0.10	0.08	0.09	0.07	0.09	0.07
6	0.10	0.08	0.10	0.08	0.09	0.07	0.09	0.07
7	0.10	0.31	0.10	0.31	0.12	0.33	0.12	0.33
8	0.10	0.31	0.10	0.31	0.12	0.33	0.12	0.33
9	0.10	0.31	0.10	0.31	0.12	0.33	0.12	0.33
10	0.10	0.31	0.10	0.31	0.12	0.33	0.12	0.33
11	0.18	0.39	0.10	0.31	0.30	0.51	0.12	0.33
12	0.18	0.39	0.10	0.31	0.30	0.51	0.12	0.33
13	0.18	0.39	0.10	0.31	0.30	0.51	0.12	0.33
14	0.18	0.39	0.10	0.31	0.30	0.51	0.12	0.33
15	0.18	0.39	0.10	0.31	0.30	0.51	0.12	0.33
16	0.18	0.39	0.10	0.31	0.30	0.51	0.12	0.33
17	0.18	0.39	0.10	0.31	0.30	0.51	0.12	0.33
18	0.18	0.39	0.10	0.31	0.30	0.51	0.12	0.33
19	0.10	0.31	0.10	0.31	0.12	0.33	0.12	0.33
20	0.10	0.31	0.10	0.31	0.12	0.33	0.12	0.33
21	0.10	0.31	0.10	0.31	0.12	0.33	0.12	0.33
22	0.10	0.31	0.10	0.31	0.12	0.33	0.12	0.33
23	0.10	0.31	0.10	0.31	0.12	0.33	0.12	0.33
24	0.10	0.31	0.10	0.31	0.12	0.33	0.12	0.33

Table A – 1d: Single Meter (TOU-D-TEV) Tariff ($/kWh) – Effective 8/11/2014

Clock Hour Ending	Winter				Summer			
	Weekday		Weekend		Weekday		Weekend	
	Level I	Level II	Level I	Level II	Level I	Level II	Level I	Level II
1	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
2	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
3	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
4	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
5	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
6	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
7	0.13	0.29	0.13	0.29	0.15	0.31	0.15	0.31
8	0.13	0.29	0.13	0.29	0.15	0.31	0.15	0.31
9	0.13	0.29	0.13	0.29	0.15	0.31	0.15	0.31
10	0.13	0.29	0.13	0.29	0.15	0.31	0.15	0.31
11	0.20	0.37	0.13	0.29	0.32	0.49	0.15	0.31
12	0.20	0.37	0.13	0.29	0.32	0.49	0.15	0.31
13	0.20	0.37	0.13	0.29	0.32	0.49	0.15	0.31
14	0.20	0.37	0.13	0.29	0.32	0.49	0.15	0.31
15	0.20	0.37	0.13	0.29	0.32	0.49	0.15	0.31
16	0.20	0.37	0.13	0.29	0.32	0.49	0.15	0.31
17	0.20	0.37	0.13	0.29	0.32	0.49	0.15	0.31
18	0.20	0.37	0.13	0.29	0.32	0.49	0.15	0.31
19	0.13	0.29	0.13	0.29	0.15	0.31	0.15	0.31
20	0.13	0.29	0.13	0.29	0.15	0.31	0.15	0.31
21	0.13	0.29	0.13	0.29	0.15	0.31	0.15	0.31
22	0.13	0.29	0.13	0.29	0.15	0.31	0.15	0.31
23	0.13	0.29	0.13	0.29	0.15	0.31	0.15	0.31
24	0.13	0.29	0.13	0.29	0.15	0.31	0.15	0.31

Table B – 1a: Separate Meter (TOU-EV-1) Tariff ($/kWh) – Effective 10/1/2013

Clock Hour Ending	Winter Weekday	Winter Weekend	Summer Weekday	Summer Weekend
1	0.11	0.11	0.11	0.11
2	0.11	0.11	0.11	0.11
3	0.11	0.11	0.11	0.11
4	0.11	0.11	0.11	0.11
5	0.11	0.11	0.11	0.11
6	0.11	0.11	0.11	0.11
7	0.11	0.11	0.11	0.11
8	0.11	0.11	0.11	0.11
9	0.11	0.11	0.11	0.11
10	0.11	0.11	0.11	0.11
11	0.11	0.11	0.11	0.11
12	0.11	0.11	0.11	0.11
13	0.23	0.11	0.33	0.11
14	0.23	0.11	0.33	0.11
15	0.23	0.11	0.33	0.11
16	0.23	0.11	0.33	0.11
17	0.23	0.11	0.33	0.11
18	0.23	0.11	0.33	0.11
19	0.23	0.11	0.33	0.11
20	0.23	0.11	0.33	0.11
21	0.23	0.11	0.33	0.11
22	0.11	0.11	0.11	0.11
23	0.11	0.11	0.11	0.11
24	0.11	0.11	0.11	0.11

Table B – 1b: Separate Meter (TOU-EV-1) Tariff ($/kWh) – Effective 11/22/2013

Clock Hour Ending	Winter Weekday	Winter Weekend	Summer Weekday	Summer Weekend
1	0.11	0.11	0.11	0.11
2	0.11	0.11	0.11	0.11
3	0.11	0.11	0.11	0.11
4	0.11	0.11	0.11	0.11
5	0.11	0.11	0.11	0.11
6	0.11	0.11	0.11	0.11
7	0.11	0.11	0.11	0.11
8	0.11	0.11	0.11	0.11
9	0.11	0.11	0.11	0.11
10	0.11	0.11	0.11	0.11
11	0.11	0.11	0.11	0.11
12	0.11	0.11	0.11	0.11
13	0.24	0.11	0.34	0.11
14	0.24	0.11	0.34	0.11
15	0.24	0.11	0.34	0.11
16	0.24	0.11	0.34	0.11
17	0.24	0.11	0.34	0.11
18	0.24	0.11	0.34	0.11
19	0.24	0.11	0.34	0.11
20	0.24	0.11	0.34	0.11
21	0.24	0.11	0.34	0.11
22	0.11	0.11	0.11	0.11
23	0.11	0.11	0.11	0.11
24	0.11	0.11	0.11	0.11

Table B – 1c: Separate Meter (TOU-EV-1) Tariff ($/kWh) – Effective 6/1/2014

Clock Hour Ending	Winter Weekday	Winter Weekend	Summer Weekday	Summer Weekend
1	0.09	0.09	0.08	0.08
2	0.09	0.09	0.08	0.08
3	0.09	0.09	0.08	0.08
4	0.09	0.09	0.08	0.08
5	0.09	0.09	0.08	0.08
6	0.09	0.09	0.08	0.08
7	0.09	0.09	0.08	0.08
8	0.09	0.09	0.08	0.08
9	0.09	0.09	0.08	0.08
10	0.09	0.09	0.08	0.08
11	0.09	0.09	0.08	0.08
12	0.09	0.09	0.08	0.08
13	0.23	0.09	0.35	0.08
14	0.23	0.09	0.35	0.08
15	0.23	0.09	0.35	0.08
16	0.23	0.09	0.35	0.08
17	0.23	0.09	0.35	0.08
18	0.23	0.09	0.35	0.08
19	0.23	0.09	0.35	0.08
20	0.23	0.09	0.35	0.08
21	0.23	0.09	0.35	0.08
22	0.09	0.09	0.08	0.08
23	0.09	0.09	0.08	0.08
24	0.09	0.09	0.08	0.08

Table B – 1d: Separate Meter (TOU-EV-1) Tariff ($/kWh) – Effective 7/7/2014

Clock Hour Ending	Winter Weekday	Winter Weekend	Summer Weekday	Summer Weekend
1	0.11	0.11	0.11	0.11
2	0.11	0.11	0.11	0.11
3	0.11	0.11	0.11	0.11
4	0.11	0.11	0.11	0.11
5	0.11	0.11	0.11	0.11
6	0.11	0.11	0.11	0.11
7	0.11	0.11	0.11	0.11
8	0.11	0.11	0.11	0.11
9	0.11	0.11	0.11	0.11
10	0.11	0.11	0.11	0.11
11	0.11	0.11	0.11	0.11
12	0.11	0.11	0.11	0.11
13	0.26	0.11	0.37	0.11
14	0.26	0.11	0.37	0.11
15	0.26	0.11	0.37	0.11
16	0.26	0.11	0.37	0.11
17	0.26	0.11	0.37	0.11
18	0.26	0.11	0.37	0.11
19	0.26	0.11	0.37	0.11
20	0.26	0.11	0.37	0.11
21	0.26	0.11	0.37	0.11
22	0.11	0.11	0.11	0.11
23	0.11	0.11	0.11	0.11
24	0.11	0.11	0.11	0.11

Table B – 1e: Separate Meter (TOU-EV-1) Tariff ($/kWh) – Effective 8/11/2014

Clock Hour Ending	Winter Weekday	Winter Weekend	Summer Weekday	Summer Weekend
1	0.11	0.11	0.11	0.11
2	0.11	0.11	0.11	0.11
3	0.11	0.11	0.11	0.11
4	0.11	0.11	0.11	0.11
5	0.11	0.11	0.11	0.11
6	0.11	0.11	0.11	0.11
7	0.11	0.11	0.11	0.11
8	0.11	0.11	0.11	0.11
9	0.11	0.11	0.11	0.11
10	0.11	0.11	0.11	0.11
11	0.11	0.11	0.11	0.11
12	0.11	0.11	0.11	0.11
13	0.25	0.11	0.37	0.11
14	0.25	0.11	0.37	0.11
15	0.25	0.11	0.37	0.11
16	0.25	0.11	0.37	0.11
17	0.25	0.11	0.37	0.11
18	0.25	0.11	0.37	0.11
19	0.25	0.11	0.37	0.11
20	0.25	0.11	0.37	0.11
21	0.25	0.11	0.37	0.11
22	0.11	0.11	0.11	0.11
23	0.11	0.11	0.11	0.11
24	0.11	0.11	0.11	0.11