

2016

Geospatial Analysis of California's Utility Services

Electricity, Gas, Water and Broadband

Using a geographic information systems (GIS) platform, this analysis examines average bill and consumption patterns for electricity, gas and water customers, and broadband availability across California at the ZIP code level. All the data and analyses in this report are also visualized in interactive maps that are accessible online. This resource aims to educate Californians about important energy, water and broadband issues through geospatial analysis.

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I. INTRODUCTION

Big data is an integral part of utility regulation. The complex and large volume of datasets that make up big data can be analyzed to obtain insights that enable organizations like ours to make sound regulatory decisions, thereby increasing operational efficiency and reducing costs and risks.

In 2015, the California Public Utilities Commission (CPUC) started the Utility Service Interactive Map Project, an effort to transform the big utility data we collect in various divisions into a more usable and accessible form. Using a geographic information systems (GIS) platform, the Project shows average bill amounts, average consumption patterns for electricity, gas and water customers, and broadband availability across California at the ZIP code level. Building on the positive feedback received for this initiative, we present in this report an updated analysis and GIS platform based on the 2015 data.

The main goal of this initiative has been to create an interactive platform that transforms the vast amount of raw utility data that the CPUC collects into a more visual, understandable and accessible data presentation. We envision this initiative as a model for how we can develop a GIS-based platform to organize complex big data into a useful tool that not only caters to analysts and decision makers within the CPUC but also to the public in general. With this objective in mind, we designed an interactive and user-friendly platform with simple but informative content.

As part of this initiative, in this report, we examine the utility data in depth. All the information in this report is reflected in interactive maps, but tailored in a way that educates Californians about important energy, water and broadband issues that can be easier to understand with geospatial analysis.

Although this report is not an exhaustive analysis of all regulatory issues, it certainly touches every basic utility topic that ratepayers care about the most. Using data from 2015, this analysis answers the following questions:

- What is the average residential electricity and gas bill by ZIP code?
- Where are the high-consumption areas for electricity, gas and water in the state?
- What is the daily per capita water usage in the state?
- How do income and regional climate affect usage of utility services?
- Where are the low-income customers located within the state?
- Which areas are the most in need of low-income and conservation programs?
- How much do consumers save through energy efficiency programs?

In answering the questions above, we gathered residential data from the following sources:

- Monthly electric and gas bill amounts, usage, data from the California Alternate Rates for Energy (CARE), the Family Electric Rate Assistance (FERA) and the Energy Savings Assistance (ESA) programs – PG&E, SCE, SDG&E and SoCalGas
- Quarterly energy efficiency data – CPUC's Energy Division and California Energy Efficiency Statistics (EESTATS)
- Monthly water consumption and conservation data – State Water Resources Control Board (SWRCB)



- Broadband availability data – CPUC’s Communications Division
- Median income and population data – US Census Bureau
- Climate zone data – California Energy Commission
- GIS layers and shapefiles – ArcGIS (ESRI)

In this update, we have made a number of improvements to our initial analysis: (1) We added an analysis on energy efficiency data at the ZIP code level; (2) We added more water consumption data, which was scarce in the last report due to the fact that CPUC regulates only 113 water utilities or about 20% of California’s water. Broadband, however, is one area that still needs more data as we have data only on the broadband availability and speed.

This analysis is divided into seven sections. The first section introduces the report while the second and third sections analyze the electric and gas bills and consumption patterns. The fourth section presents data on the low-income and energy efficiency programs. The fifth and sixth sections examine the water consumption and broadband availability data, while the last section summarizes our findings.

II. ELECTRICITY

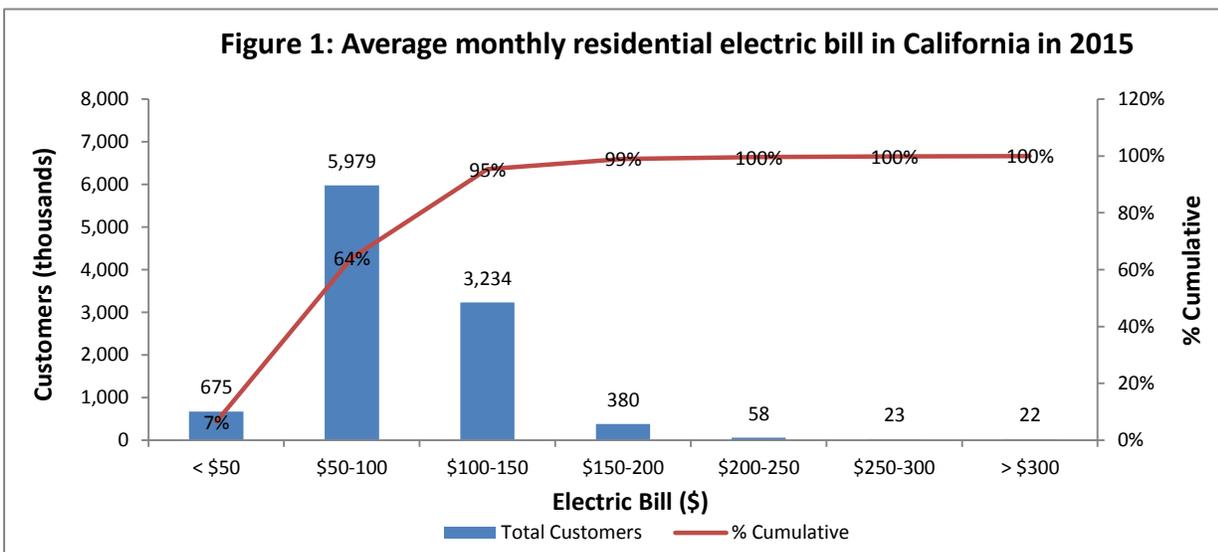
A. Electric Bill

In 2015, there were almost 10.4 million residential electric households in California served by three investor-owned utility (IOU) companies:¹ Pacific Gas and Electric Company (PG&E), Southern California Edison (SCE) and San Diego Gas and Electric (SDG&E). Overall, SCE customers account for 45% of the total in-state electric consumption in 2015, while PG&E and SDG&E customers account for 44% and 11%, respectively. Among the three IOUs, customers of SDG&E registered the highest average electric bill in 2015 at \$98, followed by SCE at \$93, and PG&E at \$91.

Table 1: Average electric bill by IOU

IOU	Number of Residential Households ²	% Total Electric Usage	Average Bill ³ (\$)	ZIP Codes ⁴
PG&E	4,701,199	44%	\$91	969
SCE	4,359,766	45%	\$93	613
SDG&E	1,310,952	11%	\$98	117
Three IOUs	10,371,917	100%	\$93	1699

Due to California’s low electric consumption per capita, the state’s monthly electric bills are among the lowest in the nation. The average monthly electric bill of California households in 2015 is \$93, which is two dollars higher than the average bill in the previous year. The national average is \$114.⁵ The thematic map on the next page illustrates the distribution of average monthly electric bills of residential customers in 1,699 ZIP codes across California. As demonstrated by the light-colored profile with specks of dark blue, electric bills in the state range mostly from low to moderate.



¹ Data provided by the California Energy Commission (CEC) show that publicly owned utilities (POUs) serve 22% or about 3.2 million of the total electric customers in all sectors in California in 2010. http://www.energy.ca.gov/maps/serviceareas/electric_service_areas.html

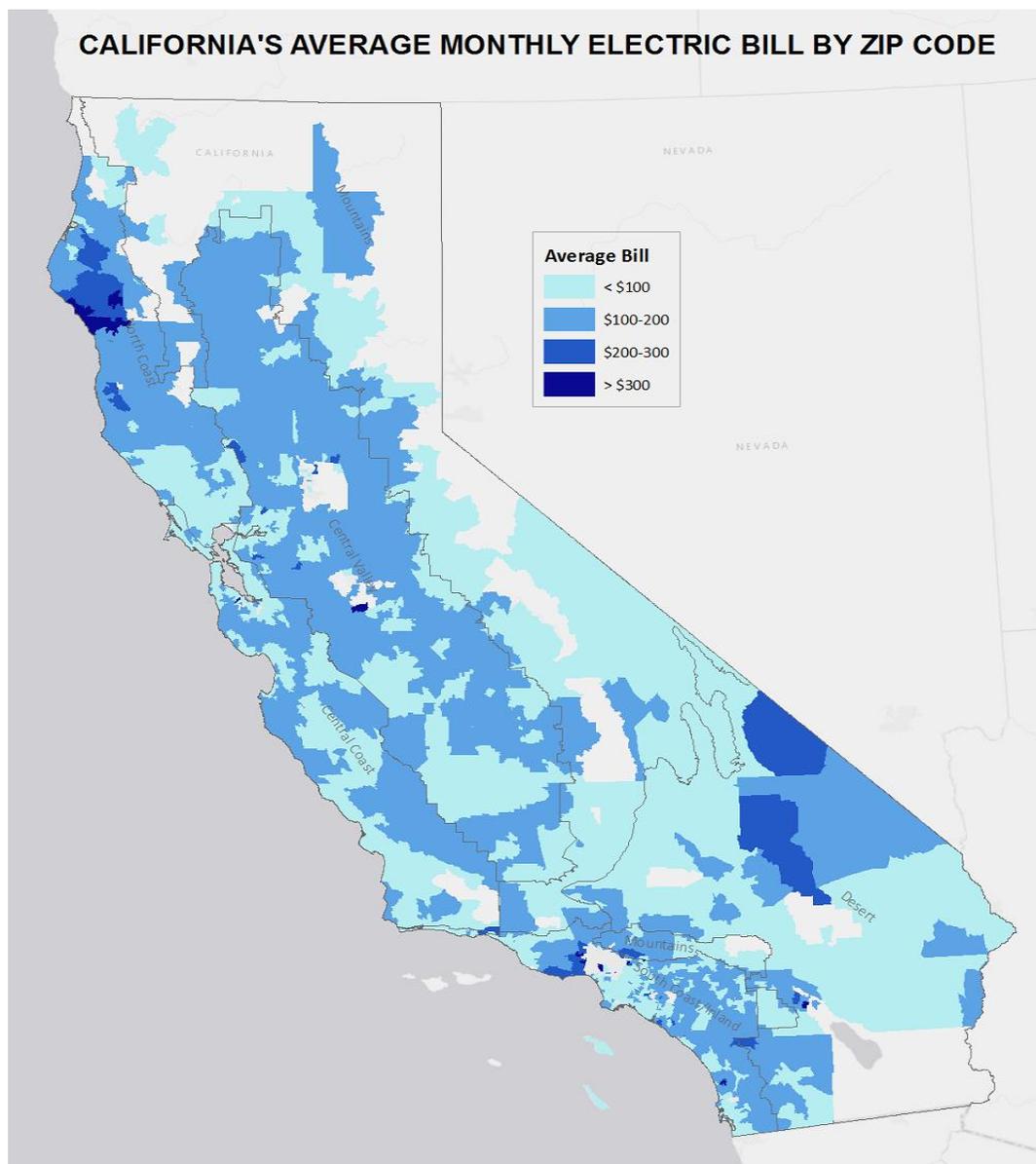
² These figures are based on the data provided by the three IOUs, and include the number of customers served in December 2015.

³ Calculated as (total bill for 12 months / total number of customers). The words “customers” and “households” are used interchangeably in this analysis.

⁴ Only ZIP codes with positive values of consumption are included.

⁵ Energy Information Agency (EIA), 2014 Average Monthly Bill – Residential.

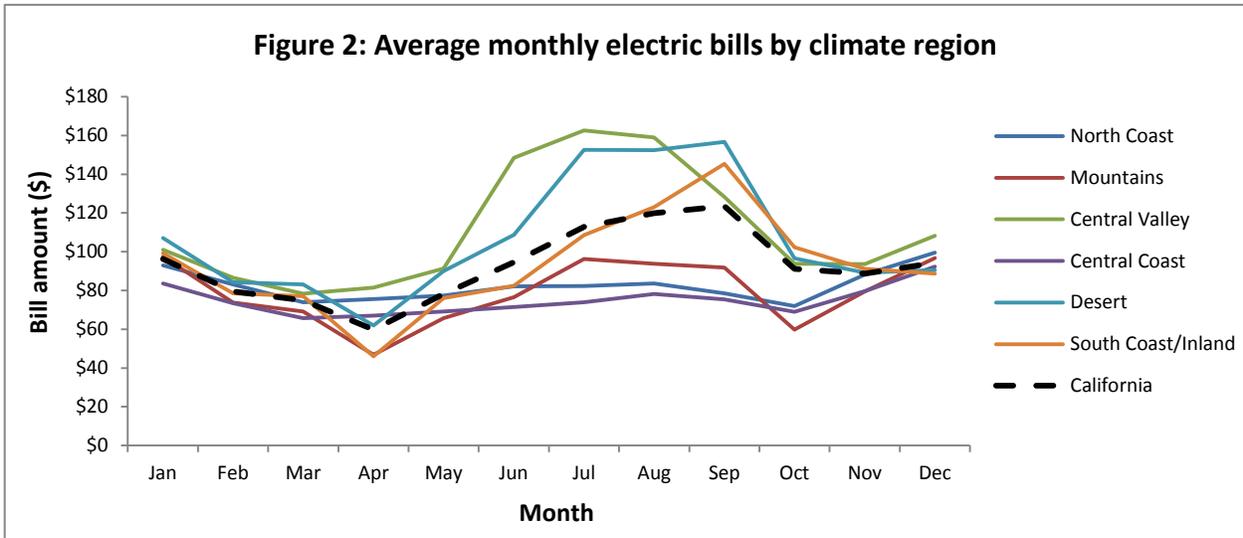
Map 1



Average monthly electric bill

Figure 1 reveals that approximately 95% of the residential electric customers have low to moderate (< \$150) monthly bills in 2015. Around 64% of the customers have monthly bill less than \$100. It is also very interesting to note that low-bill households (< \$50) only represent about 7% of the total residential customers. Similarly, high-bill households (> \$200) are only about 1% of the entire residential customers in the state. The average monthly electric bill varies by season: \$91 in winter, \$78 in spring and \$114 in summer.⁶

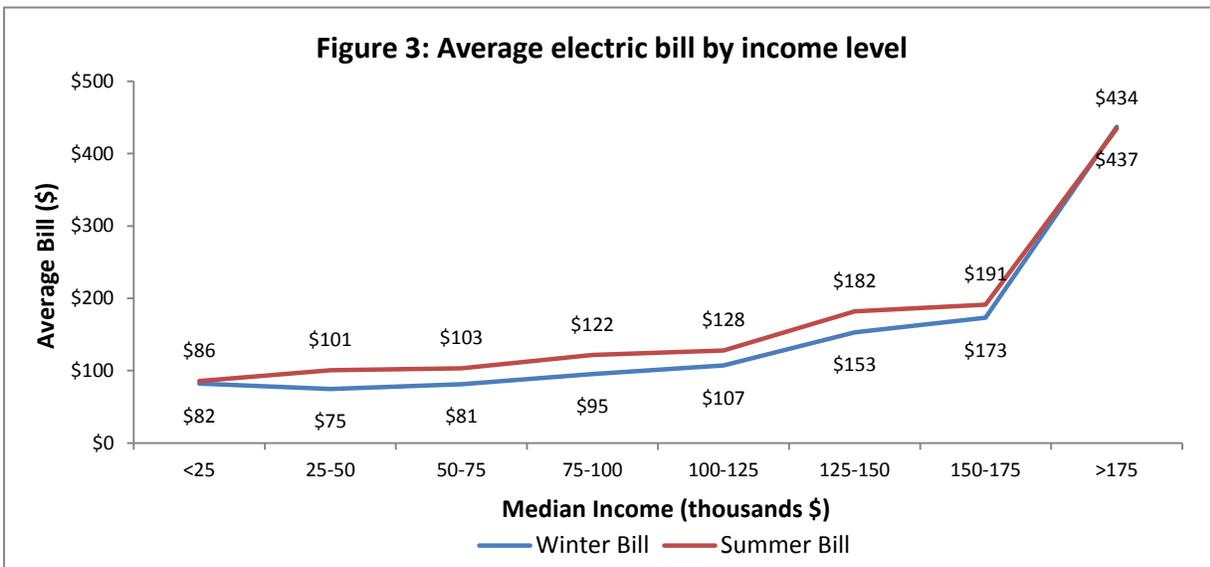
⁶ For the purposes of this analysis, winter months are January, February, November and December. Only the months of January and February are included in the winter bill analysis. Spring months are March, April, May and June. Summer months are July, August, September, and October.



Average electric bills by climate region

Breaking California into distinct climate regions provides more detailed information on how monthly electric bills differ in each part of the state. In this analysis, California is divided into 6 climate regions: North Coast, Mountains, Central Coast, Central Valley, Desert and South Coast/Inland. Figure 2 shows that monthly bill profiles for each of the region are very similar during the winter months (January and February). As the climate becomes warmer, however, the bills increase in 3 regions and remain similar to the winter bills in the other three regions. In the summer months (July to October), the average monthly bills in the North Coast, Mountains and Central Coast—regions with cooler summer temperatures—fall below the overall state monthly averages in 2015.

Average electric bills by income level⁷



⁷ These figures are for ZIP Codes with available median income data only. 272 ZIP codes without income data are excluded.

Grouping electric bills by income levels reveals that the average bill increases as the median income level increases.⁸ For example, ZIP codes that have income levels below \$50,000 but above \$25,000, summer electric bills averaged \$101, while those ZIP codes with income levels between \$100,000-125,000, summer bills averaged \$128. The average summer bill drastically increases for those customers in ZIP codes with income levels \$125,000 and up.

Tables 2 through 5 provide the top 15 ZIP codes with the highest and the lowest average summer and winter electric bills in California. One clear trend in these areas is that many of the very high bills in both summer and winter are also in ZIP codes with high income levels of \$100,000 and over. On the other hand, most of the lowest bills are located in ZIP codes with low income levels of \$50,000 and below.

Table 2: Top ZIP codes with the highest average electric bills (summer)

Rank	ZIP Code	City	IOU	Median Income ⁹	Average Summer Bill
1	92067	Rancho Santa Fe	SDG&E	\$125,051	\$648
2	90210	Beverly Hills	SCE	\$132,254	\$521
3	94027	Atherton	PG&E	\$220,583	\$458
4	92679	Coto de Caza	SDG&E	\$142,803	\$424
5	91008	Duarte	SCE	\$85,556	\$392
6	92210	Indian Wells	SCE	\$84,286	\$387
7	91307	Canoga Park	SCE	\$97,081	\$368
8	91302	Calabasas	SCE	\$129,708	\$360
9	94528	Diablo	PG&E	\$223,893	\$349
10	92861	Villa Park	SCE	\$155,275	\$345
11	95589	Whitehorn	PG&E	\$50,188	\$338
12	95571	Weott	PG&E	\$50,188	\$335
13	94562	Oakville	PG&E	\$76,000	\$325
14	92091	Rancho Santa Fe	SDG&E	\$131,406	\$314
15	90265	Malibu	SCE	\$129,750	\$300

Table 3: Top ZIP codes with the lowest average electric bills (summer)

Rank	ZIP Code	City	IOU	Median Income	Average Summer Bill
1	91948	Mount Laguna	SDG&E	\$45,000	\$17
2	92341	Green Valley Lake	SCE	\$28,500	\$19
3	93208	Camp Nelson	SCE	\$41,000	\$25
4	93629	Huntington Lake	SCE	\$73,100	\$27
5	92092	La Jolla	SDG&E	\$95,000	\$28
6	96061	Mill Creek	PG&E	\$69,688	\$29
7	94804	Richmond	PG&E	\$49,261	\$29
8	95486	Villa Grande	PG&E	\$40,000	\$30
9	94801	Richmond	PG&E	\$40,030	\$30
10	95064	Santa Cruz	PG&E	\$54,669	\$30
11	93260	Posey	SCE	\$25,089	\$30
12	95335	Long Barn	PG&E	\$32,951	\$31
13	94704	Berkeley	PG&E	\$31,116	\$31
14	92317	Blue Jay	SCE	\$56,000	\$31
15	95735	Twin Bridges	PG&E	\$33,750	\$31

⁸ It is important to note that this observation is made from simple descriptive statistical analysis and not from an econometric analysis. Other variables or factors contributing to low or high bills were not controlled for, and statistical significance was not also considered.

⁹ Median income data are estimate for 2015 from the U.S. Census Bureau.

Table 4: Top ZIP codes with the highest average electric bills (winter)

	ZIP Code	City	IOU	Median Income	Average Winter Bill
1	92067	Rancho Santa Fe	SDG&E	\$125,051	\$536
2	94027	Atherton	PG&E	\$220,583	\$476
3	90210	Beverly Hills	SCE	\$132,254	\$404
4	95571	Weott	PG&E	\$50,188	\$400
5	95589	Whitehorn	PG&E	\$50,188	\$398
6	94562	Oakville	PG&E	\$76,000	\$389
7	95553	Miranda	PG&E	\$33,000	\$342
8	94573	Rutherford	PG&E	\$61,103	\$331
9	95511	Alderpoint	PG&E	\$11,955	\$325
10	92210	Palm Desert	SCE	\$84,286	\$304
11	94528	Diablo	PG&E	\$223,893	\$297
12	95549	Kneeland	PG&E	\$52,222	\$293
13	95542	Garberville	PG&E	\$43,021	\$286
14	91008	Duarte	SCE	\$85,556	\$286
15	90265	Malibu	SCE	\$129,750	\$276

Table 5: Top ZIP codes with the lowest average electric bills (winter)

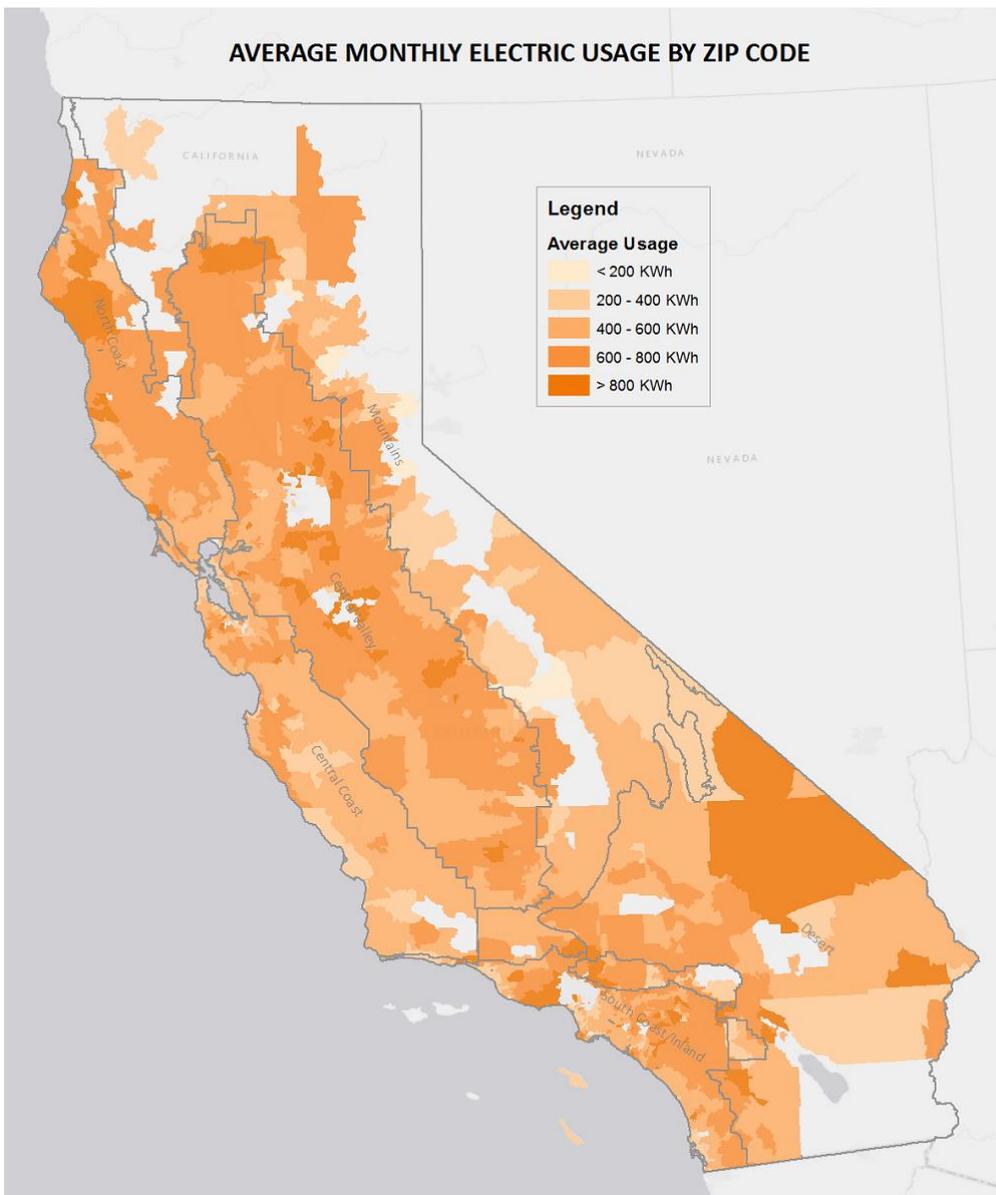
Rank	ZIP Code	City	IOU	Median Income	Average Winter Bill
1	96061	Mill Creek	PG&E	\$69,688	\$24
2	93633	Kings Canyon National Park	PG&E	\$29,000	\$24
3	95735	Twin Bridges	PG&E	\$33,750	\$26
4	93628	Hume	PG&E	\$58,977	\$28
5	95981	Strawberry Valley	PG&E	\$25,000	\$28
6	92092	La Jolla	SDG&E	\$66,000	\$29
7	95721	Echo Lake	PG&E	\$21,200	\$29
8	95720	Kyburz	PG&E	\$55,938	\$30
9	96063	Mineral	PG&E	\$44,375	\$30
10	92267	Parker Dam	SCE	\$35,000	\$32
11	94301	Palo Alto	PG&E	\$122,473	\$32
12	92341	Green Valley Lake	SCE	\$28,500	\$32
13	90038	Los Angeles	SCE	\$35,144	\$33
14	91948	Mount Laguna	SDG&E	\$39,000	\$33
15	95486	Villa Grande	PG&E	\$39,300	\$34



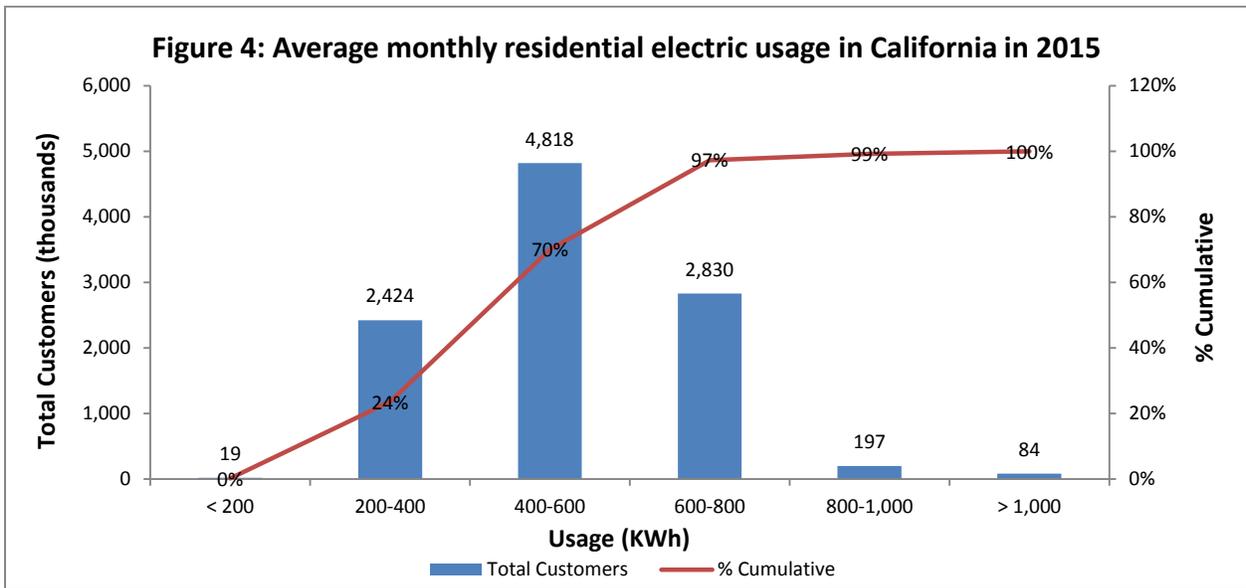
B. Electric Usage

The data at the ZIP code level reveals that California’s average residential electricity usage in 2015 is 519 kilowatt-hour (kWh) per month, which remains among the lowest in the nation. In 2014, California ranked third among the lowest average consumption nationwide at 562 kWh, after Hawaii (506 kWh) and Maine (549 kWh).¹⁰ To provide a perspective, California’s average usage is less than half of the usage observed in the top three states with the highest average consumption: Louisiana (1,291 kWh), Tennessee (1,286 kWh) and Alabama (1,265 kWh). One important factor that contributes to this low consumption is the state’s moderate climate conditions compared to those of other states.

Map 2



¹⁰ Energy Information Agency (EIA), 2014 Average Monthly Bill and Consumption – Residential



As Map 2 shows, California’s electricity consumption remains low to moderate with some areas of high consumption. As shown in Figure 4, approximately 70% of electric customers in the state consume less than 600 KWh per month, while 30% of households consume over 600 KWh on average. Although they only make up less than 1% of the total households, close to 84,000 customers in the state used 1,000 KWh or higher in 2015.

Average electric usage by climate region

As Figure 5 below illustrates, the monthly per kWh usage in the state in 2015 varies significantly by climate region. As the electricity usage amount is proportional to the bill amount, the trend by region closely resembles that of the regional electric bill trend shown in Figure 2 in which average bills fluctuate significantly in the warmer months and remain stable during the cooler months.

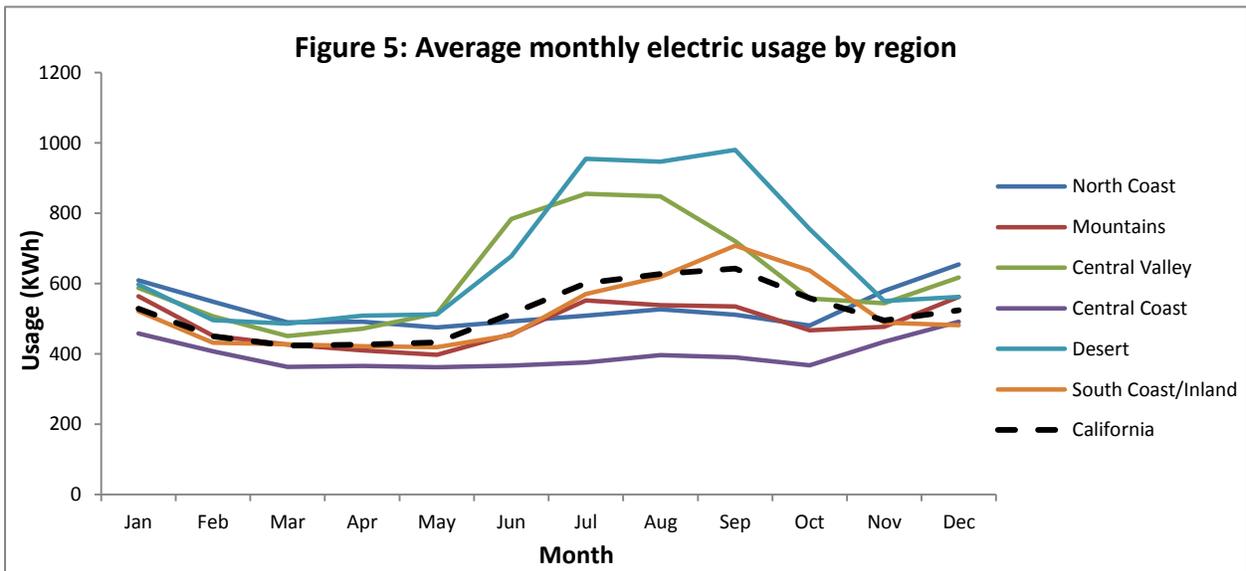


Table 6: Top ZIP codes with the highest average electric usage (summer)

Rank	ZIP Code	City	IOU	Median Income	Average Summer Usage (KWh)
1	92210	Indian Wells	SCE	\$84,286	2,046
2	90210	Beverly Hills	SCE	\$132,254	2,027
3	92067	Rancho Santa Fe	SDG&E	\$125,051	1,867
4	94562	Oakville	PG&E	\$76,000	1,725
5	91008	Duarte	SCE	\$85,556	1,670
6	94027	Atherton	PG&E	\$220,583	1,641
7	91307	Canoga Park	SCE	\$97,081	1,592
8	92270	Rancho Mirage	SCE	\$77,526	1,552
9	92861	Villa Park	SCE	\$155,275	1,533
10	94573	Rutherford	PG&E	\$113,200	1,493
11	91302	Calabasas	SCE	\$129,708	1,476
12	94528	Diablo	PG&E	\$223,900	1,309
13	92504	Riverside	SCE	\$56,108	1,298
14	95589	Whitethorn	PG&E	\$50,188	1,295
15	92679	Coto De Caza	SDG&E	\$142,803	1,284

Table 7: Top ZIP codes with the highest average electric usage (winter)

Rank	ZIP Code	City	IOU	Median Income	Average Winter Usage (KWh)
1	94027	Atherton	PG&E	\$220,583	1,786
2	92067	Rancho Santa Fe	SDG&E	\$125,051	1,778
3	95571	Weott	PG&E	\$50,188	1,656
4	95589	Whitethorn	PG&E	\$50,188	1,580
5	90210	Beverly Hills	SCE	\$132,254	1,560
6	95553	Miranda	PG&E	\$33,000	1,466
7	94562	Oakville	PG&E	\$76,000	1,448
8	95511	Alderpoint	PG&E	\$11,955	1,371
9	94573	Rutherford	PG&E	\$113,200	1,363
10	95549	Kneeland	PG&E	\$52,222	1,362
11	95542	Garberville	PG&E	\$43,021	1,250
12	92210	Palm Desert	SCE	\$84,286	1,229
13	91008	Duarte	SCE	\$85,556	1,200
14	94528	Diablo	PG&E	\$223,900	1,173
15	94957	Ross	PG&E	\$200,000	1,173

III. GAS

A. Gas Bill

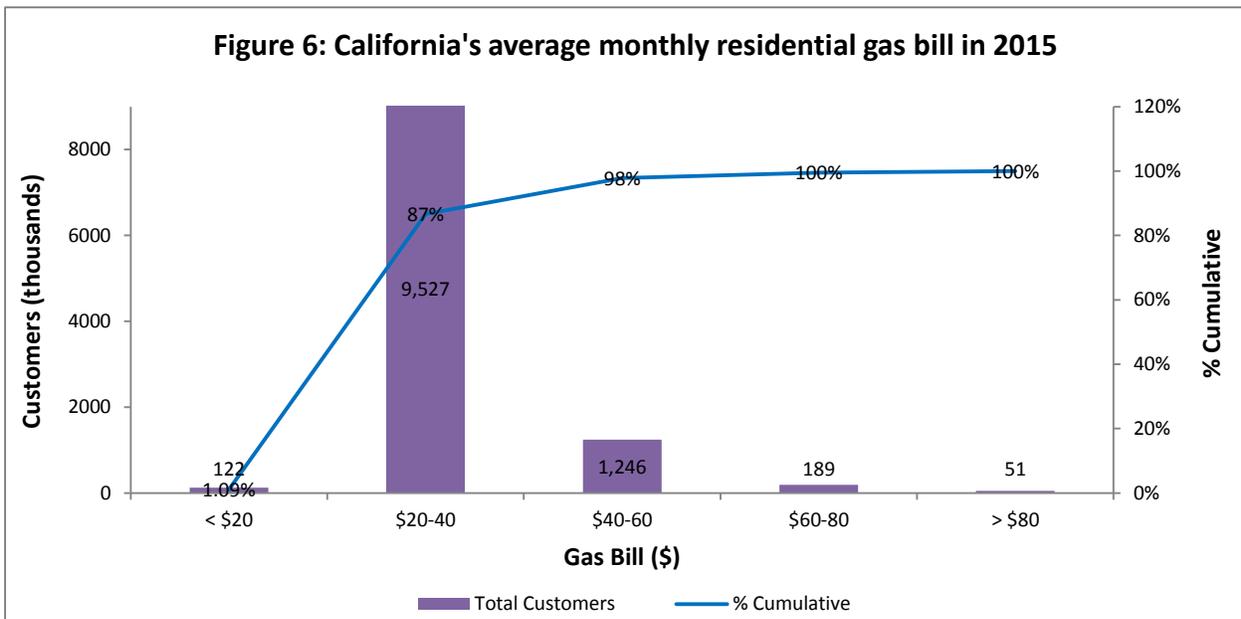
The combined service territories of PG&E, SoCalGas and SDG&E cover approximately 80% of the residential customers in the state. There were over 11.1 million residential gas customers in the state in 2015, with SoCalGas providing service to about 6.1 million or 55% of the total customers, followed by PG&E at 4.1 million or about 38%. In terms of the total gas usage, SoCalGas customers in 660 ZIP codes account for 53% of the total consumption in the state, followed by PG&E and SDG&E with 40% and 7% respectively. PG&E customers registered the highest average monthly gas bill of \$36, followed by SoCalGas at \$32 and SDG&E at \$31.

Table 8: Average gas bill by IOU

IOU	Total Residential Customers	% Total Gas Usage	Average Bill (\$)	ZIP Codes
PG&E	4,180,059	40%	\$36	644
SDG&E	858,806	7%	\$31	86
SoCalGas	6,096,390	53%	\$32	660
Three IOUs	11,135,255	100%	\$34	1390

Average monthly gas bill

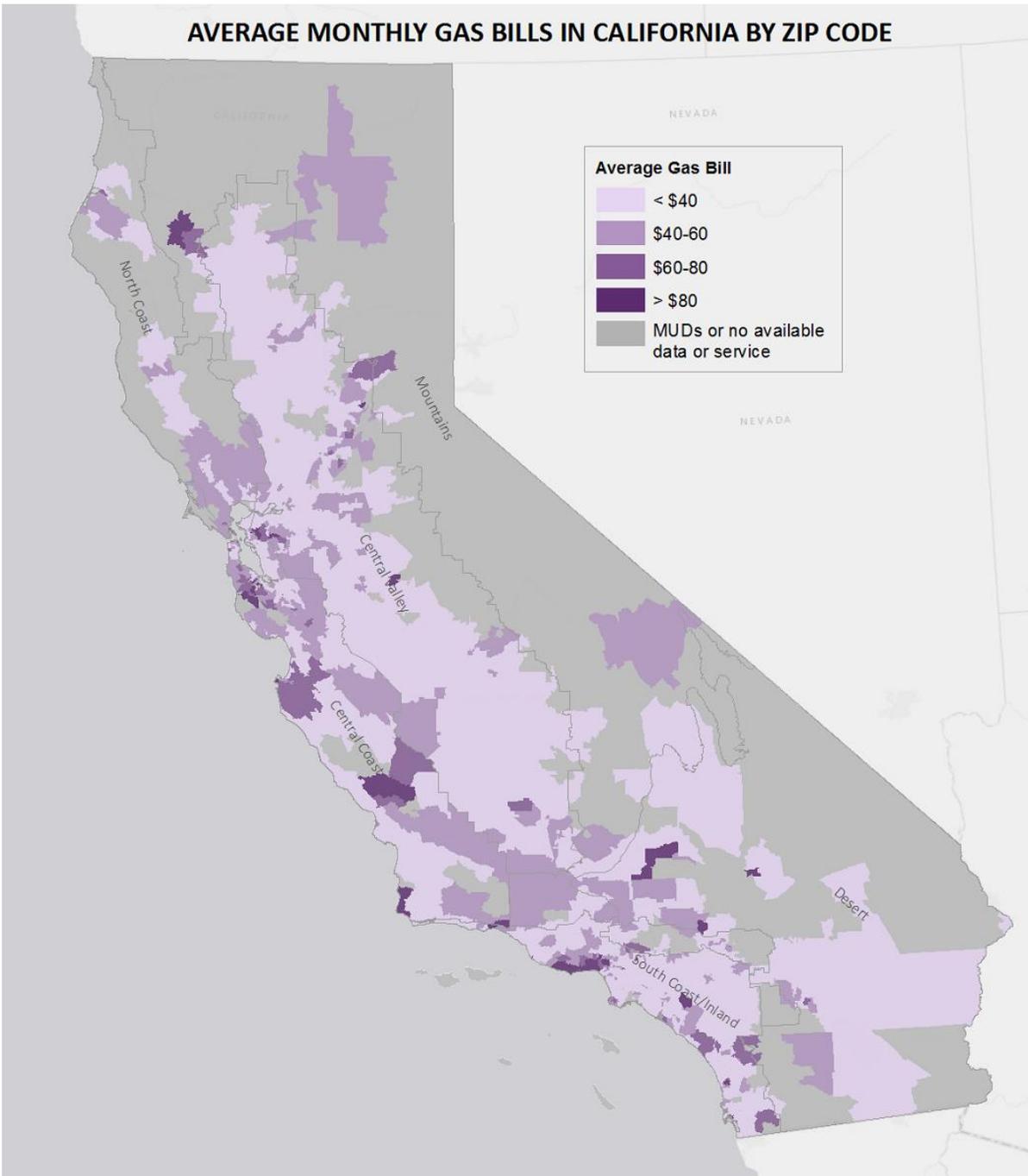
The gas bill profile illustrated by Map 3 reveals that the monthly gas bills range from low to moderate in 2015 with households paying \$34 per month on average. The national average gas bill is around \$64.¹¹ Figure 6 shows that 87% or over 9.5 million gas customers have gas bills under \$40 in 2015. Only about 0.5% or 51,000 customers have very high monthly bills of \$80 or more.



¹¹ EIA, 2015 Short-term Energy Outlook.

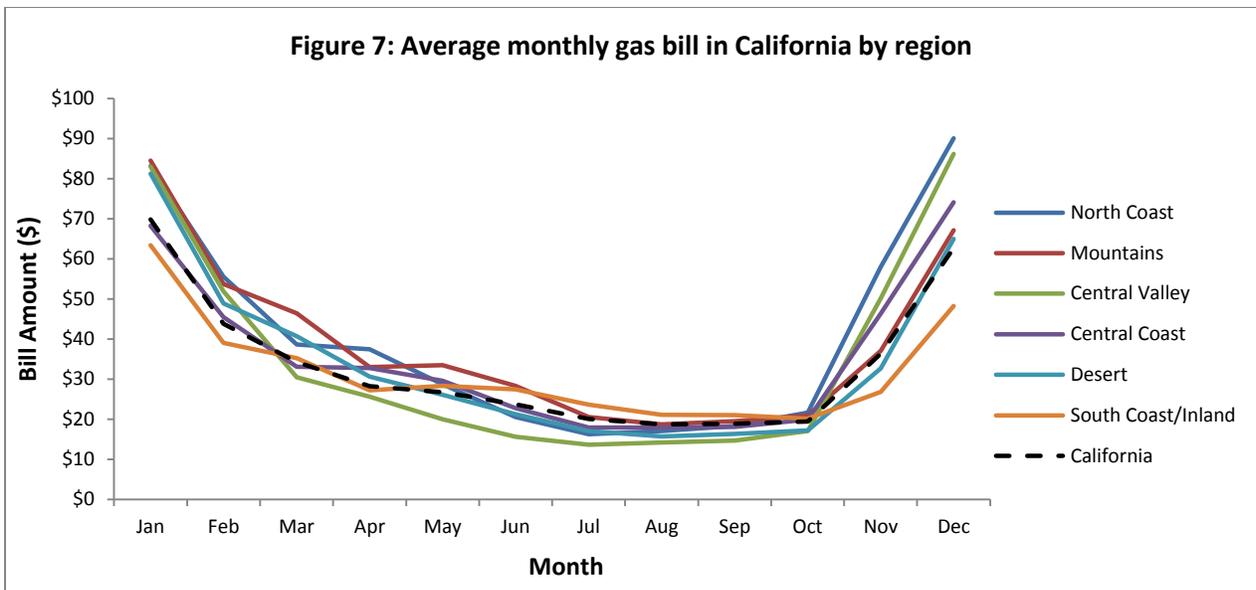


Map 3



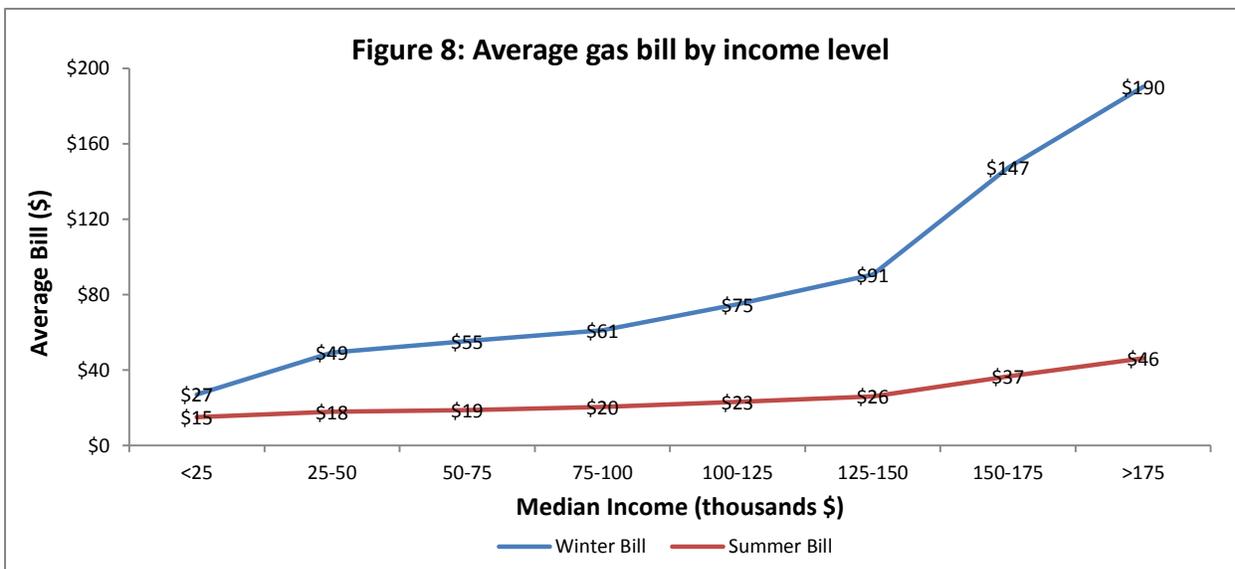
Average monthly gas bill by climate region

The low bill profile observed in Map 3 is also evident if the bill data are broken down by climate region. As Figure 7 shows below, the average monthly bill in each region remains similar to the overall California average throughout the year. Gas bills are highest in January and go down steeply as the weather becomes warmer and remain relatively flat throughout the summer until about October.



Average gas bills by income level¹²

Similar to the electric bill pattern, examining gas bills by income levels reveals that the average bills increase as the median income level increases. Figure 8 below shows bill average variations by income are higher in the winter than in the summer. The difference in average bills becomes even higher in more affluent areas with income levels above \$150,000.



¹² These figures are for ZIP Codes with available median income data only. 272 ZIP codes without income data are excluded.

Tables 9-12 below further illustrate these patterns. The top 15 ZIP codes with the highest and lowest gas bills in winter and summer reveal one striking observation: 12 of the 15 ZIP codes with the highest average gas bills have also high median income levels of \$100,000 or higher. On the other hand, 13 (winter) and 12 (summer) ZIP codes with the lowest average gas bills have also low median income levels of \$50,000 or lower.

Table 9: Top ZIP codes with the highest average gas bills (winter)

Rank	Zip	City	IOU	Median Income	Average Winter Gas Bill
1	94027	Atherton	PG&E	\$220,600	\$301
2	92067	Rancho Santa Fe	SDG&E	\$125,000	\$229
3	94528	Diablo	PG&E	\$223,900	\$211
4	94957	Ross	PG&E	\$200,000	\$208
5	90077	Los Angeles	SoCalGas	\$199,000	\$190
6	95722	Meadow Vista	PG&E	\$78,000	\$186
7	90210	Beverly Hills	SoCalGas	\$132,200	\$184
8	94028	Portola Valley	PG&E	\$200,000	\$184
9	94507	Alamo	PG&E	\$166,000	\$167
10	92210	Palm Desert	SoCalGas	\$84,300	\$151
11	91436	Encino	SoCalGas	\$135,000	\$147
12	93108	Santa Barbara	SoCalGas	\$105,000	\$147
13	93307	Bakersfield	SoCalGas	\$35,000	\$146
14	95746	Granite Bay	PG&E	\$127,000	\$144
15	94022	Los Altos	PG&E	\$185,000	\$144

Table 10: Top ZIP codes with the lowest average gas bills (winter)

Rank	Zip	City	IOU	Median Income	Average Winter Gas Bill
1	94108	San Francisco	PG&E	\$35,400	\$14
2	90014	Los Angeles	SoCalGas	\$17,000	\$16
3	94109	San Francisco	PG&E	\$60,700	\$16
4	90013	Los Angeles	SoCalGas	\$20,000	\$16
5	91210	Glendale	SoCalGas	\$46,000	\$18
6	91330	Northridge	SoCalGas	\$77,300	\$19
7	94102	San Francisco	PG&E	\$22,500	\$19
8	90010	Los Angeles	SoCalGas	\$32,000	\$21
9	90012	Los Angeles	SoCalGas	\$21,000	\$21
10	93043	Port Hueneme	SoCalGas	\$50,000	\$22
11	90015	Los Angeles	SoCalGas	\$22,000	\$23
12	93452	San Simeon	SoCalGas	\$38,300	\$25
13	90021	Los Angeles	SoCalGas	\$17,000	\$25
14	90017	Los Angeles	SoCalGas	\$21,000	\$26
15	92233	Calipatria	SoCalGas	\$36,000	\$26

Table 11: Top ZIP codes with the highest average gas bills (summer)

Rank	Zip	City	IOU	Median Income	Average Summer Gas Bill
1	94027	Atherton	PG&E	\$220,583	\$92
2	90210	Beverly Hills	SoCalGas	\$132,254	\$87
3	92067	Rancho Santa F	SDG&E	\$125,051	\$79
4	90077	Los Angeles	SoCalGas	\$199,000	\$73
5	92101	San Diego	SDG&E	\$52,500	\$70
6	94957	Ross	PG&E	\$200,000	\$62
7	94528	Diablo	PG&E	\$223,893	\$62
8	90265	Malibu	SoCalGas	\$129,800	\$59
9	95722	Meadow Vista	PG&E	\$78,000	\$55
10	90272	Pacific Palisades	SoCalGas	\$154,000	\$54
11	93108	Santa Barbara	SoCalGas	\$105,000	\$53
12	94105	San Francisco	PG&E	\$164,000	\$52
13	91436	Encino	SoCalGas	\$135,000	\$51
14	91302	Santa Barbara	SoCalGas	\$67,000	\$49
15	90402	Santa Monica	SoCalGas	\$140,000	\$47

Table 12: Top ZIP codes with the lowest average gas bills (summer)

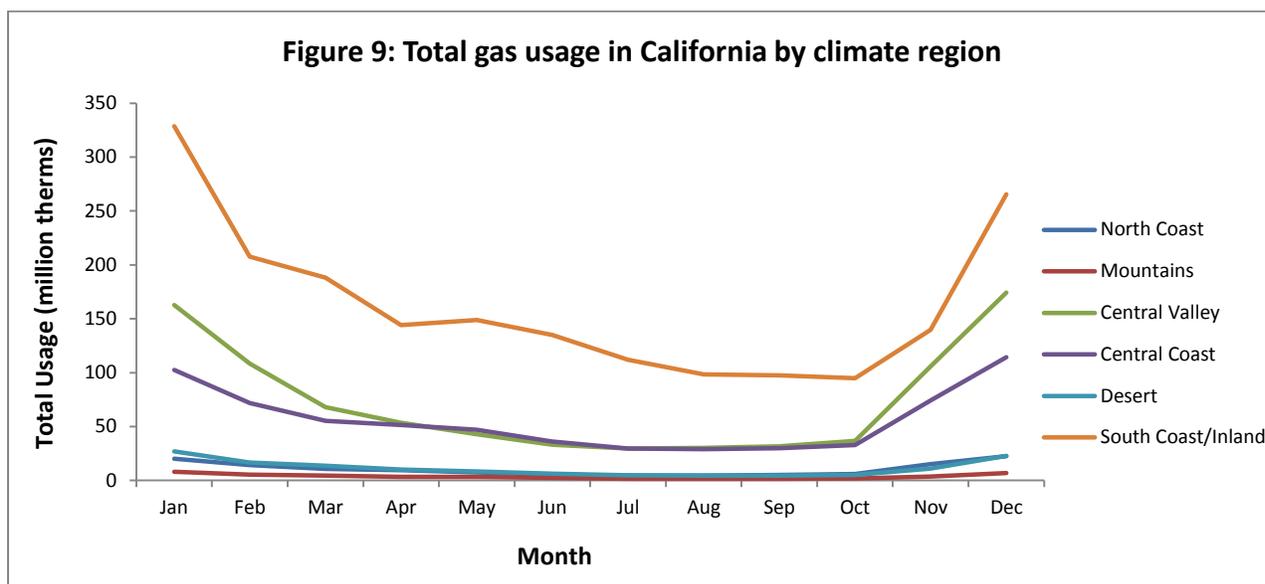
Rank	Zip	City	IOU	Median Income	Average Summer Gas Bill
1	95064	Santa Cruz	PG&E	\$54,600	\$5
2	93437	Lompoc	SoCalGas	\$65,100	\$6
3	93043	Port Hueneme	SoCalGas	\$50,000	\$7
4	92239	Desert Center	SoCalGas	\$27,000	\$8
5	92241	Desert Hot Springs	SoCalGas	\$37,300	\$9
6	96090	Tehama	PG&E	\$44,000	\$9
7	95202	Stockton	PG&E	\$14,400	\$9
8	94109	San Francisco	PG&E	\$60,700	\$9
9	94108	San Francisco	PG&E	\$35,400	\$9
10	90010	Los Angeles	SoCalGas	\$32,000	\$10
11	92518	March Air Base	SoCalGas	\$57,000	\$10
12	93721	Fresno	PG&E	\$16,600	\$10
13	94520	Concord	PG&E	\$47,300	\$10
14	90014	Los Angeles	SoCalGas	\$17,000	\$10
15	95616	Davis	PG&E	\$44,700	\$10

B. Gas Usage

Like electric usage, residential gas consumption in California remains among the lowest in the nation due to the state’s moderate climate compared to the severe winter conditions in many other states. On average, households in California used about 29 therms of gas in 2015. By season, however, the average changes significantly: 48 therms in winter, 25 therms in spring and 16 therms in summer.

Average gas usage by climate region

Figure 9 shows how residential gas usage changes by region and by month. Households in the South Coast/Inland region registered the highest total usage in 2015, followed by the Central Coast and Valley regions. These regions consumed more gas during the winter months and less during the summer months. The lowest total usages are registered in the North Coast, Mountains and Desert regions, where household gas consumption remained relatively flat in the entire year. This is attributed to the low population level in these regions of the state.



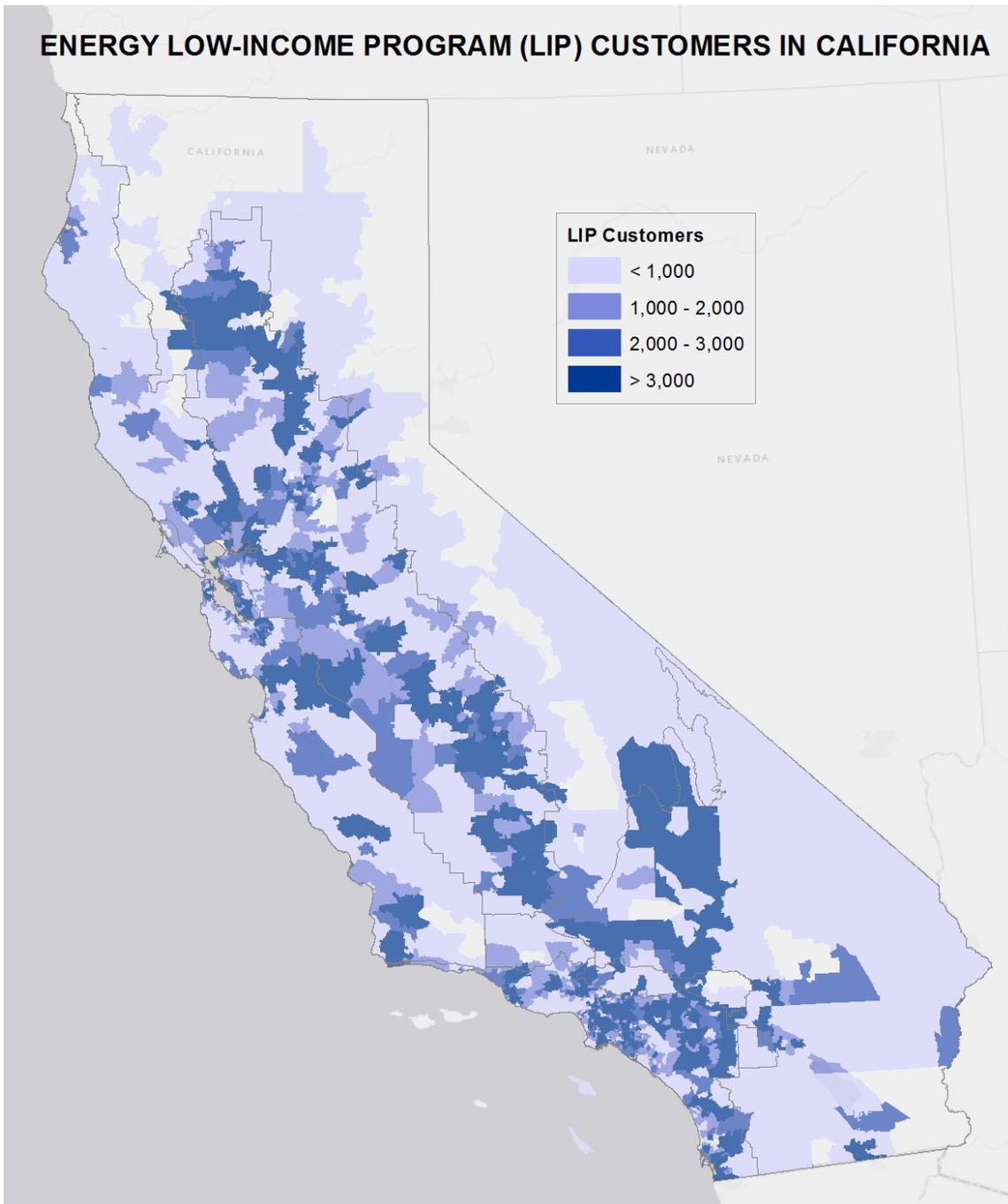


IV. LOW-INCOME AND ENERGY EFFICIENCY PROGRAMS

A. Low-Income Program

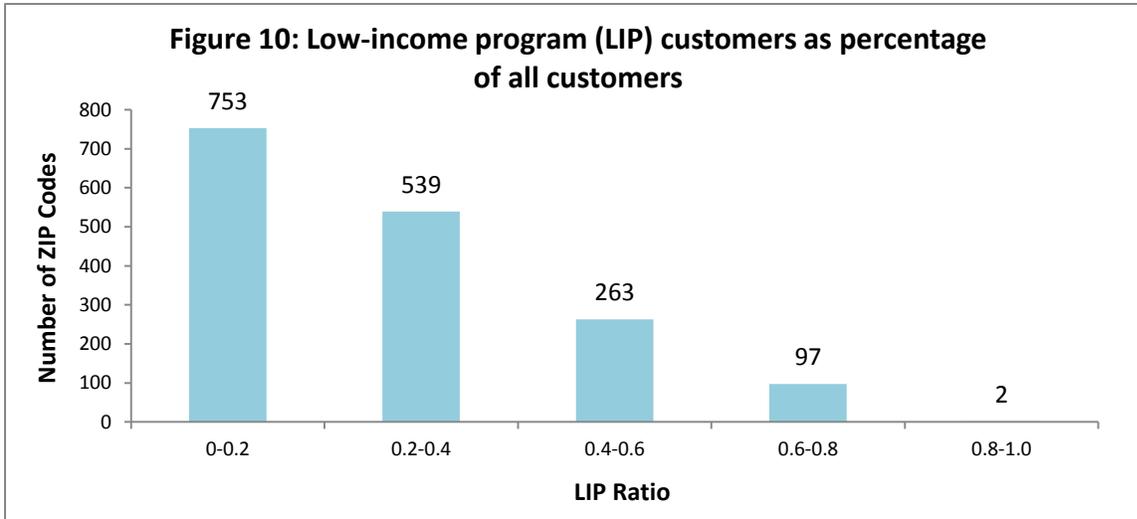
The CPUC oversees low-income assistance programs for both electric and gas customers. The California Alternate Rates for Energy (CARE) program provides 30% to 35% discount on energy bills to low-income electric and gas customers based on income limits set by the CPUC. In addition, the Family Electric Rate Assistance (FERA) program offers 12% discount on electric bills to electric customers whose income exceeds the CARE limits.

Map 4



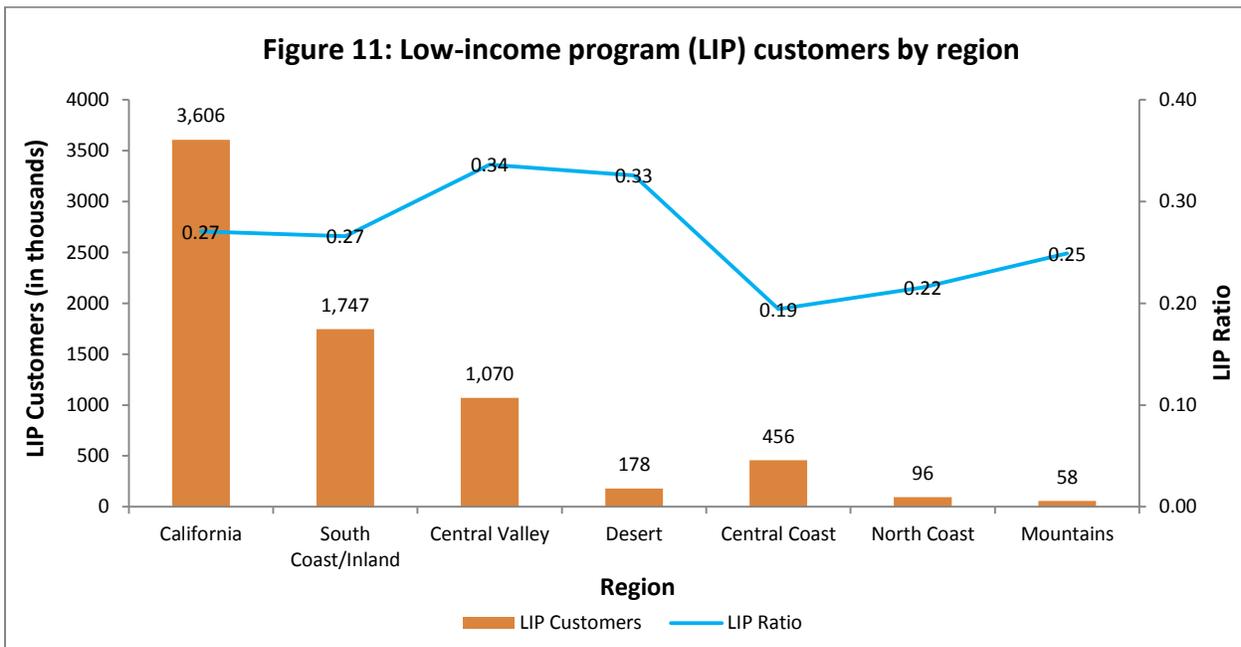


The data shows that there are low-income program (LIP) customers in 1,654 ZIP codes: About 27% of the total energy customers in the state participate in LIP. Of these ZIP codes, 1,292 have moderate LIP ratios (LIP customers/total customers in the ZIP code) between 0-0.4. About 263 ZIP codes have high LIP ratios between 0.4-0.6, and 99 ZIP codes have very high ratios over 0.6.



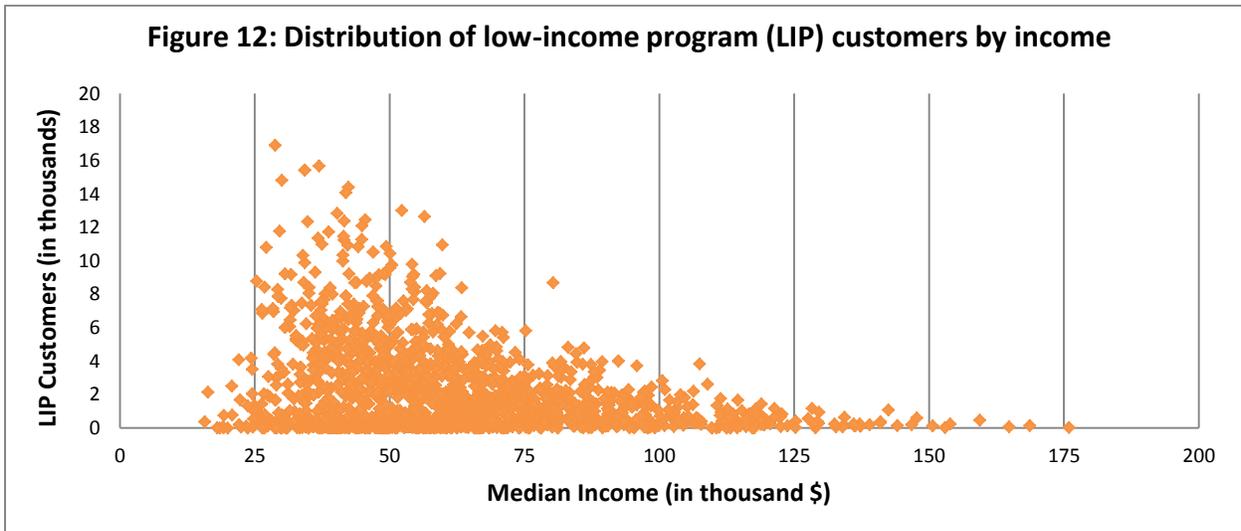
Low-income customers by region

Breaking down the low-income program (LIP) customer data by region reveals that the highest concentration of the CARE and the FERA customers in California are in the Central Valley and Desert regions with LIP ratios of 0.34 and 0.33, respectively. South Coast/Inland and North Coast regions follow with LIP ratios of 0.27 and 0.22, respectively.

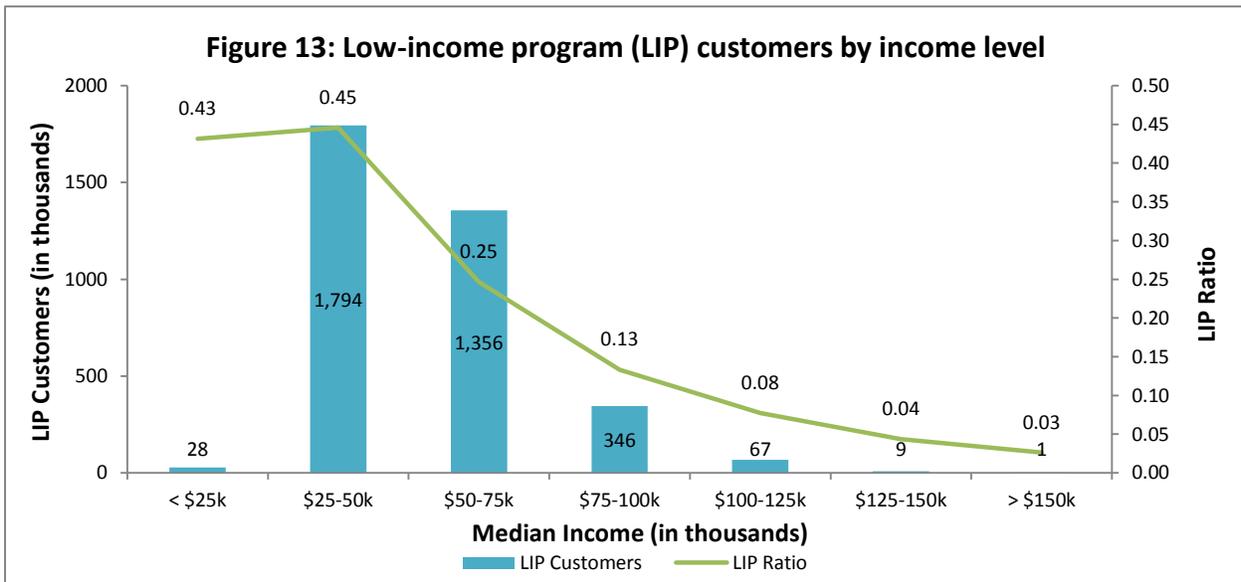


LIP customer distribution and income level¹³

The income level in each ZIP code provides a clear distribution pattern of LIP customers across California. As the scatter plot in Figure 12 below illustrates, the concentrations of LIP customers are the highest in low-income ZIP codes, and the lowest in high-income ZIP codes.



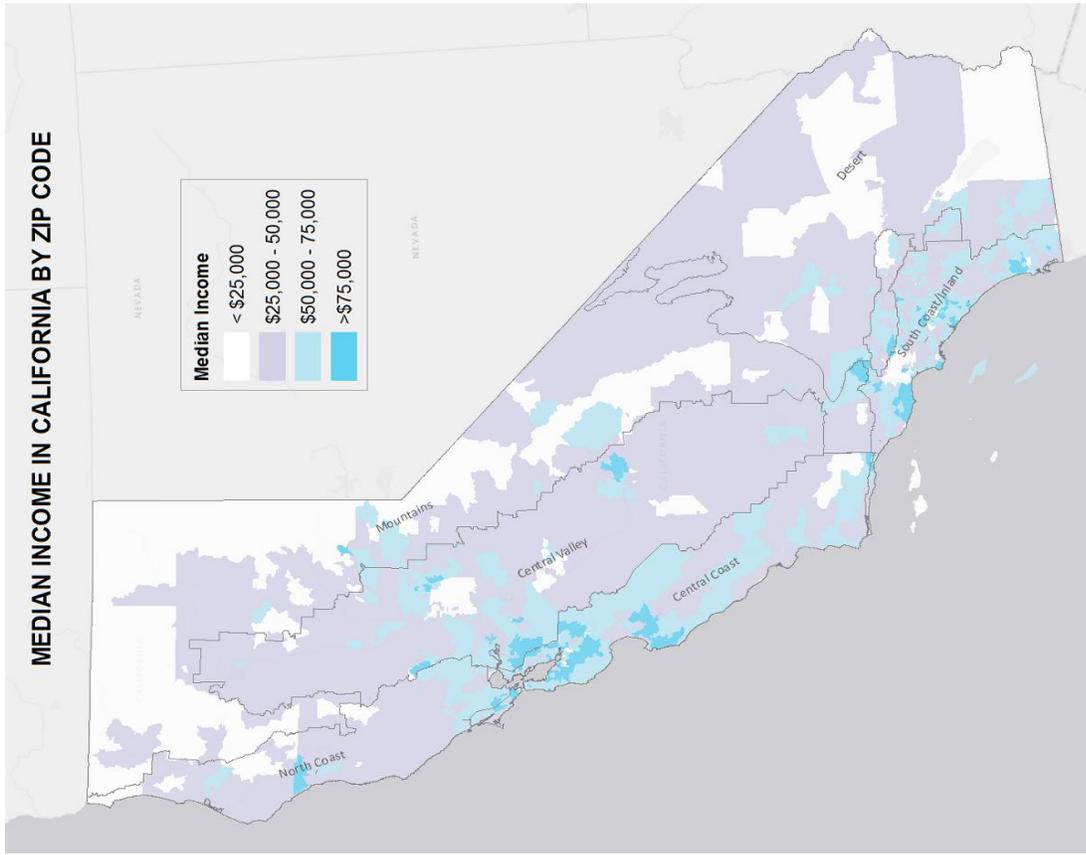
The highest concentrations of LIP customers in the state are located in ZIP codes with median income between \$25,000-50,000 and ZIP codes with income less than \$25,000, which makes up about 45% and 43% of the total customers in those areas, respectively. It is also interesting to point out that about 77,000 LIP customers in high-income ZIP codes (> \$100,000) make up about 7% of the total customers in these high median income areas.



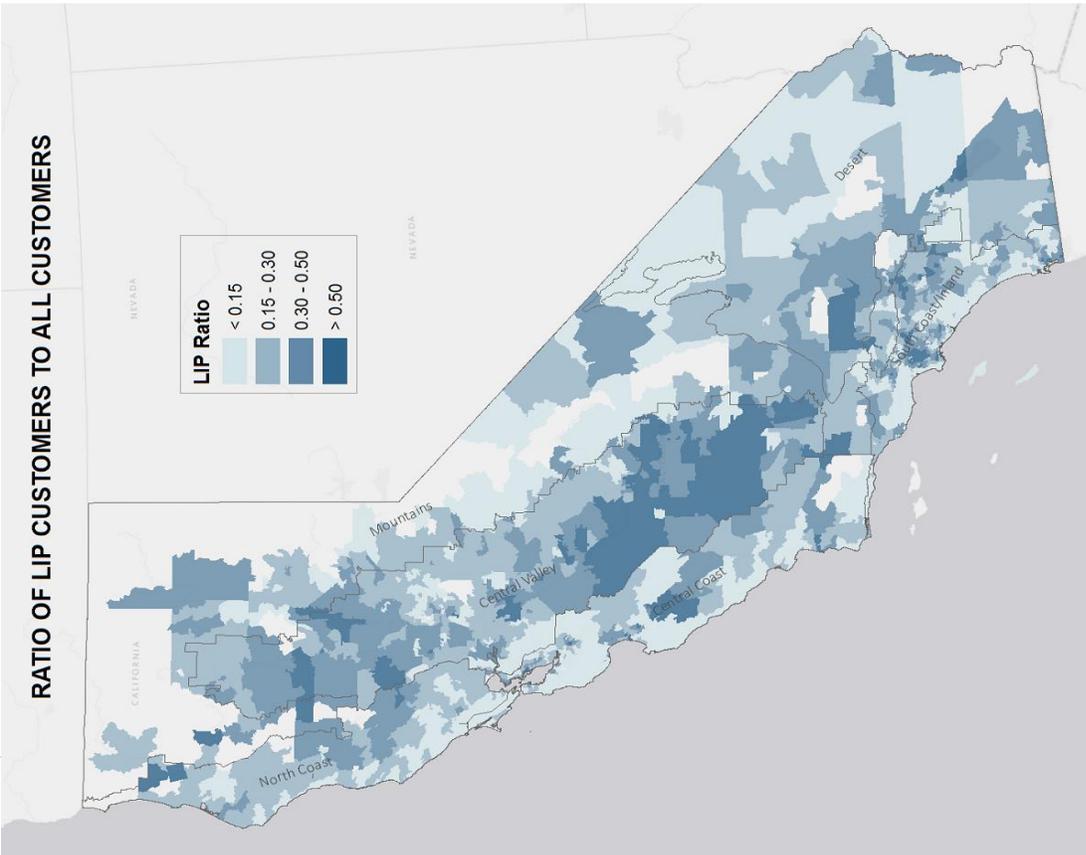
¹³ These figures are for ZIP Codes with available median income data only. 272 ZIP codes without income data are excluded.



Map 6



Map 5

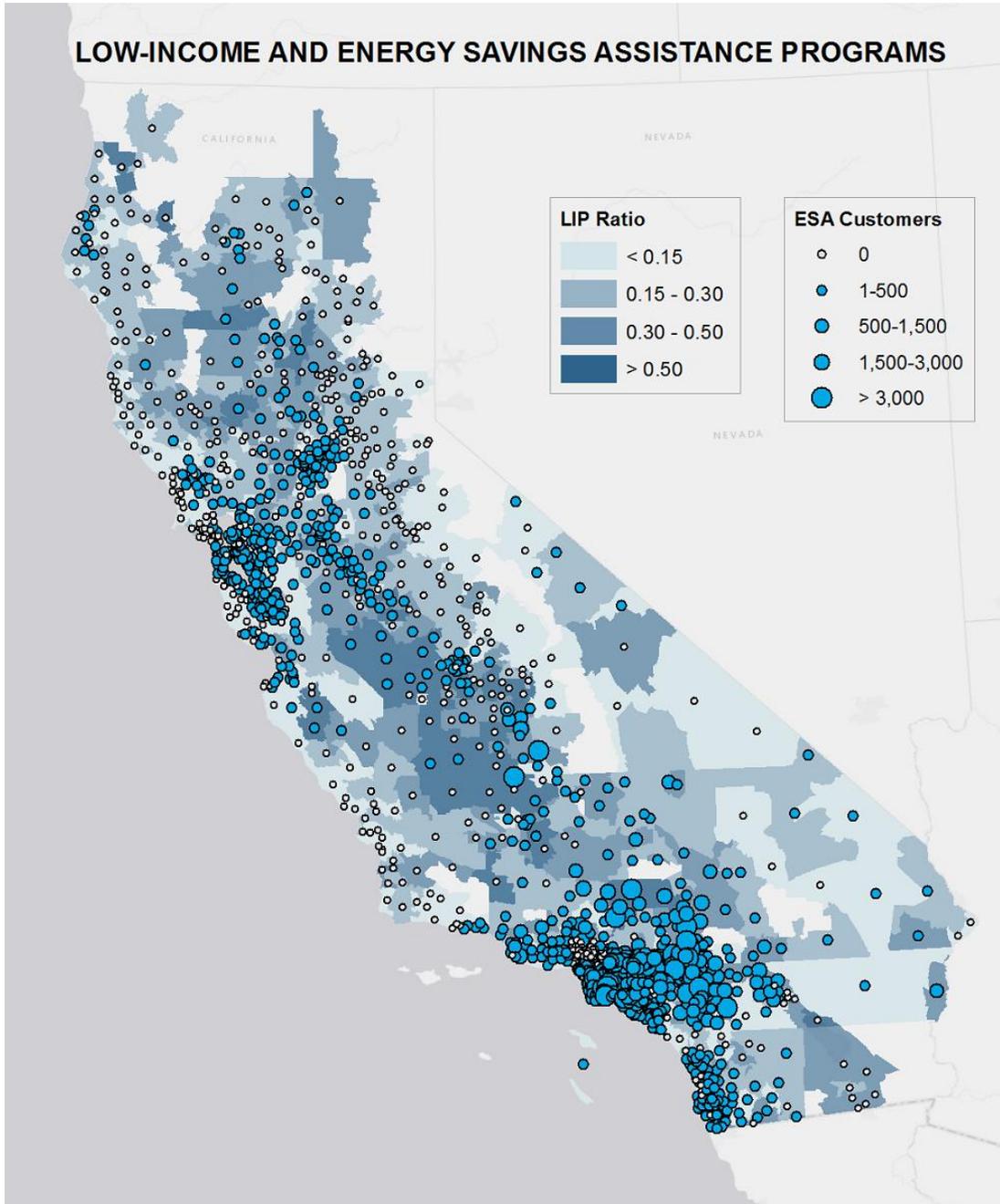




B. Energy Savings Assistance Program

Utility customers who receive bill discounts through the CARE program are also eligible for weatherization services at no cost through the Energy Savings Assistance (ESA) program, which aims to promote energy conservation and efficiency among low-income customers. As the thematic map shows, very high numbers of the ESA customers are concentrated in ZIP codes located in the Southern California Edison service territory.

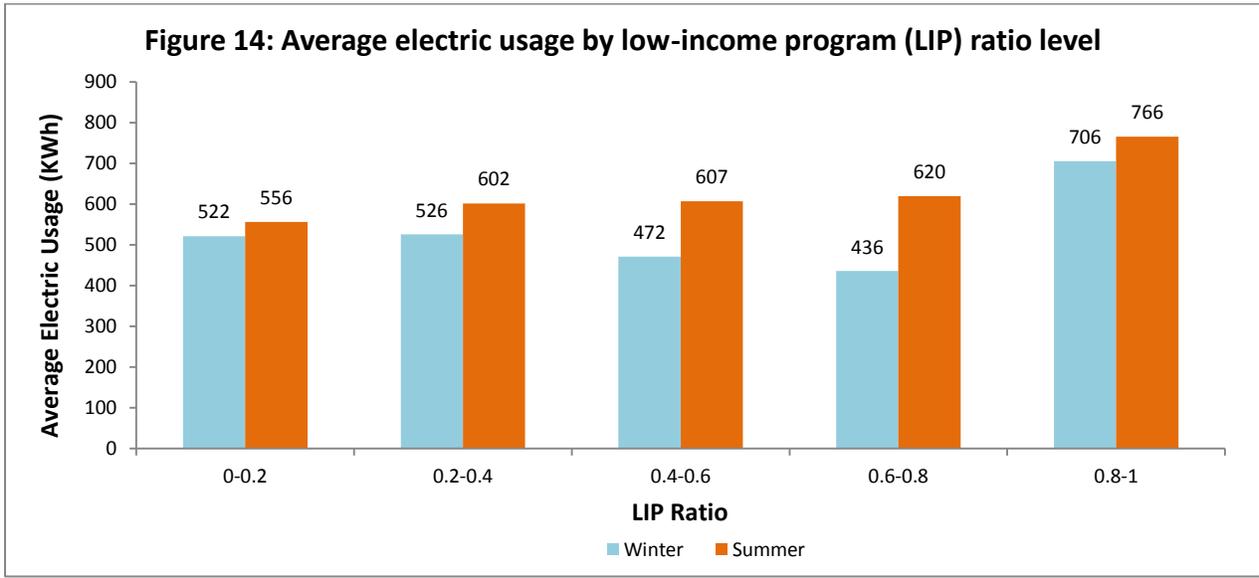
Map 7





ESA program customers and electric usage

It is also visible in Map 7 that a high number of ZIP codes has no ESA customers even in places with significantly high LIP ratios. As the graph below shows, the average electric usage in the summer is higher in ZIP codes with higher LIP ratios. Enrolling more LIP program customers in many other energy-saving programs, in which they can upgrade to more energy efficient refrigerators and light bulbs or install insulation, provides more opportunity to achieve higher energy efficiency and conservation goals.

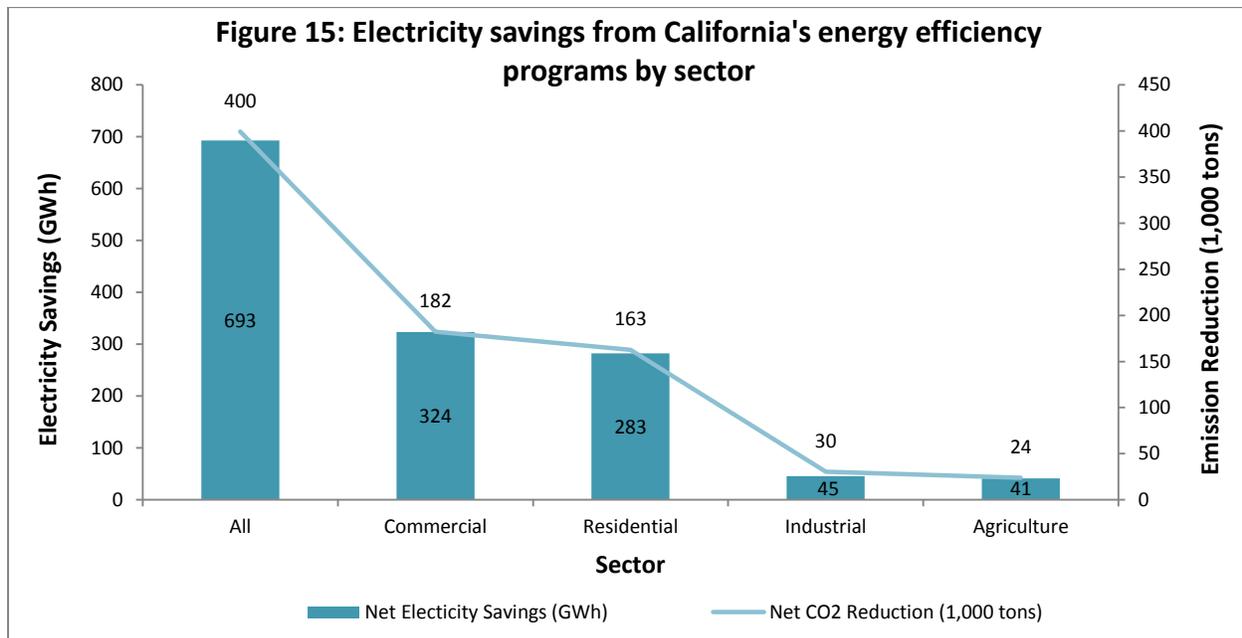


C. Energy Efficiency

At 562 KWh per month, California has the third lowest average monthly residential electricity consumption in the nation after Hawaii and Maine with 506 KWh and 549 KWh, respectively.¹⁴ This trend that has remained relatively flat in the last few decades is in part result of the state's many energy efficiency programs. The net electricity savings in 2014 alone within the three IOU territories is about 1,315 GWh.¹⁵

Energy efficiency by sector

Figure 15 below provides an overview of electricity savings by sector and carbon emission reductions associated with these savings from energy efficiency programs in the first three quarters of 2015. In that time period, net savings of 693 GWh was recorded across the three electric IOUs, 47% of which occurred in the commercial sector while 41% occurred in the residential sector.



Energy efficiency at the ZIP code level

The ZIP code level data provides a clearer view of the extent of energy savings from efficiency programs across the state.¹⁶ Map 9 on the next page illustrates that residential customers in 86% of the ZIP codes or 1,756 of them each saved 200 MWh or less in the first 3 quarters of 2015. Large-scale savings over 600 MWh, however, were only registered in 102 or 6% of the total ZIP codes in the state.

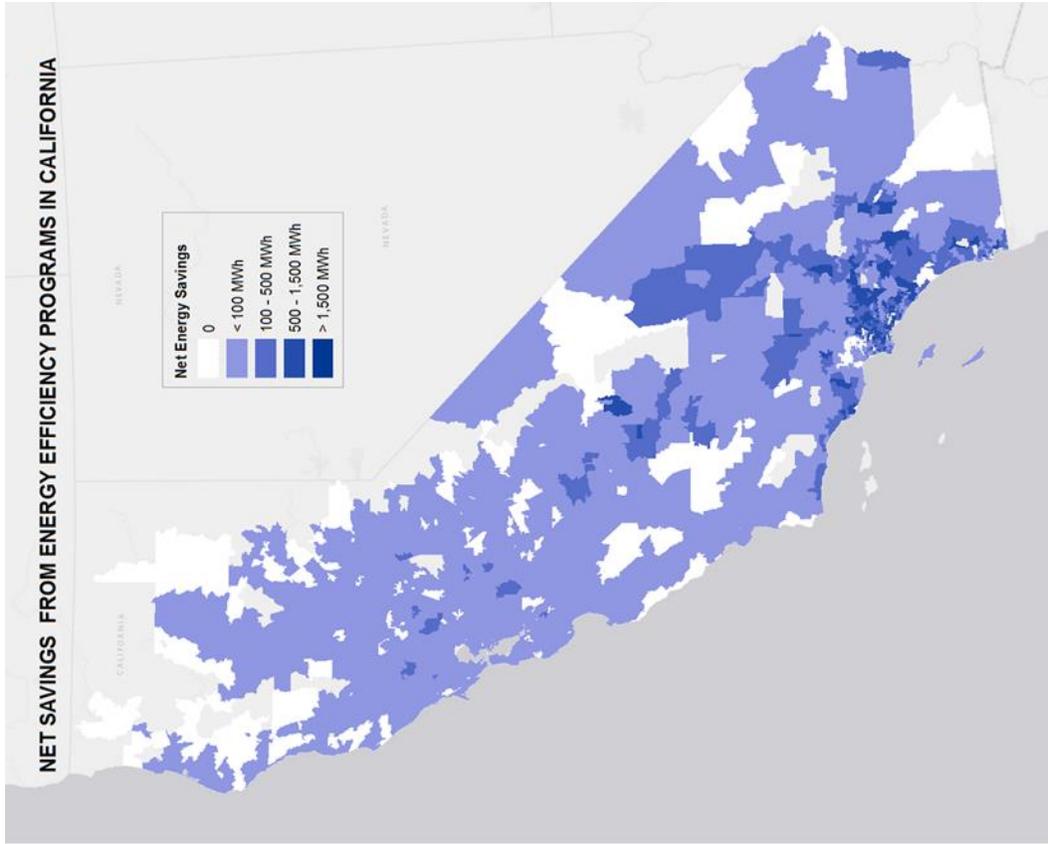
¹⁴ Energy Information Agency (EIA), 2014 Average Monthly Bill and Consumption – Residential

¹⁵ CPUC Energy Division, California Energy Efficiency Statistics (EEStats). Data only cover residential customers for PG&E, SCE and SDG&E territories.

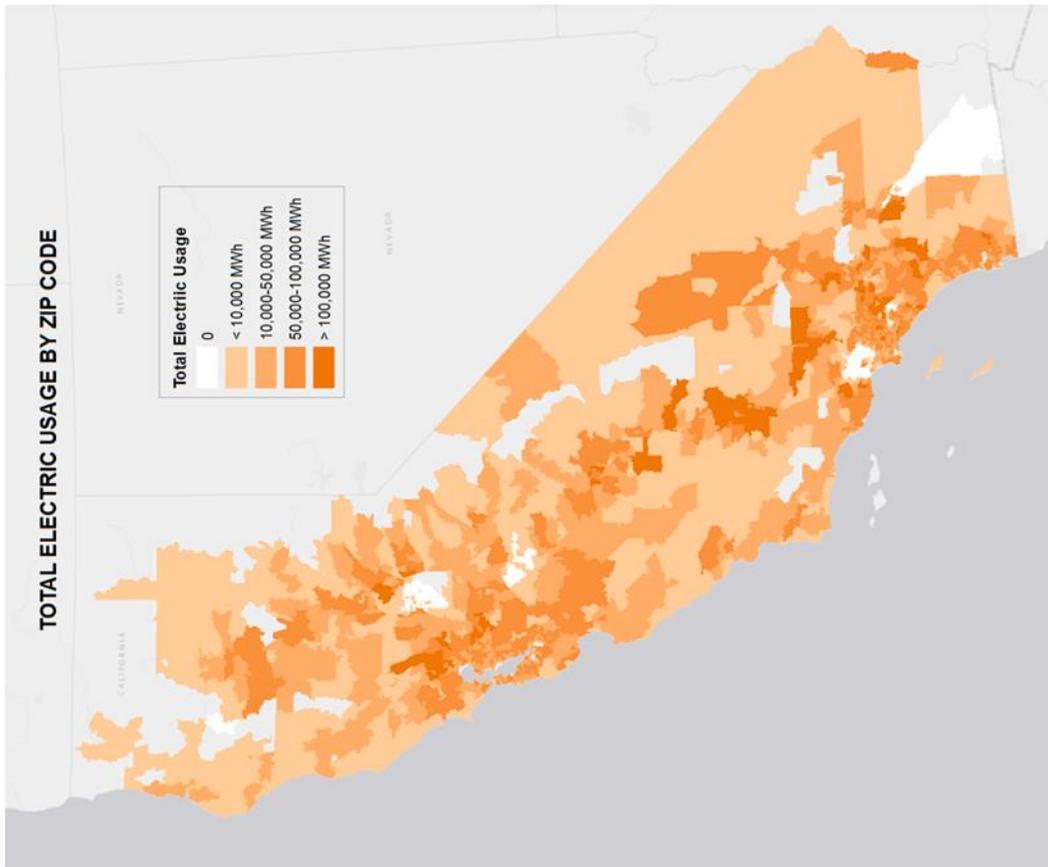
¹⁶ The energy efficiency data cover only the first, second and third quarters of 2015.



Map 9



Map 8



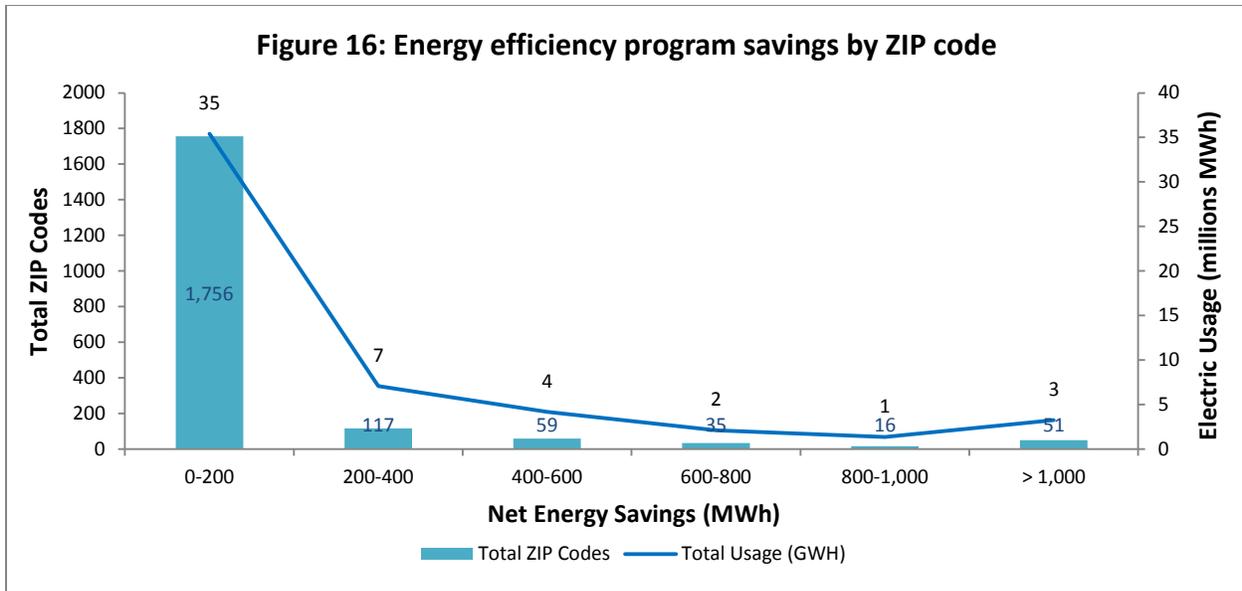


Figure 16 suggests that 65% of the total electricity consumption takes place in households in the low-savings ZIP codes.¹⁷ This means that there is opportunity to reduce consumption in these areas, and therefore increase future net energy savings. The net savings and total electric usage maps in the previous page show that significant number of high-usage areas (over 50,000 MWh) have lower net savings (< 100 MWh). A closer examination of the data reveals that each of the top 600 ZIP codes with the highest total electric usage has net savings from energy efficiency programs under 100 MWh. The following table lists the top performing ZIP codes with regards to electricity savings from energy efficiency programs.

Table 13: Top ZIP codes with the highest energy efficiency savings¹⁸

Rank	ZIP Code	City	IOU	Net Energy Savings (GWh)	Average Electric Usage (GWh)
1	92879	Corona	SCE	3.8	600
2	92064	Poway	SDG&E	2.3	606
3	92683	Westminster	SCE	2.2	477
4	90280	South Gate	SCE	2.0	363
5	92704	Santa Ana	PG&E	2.0	433
6	90250	Hawthorne	SCE	1.9	342
7	90813	Long Beach	SCE	1.9	290
8	92648	Huntington Beach	SCE	1.9	456
9	92843	Garden Grove	SCE	1.9	446
10	90640	Montebello	SCE	1.6	446
11	92509	Riverside	SCE	1.6	660
12	90631	La Habra	SCE	1.4	552
13	90650	Norwalk	SCE	1.4	468
14	91763	Montclair	SCE	1.4	531
15	92703	Santa Ana	SCE	1.4	416

¹⁷ Low-savings ZIP codes include those with net savings of 0.2 GWh and below.

¹⁸ Data only cover the first three quarters of 2015.

V. WATER

A. Water Usage

As California experiences its fifth year of drought, state water regulatory agencies have intensified their efforts to achieve the 25% conservation goal put forth by Governor Brown. Due to the mandatory reporting of conservation targets and achievements by water districts across the state, more data have become available, providing more insights into our water supply, consumption and conservation patterns. The State Water Resources Control Board (SWRCB) reported that Californians conserved 1.19 million acre-feet or 387 billion gallons of water from June 2015 through February 2016, which is enough to supply nearly 6 million people for a year.¹⁹

The water consumption data in this analysis is from the SWRCB water conservation reporting, which requires water districts across the state to report their monthly potable water production, consumption and other variables starting June 2014. The data is only available at the water district level but we are able to aggregate the data to the county level using GIS mapping.

Although the water data in this analysis is not at the ZIP code level unlike the energy data, they still provide a clear picture of the state’s water consumption patterns. Overall, the data includes 410 water districts in 51 counties, which serve approximately 36 million Californians or 91% of the state’s total population.

Total residential water consumption

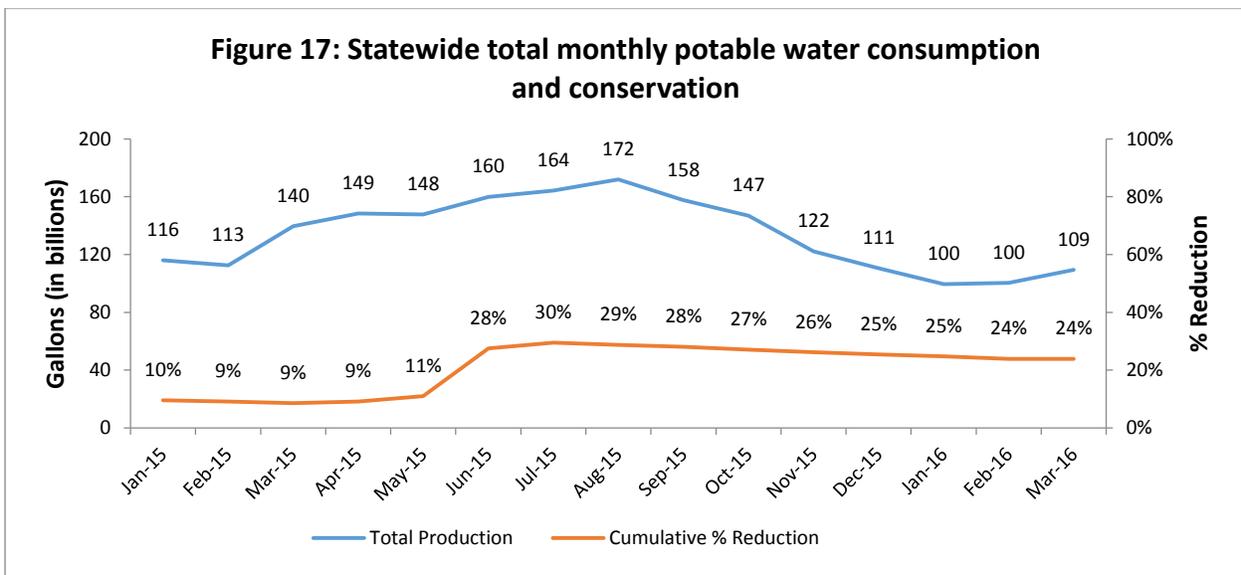


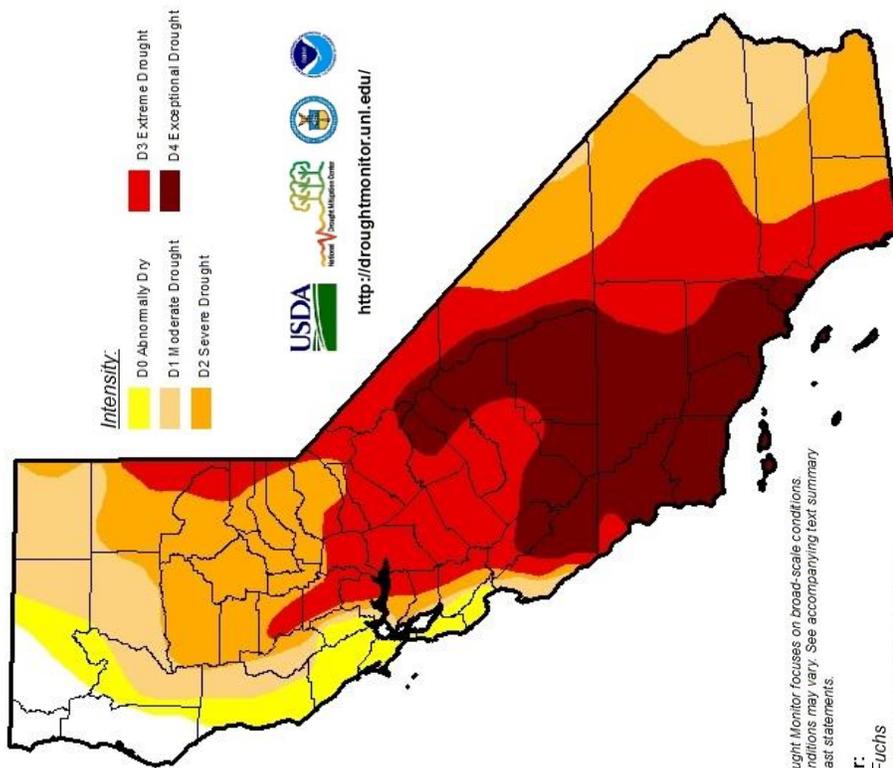
Figure 17 above illustrates that the total monthly potable water consumption in the first quarter of 2016 has significantly decreased from the same period in 2015. As the total consumption declines drastically, the conservation rate rises substantially. From a 9% cumulative reduction in water consumption in March 2015, the reduction rate is now 24% a year after. This reduction in water usage can be attributed to the conservation standards and emergency regulation that were put in place to address the severe drought.

¹⁹ State Water Resources Control Board, Press Release on April 4, 2016.



U.S. Drought Monitor California

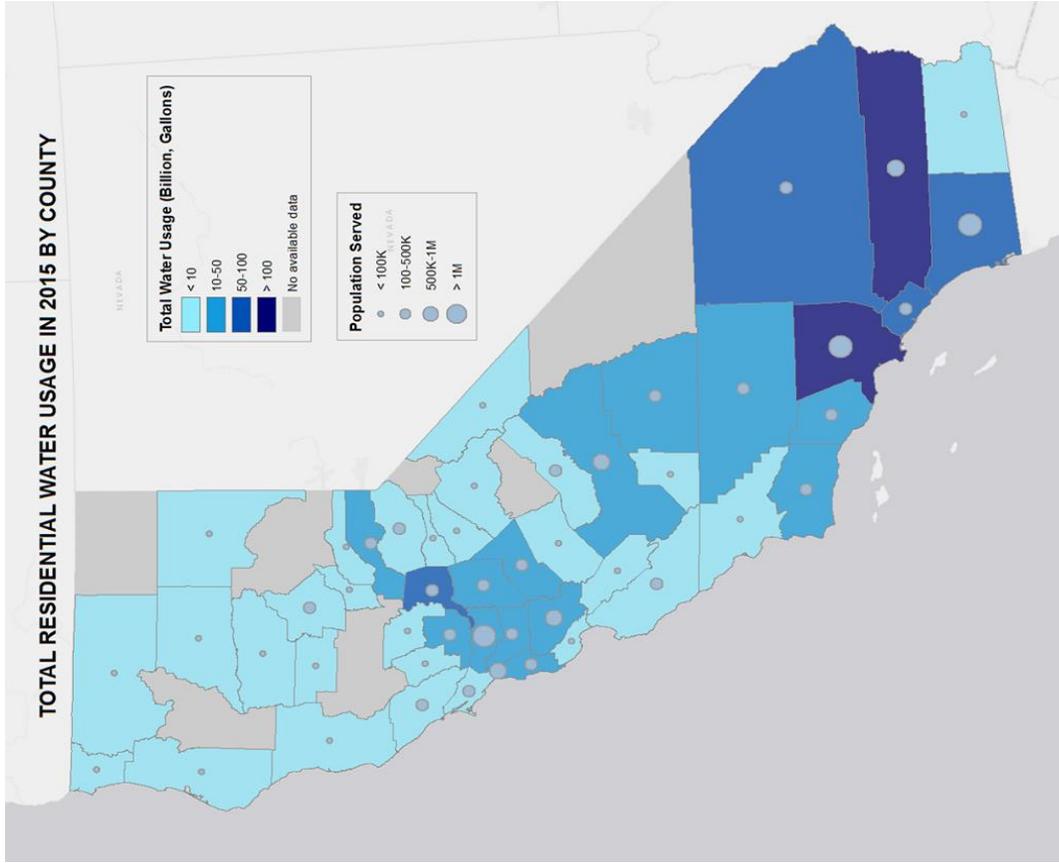
Map 10



The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.

Author:
 Brian Fuchs
 National Drought Mitigation Center

Map 11



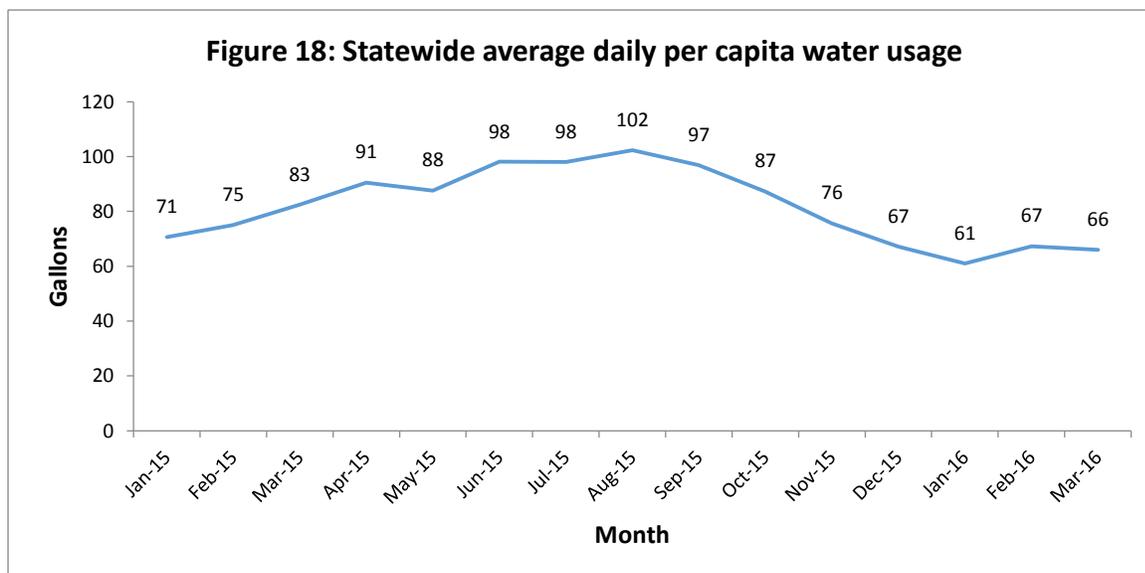
At the county level, 33 counties produced below 10 billion gallons of potable water while 6 counties produced over 50 billion gallons in 2015. As Map 10 and Map 11 show, the high-production counties, which are all located in Southern California and Central Valley, are also in areas where the drought intensity is severe, extreme or exceptional. On the other hand, the low-production counties are mostly located in the northern part of the state where the drought intensity ranges from abnormally dry to severe. Five of the highest consumption counties have also higher population densities than those of the rest in the state, which is also a factor for the very high total consumption in these areas.

Table 14: Counties with the highest residential usage in 2015

County	Total Residential Water Usage (billion gallons)	Average Daily Usage (gallons)	Population density
Los Angeles	301	92	2,500
Riverside	103	121	323
Orange	91	101	3,999
San Diego	83	105	774
San Bernardino	67	100	105
Sacramento	53	123	1,530
Contra Costa	49	80	1,554
Santa Clara	45	70	1,471
Kern	37	124	108

Average daily per capita usage

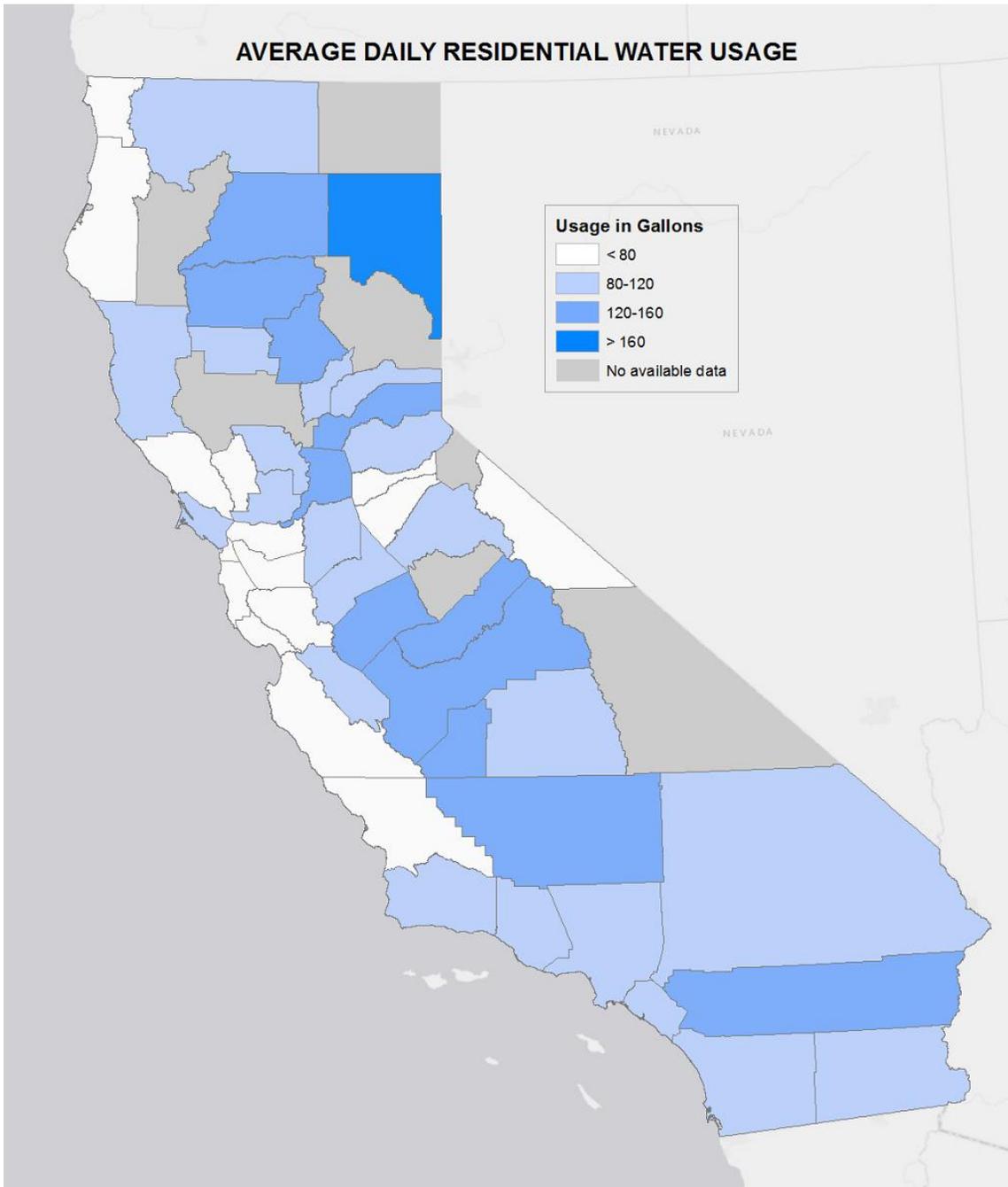
In 2015, the statewide average daily per capita potable water usage is 86 gallons. The latest data show in Figure 18 that the average daily gallon usage in California in March 2016 has declined by 17 gallons from a year ago. The highest average daily usage numbers were recorded in the warmest months, with August 2015 reaching 102 gallons per day. On the other hand, the lowest daily water usage was recorded in January 2016 at 61 gallons.





If we look at the same metric at the county level, only 13 counties registered less than 80 gallons while 25 counties registered daily per capita usage between 80 to 120 gallons, and 12 counties registered average daily usage over 120 gallons. Map 12 illustrates that most of these counties with high average daily usage are located in the Central Valley and South Coast/Inland regions.

Map 12





Although the overall gallon per capita usage has significantly decreased in the state, some water districts have among the highest per capita usage at the supplier level. Table 13 below shows that the top districts or suppliers recorded an average per capita daily usage amounts that are at least more than twice the state average of 86 gallons in 2015. Santa Fe Irrigation District, for example registered a usage level of 325 gallons, which is four times more than the state average.

Table 15: Water districts/suppliers with the highest average daily water usage

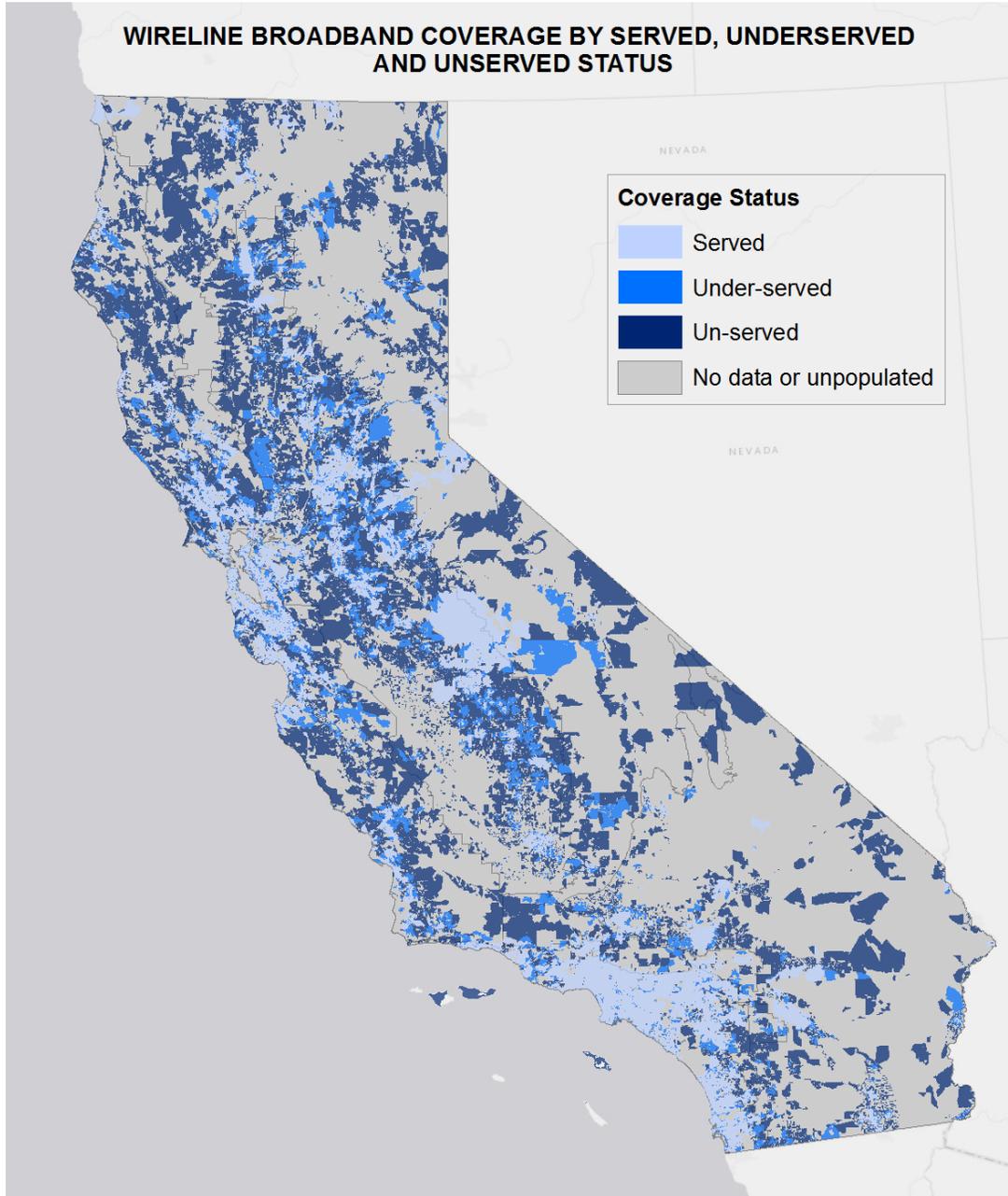
Water District/Supplier	County	Hydrologic Region	Population Served	Average Daily Usage (gallons)
Santa Fe Irrigation District	San Diego	South Coast	19,839	325
Serrano Water District	Orange	South Coast	6,641	281
Vaughn Water Company	Kern	Tulare Lake	31,060	276
Myoma Dunes Mutual Water Company	Riverside	Colorado River	9,233	265
Golden State Water Company Cowan Heights	Orange	South Coast	7,254	246
Valley Water Company	Los Angeles	South Coast	9,900	237
LA County Public Works Waterworks District 29	Los Angeles	South Coast	22,249	236
San Juan Water District	Placer	Sacramento River	36,761	234
California Water Service Company Westlake	Ventura	South Coast	19,468	215
South Feather Water and Power Agency	Butte	Sacramento River	18,300	210
Bella Vista Water District	Shasta	Sacramento River	17,619	197
East Orange County Water District	Orange	South Coast	3,247	192
Coachella Valley Water District	Riverside	Colorado River	318,217	190
Madera County	Madera	San Joaquin River	14,326	187
Susanville City of	Lassen	North Lahontan	9,344	186



VI. BROADBAND

Wireline broadband service covers about 95% of households in California.²⁰ Three percent or slightly over 340,000 households are still unserved in the state, with the remainder underserved. As Map 13 shows, the vast majority of underserved or unserved households are concentrated in the North Coast, Mountains, Central Valley and Desert regions.

Map 13



²⁰ CPUC Communication Division, Consumer Wireline Broadband Served Status (December 2014).

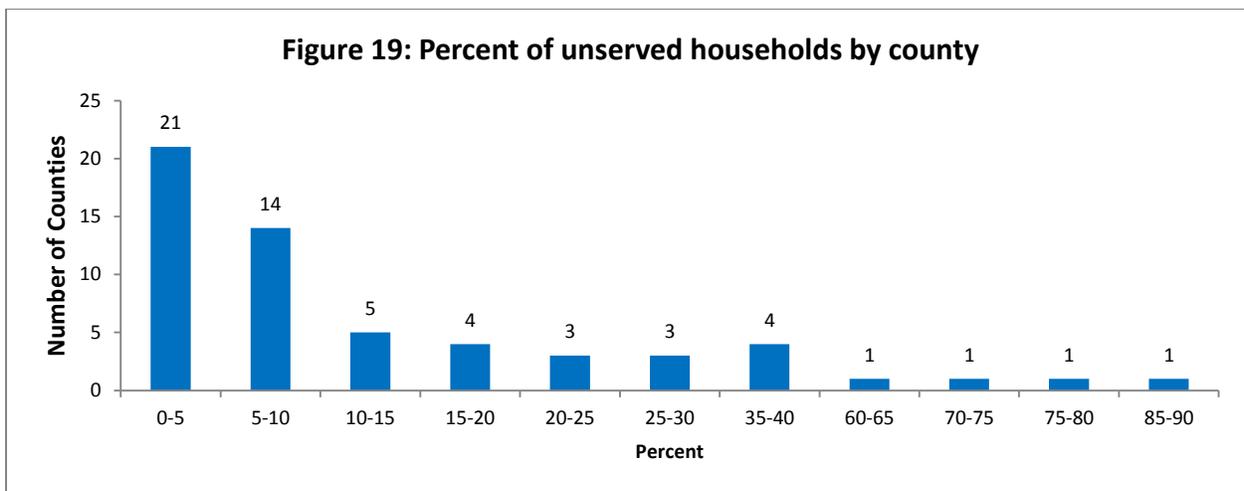
One way to examine broadband coverage in the state is to classify areas as served, underserved and unserved. These classifications are defined in the table below:

Table 16: Classifications of broadband coverage

Status	Provider	Speed
Served	At least 1	At least 6 mbps downstream & 1.5 mbps upstream
Underserved	At least 1	Slower than the speed under the served status
Unserved	No provider or very slow speed	Slower than 768 kbps downstream and 200 kbps upstream

Unserved households by county²¹

Looking closely at the ratio of unserved households to the total number of households per county, Figure 19 below reveals that 4 counties (Sierra, Plumas, Trinity and Modoc) have very high unserved ratios of 0.60 or higher. This means that more than 60% of the households in each of these counties have either service with very slow speeds or no service at all. In contrast, 35 counties have very low to low unserved ratios of less than 0.10, which means that 90% or more of households in these counties are covered by wireline broadband service. Unserved households are concentrated in counties located in the North Coast and Mountains regions of the state as shown by the darker hues in upper part of Map 14 on the next page.



Unserved households and income levels²²

Although many of these unserved counties are in sparsely populated counties, it is also important to mention that these counties have among the lowest median income levels in the state. By comparing Maps 14 and 15, it is evident that counties with high percentage of unserved households shown in the right map have also high percentage of households that earn median income of \$50,000 or less shown in the left map. The data reveal that households with low median income of \$50,000 or less in Sierra, Plumas, Trinity and Modoc counties, which are the least served in terms of wireline broadband, make up

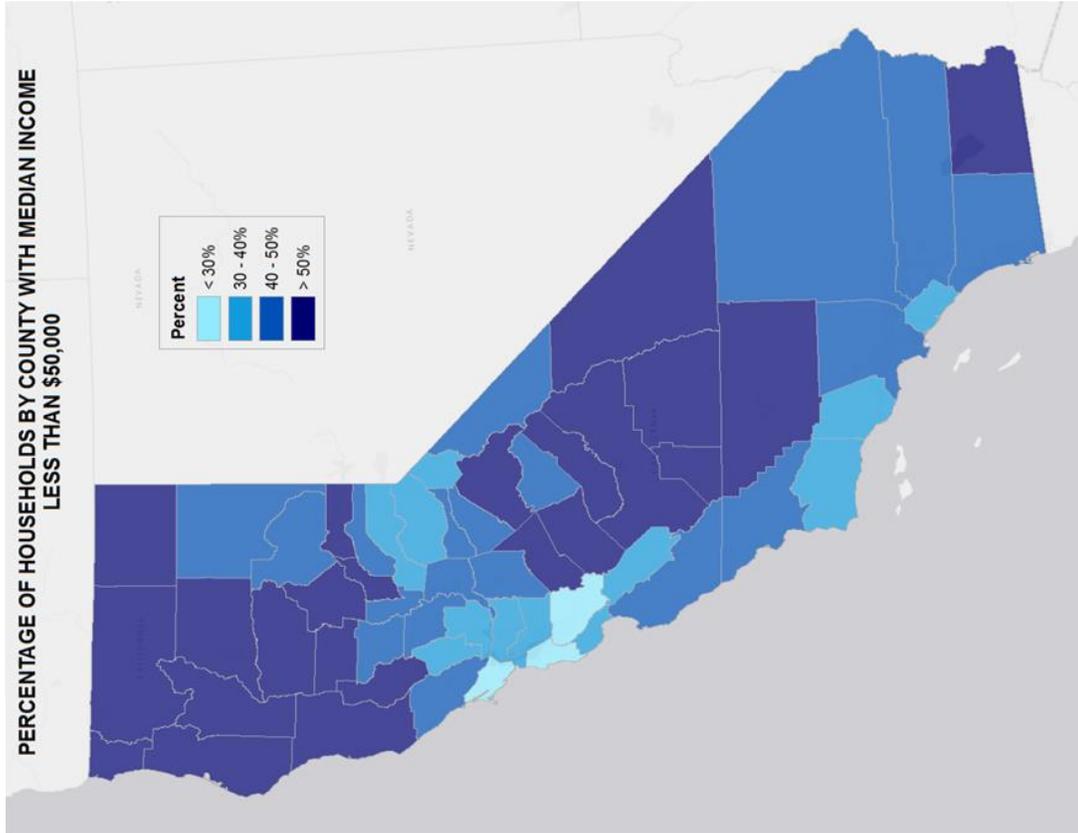
²¹ Unserved household percentages are from the broadband availability data collected by the CPUC Communications Division as of December 2014.

²² Median income data by county are estimates for 2015 from the U.S. Census Bureau.



55%, 49%, 61% and 59% of the total households in these counties respectively. Table 17 lists all 58 counties and their corresponding unserved ratios.

Map 15



Map 14

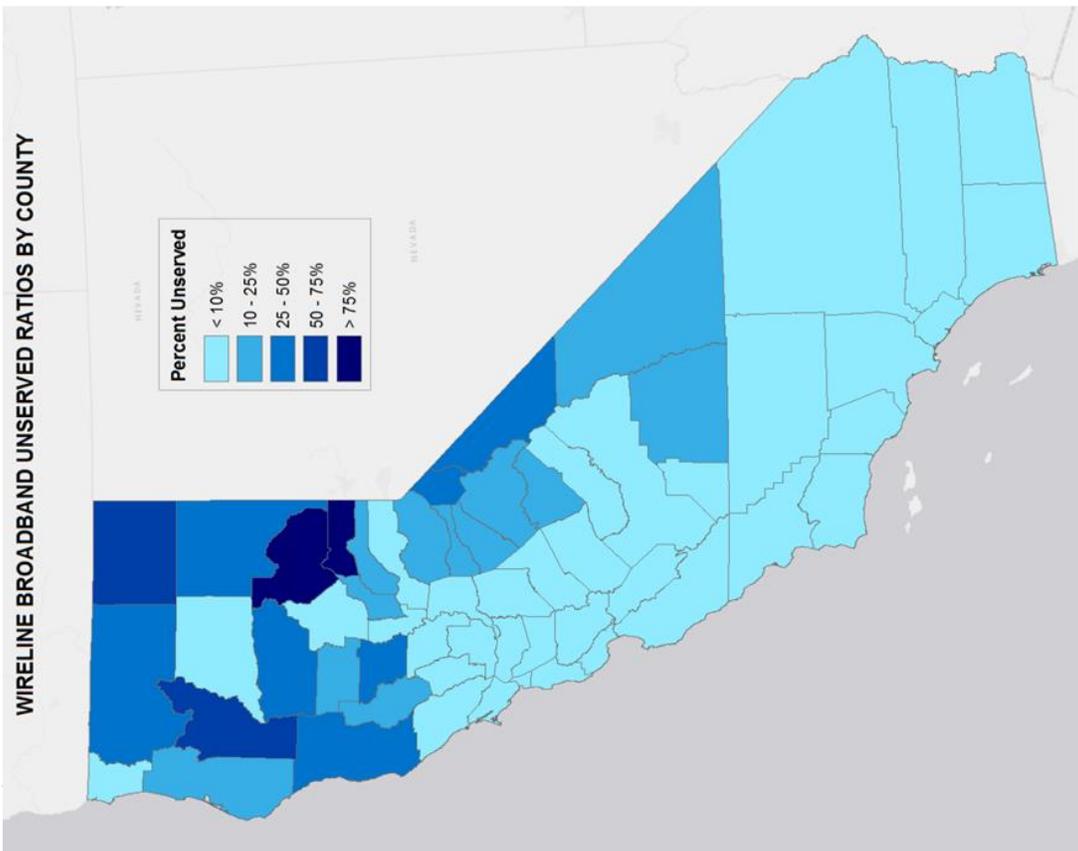


Table 17: Wireline broadband availability and percentage of unserved households by county

County	Total Households	% Unserved	Median Income	% of Households with Income below \$50,000	County	Total Households	% Unserved	Median Income	% of Households with Income below \$50,000
Alameda	554,954	0.7	\$72,465	36	Orange	1,012,422	1	\$72,856	35
Alpine	501	27.6	\$65,234	38	Placer	138,060	5.5	\$69,438	36
Amador	14,686	10.3	\$53,988	47	Plumas	9,078	75.9	\$51,504	49
Butte	89,398	9.6	\$43,605	56	Riverside	706,222	2	\$53,013	48
Calaveras	19,135	15.1	\$58,517	44	Sacramento	521,639	1.5	\$53,877	47
Colusa	7,227	39.5	\$51,857	48	San Benito	17,176	9	\$65,781	38
Contra Costa	382,883	1	\$76,218	33	San Bernardino	620,812	2.7	\$50,644	50
Del Norte	9,974	6.1	\$43,779	55	San Diego	1,113,250	2.2	\$61,766	42
El Dorado	70,822	14.9	\$69,061	36	San Francisco	364,363	0	\$75,910	36
Fresno	299,452	5.7	\$42,917	57	San Joaquin	220,294	4.7	\$51,027	49
Glenn	10,020	20.7	\$45,879	54	San Luis Obispo	104,973	4.5	\$62,959	41
Humboldt	56,060	16.8	\$43,919	56	San Mateo	261,284	0.6	\$89,434	27
Imperial	49,792	8.4	\$40,239	59	Santa Barbara	144,371	2.1	\$64,571	40
Inyo	8,068	16.7	\$49,203	51	Santa Clara	625,869	1.6	\$93,827	28
Kern	262,965	6.1	\$48,177	52	Santa Cruz	95,749	2.3	\$70,960	36
Kings	42,259	9.9	\$48,223	52	Shasta	71,582	8.9	\$46,873	53
Lake	27,491	12.2	\$35,102	64	Sierra	1,487	85.8	\$45,000	55
Lassen	10,073	38.3	\$59,101	43	Siskiyou	19,569	35.1	\$37,793	62
Los Angeles	3,285,160	0.2	\$54,514	47	Solano	144,730	3.2	\$64,618	39
Madera	44,632	7.8	\$42,823	58	Sonoma	188,528	3.2	\$63,995	40
Marin	103,645	1.1	\$92,999	29	Stanislaus	166,438	3.4	\$46,065	54
Mariposa	7,873	23.7	\$58,661	45	Sutter	31,404	5.5	\$50,511	50
Mendocino	35,522	25.7	\$43,854	55	Tehama	24,082	25.8	\$42,229	59
Merced	77,041	9.2	\$45,576	54	Trinity	6,131	70.7	\$39,399	61
Modoc	4,105	61.3	\$41,921	59	Tulare	134,612	10.9	\$41,336	59
Mono	5,816	36.5	\$60,307	44	Tuolumne	22,267	23.7	\$43,967	56
Monterey	126,025	6	\$58,984	43	Ventura	270,879	0.7	\$73,044	34
Napa	49,281	5.1	\$69,717	36	Yolo	71,300	4.6	\$54,745	47
Nevada	41,181	15.1	\$58,859	44	Yuba	25,423	12.4	\$46,211	54

VII. SUMMARY OF FINDINGS

Electricity

1. California's monthly electric bills are still among the lowest in the nation. The average monthly electric bill of California households in 2015 is \$93, which is two dollars higher than the average in the previous year.
2. The monthly average bill changes by season: \$91 in winter, \$78 in spring and \$114 in summer.
3. California's electricity consumption remains low to moderate with an average monthly electric usage in 2015 of 519 KWh.

Gas

1. Gas bills range from low to moderate in 2015 with households paying \$34 per month on average.
2. On average, households used about 29 therms of gas in 2015. By season, however, the average changes significantly: 48 therms in winter, 25 therms in spring and 16 therms in summer.

Low-Income Customers Programs

1. There are low-income program (LIP) customers in 1,654 ZIP codes or about 25% of the total energy customers in the state.
2. The highest concentration of CARE and FERA customers in California is in the Central Valley region where 34% of the total LIP customers are located, South Coast/Inland and Desert regions follow with 27% and 33% respectively.

Energy Efficiency

1. An overwhelming 86% of ZIP codes or 1,756 each saved at least 200 MWh in the first 3 quarters of 2015. Large-scale savings over 600 MWh, however, were only registered in 102 or 6% of the total ZIP codes in the state.

Water

1. Thirteen counties have average daily per capita usage of less than 80 gallons while 37 counties registered daily usage per capita usage between 80 to 160 gallons.

Broadband

1. Four counties have percentages of unserved households of 60% or higher, which means more than 60% of the populated areas in each of these counties have either service with very slow speeds or no service at all. On the other hand, 90% or more of households in 35 counties are served.