DOCKETED	
Docket Number:	18-IEPR-08
Project Title:	Energy Equity
TN #:	223922
Document Title:	Energy Equity Indicators Tracking Progress
Description:	N/A
Filer:	Stephanie Bailey
Organization:	California Energy Commission
Submitter Role:	Commission Staff
Submission Date:	6/25/2018 3:49:54 PM
Docketed Date:	6/25/2018

Energy Equity Indicators

Adding to the Energy Commission's Tracking Progress reports,[1] this report launches a set of energy equity indicators to identify opportunities and track progress for advancing the recommendations in the SB 350 Low-Income Barriers Study. This report includes nine indicators relating to clean energy access, investment, and resilience in California's low-income and disadvantaged communities. Key themes emerging from these indicators are highlighted below, illustrating how the indicators apply in different areas of the state:

- Census tracts with median household income less than 60 percent of statewide median household income (Figure 2) are likely to be eligible for most low-income clean energy programs. For 2011-2015, statewide median income was $61,818 per household per year. Sixty percent of the 2011-2015 statewide median annual income is about $37,000 per household.
- Many counties in the San Joaquin Valley have high levels of asthma-related emergency room visits (Figure 19) and heat-related illness (Figure 20). These areas are expected to see more than 1,000 additional cooling degree days per year on average, a measure used to estimate energy demand needed to cool a building, by midcentury (2035-2064) compared to 1961-1990 due to climate change.[2] For comparison, Fresno had more than 1,800 cooling degree days on average in 1961-1990.[3] Some low-income communities in these areas have low levels of investment from investor-owned electric utilities' energy efficiency programs.
- While many San Joaquin Valley counties report a fair number of clean energy jobs compared to other counties, they tend to score in the bottom 20 percent in terms of clean energy jobs per 1,000 people (Figure 27). Expanded outreach and investment for energy efficiency, rooftop solar, and access to clean transportation options including electric vehicles and associated charging infrastructure in these counties should be designed to help low-income communities improve health and safety conditions, such as asthma and heat-related illness. For example, the percentage of people owning electric vehicles is lower in the Central Valley than in other parts of the state, suggesting an opportunity for programs to focus on this region to provide greater access to electric vehicles (Figure 16).
- Regarding inland areas of Southern California, opportunities for improved clean energy services for low-income communities vary across indicators. For example, more than 140 low-income census tracts in the Southern California Edison service territory had an average 2014 August electricity bill greater than $300. Many of these inland areas,

1 The Energy Commission Tracking Progress reports provide sector-specific summaries of California's progress toward a cleaner energy future, with links to additional resources. Information and metrics are updated regularly. The reports are available at: http://www.energy.ca.gov/renewables/tracking_progress/.
2 For example, if the average temperature is 10 degrees above 65 degrees for one day in a year, there are 10 cooling degree days for that year for that location.
3 Energy Commission staff analysis using data from the Cal-Adapt Cooling Degree Days tool. Observed data for the city of Fresno (Incorporated and Census Designated Places, 2015). cal-adapt.org.

including Riverside and San Bernardino, expect to see 1,300 or more additional cooling degree days by midcentury (2035-2064) compared to 1961-1990 due to climate change (Figure 4). In San Bernardino, for example, the number and frequency of days hotter than 101.9 degrees Fahrenheit during midcentury (2035-2064) are expected to increase to 30, up from 4.3 during 1961-1990 (Figure 6). Several low-income census tracts in San Bernardino also score low on rooftop solar per capita (Figure 13).

- To reduce the risk of starting fires, electric utilities may deenergize transmission and distribution lines for several days during high risk periods, such as periods of Santa Ana wind conditions in Southern California. For example, critical facilities in western Riverside County exposed to Santa Ana conditions could increase community energy resilience by expanding the installation of microgrids (Figure 26).
- Many areas with low levels of investor-owned electric utility energy efficiency investments near low-income areas of Los Angeles County are also near areas where 70 percent of the structures were built before 1979 (Figure 11), indicating potential opportunities for energy savings from measures such as insulation. Also, many high-density low-income areas in Los Angeles County served by SCE score low on the amount of net-energy-metered rooftop solar per 1,000 people (Figure 12).
- In San Diego, public charging stations along major transportation corridors present opportunities for expanding electric vehicle ownership and car-sharing options, especially for low-income areas near these corridors (Figure 15).
- Also, areas of high roof-top solar and high plug-in electric vehicle use may offer a potential opportunity for focused investment in distributed energy storage through the self-generation incentive program (Figure 14), especially where vehicle charging occurs after sunset. Lessons learned from San Diego County (Figure 15) can inform efforts to expand access to rooftop solar, plug-in electric vehicles, and distributed energy storage in many areas of California, including low-income areas with low participation in the clean vehicle rebate program incentive opportunities (Figure 17).
- Many census tracts in Northern California are in high fire threat areas indicating potential opportunities to coordinate fire preparedness and resilient distributed energy resources to provide energy to critical facilities during planned or unplanned grid outages (Figure 23). For example, a microgrid located at the Blue Lake Rancheria emergency response center maintained local energy reliability during a 2017 fire (Figure 25).
- Several rural and tribal Northern California communities use high-cost heating fuels. This may pose a winter energy burden for low-income communities in these areas (Figure 7 and Figure 8) and cause indoor-air concerns. For example, Humboldt County ranks high on emergency visits due to asthma per capita (Figure 19).
- In Northern California, some areas of Lassen, Del Norte, Humboldt, Lake, and Colusa Counties with low levels of investor-owned electric utility energy efficiency investments also have 70 percent or more of structures built before 1979. This may indicate opportunities for energy efficiency upgrades, such as insulation and dual-pane windows (Figure 11).

- California state government has met the 25 percent minimum goal for small business participation for the past three fiscal years (Figure 28). Additional data and effort are needed to accurately track what percentage of this funding has gone to small and microbusinesses in low-income areas and disadvantaged communities and to help these businesses compete successfully for state funding.
- The Energy Commission is working to expand access to funding for energy innovation demonstration projects in disadvantaged communities (Figure 30 and Figure 31), including funding for innovative small businesses in these areas. As of December 31, 2017, $194 million was awarded for technology demonstration and deployment agreements. Of this amount, more than $61.7 million was allocated to project sites in disadvantaged communities.

As next steps, the Energy Commission anticipates continuing to work closely with other public agencies and relevant stakeholder groups to add information on natural gas and fill key data gaps identified during development of this initial energy equity indicators tracking progress report. Moving forward, Energy Commission staff plans to improve and update this report annually, in coordination with other supporting agencies. While this report illustrates the performance of unique energy equity indicators in specific regions of the state, an interactive mapping tool is available that stakeholders can use for their own analyses for each indicator. Updates of this report will be closely coordinated with California Air Resources Board (CARB), given its related efforts on clean transportation access and Assembly Bill 617(Cristina Garcia, Chapter 136, Statutes of 2017) community air monitoring, and other state and local agencies.

Low-Income Clean Energy Access, Investment, and Resilience

In December 2016, the California Energy Commission adopted the *Low-Income Barriers Study, Part A: Overcoming Barriers to Energy Efficiency and Renewables for Low-income Customers and Small Business Contracting Opportunities in Disadvantaged Communities* (Barriers Study). The study, mandated by Senate Bill 350 (De León, Chapter 547, Statutes of 2015), included 12 recommendations (Table 1) to address barriers to clean energy investment in California's low-income and disadvantaged communities.

Table 1: Energy Commission Low-Income Barriers Study Recommendations and Associated Indicators

#	Recommendation	Indicator
1	Organizing a multiagency task force to facilitate coordination across state-administered programs	Health and safety issues abated
2	Enabling community solar offerings for low-income customers	Community energy resilience
3	Formulating a statewide clean energy labor and workforce development strategy.	Clean energy jobs
4	Developing new financing pilot programs to encourage investment for low-income customers.	Energy savings
5	Establishing common metrics and encouraging data sharing across agencies and programs.	All Indicators
6	Expanding funding for photovoltaic and solar thermal offerings for low-income customers.	Rooftop solar
7	Enhancing housing tax credits for projects to include energy upgrades during rehabilitation.	Amount invested
8	Establishing regional outreach and technical assistance one-stop shop pilots.	Number served
9	Investigating consumer protection issues for low-income customers and small businesses in disadvantaged communities.	Number served
10	Encouraging collaboration with community-based organizations in new and existing programs.	High energy bills
11	Funding research and development to enable targeted benefits for low-income customers and disadvantaged communities.	Amount invested
12	Conducting a follow-up study for increasing contracting opportunities for small businesses located in disadvantaged communities.	Small businesses

Source: California Energy Commission

This Tracking Progress report was developed to advance implementation of Recommendation 5 summarized in the above table, which indicates the need for "collaboration among all program delivery agencies to establish common metrics and collect and use data systematically across programs to increase the performance of these programs in low-income and disadvantaged communities." Specific subrecommendations include directives to:

- Develop standardized energy equity indicators as metrics to ensure low-income customers are being served.
- Use these metrics to set a statewide baseline, advance energy savings, and track performance.
- Establish standardized metrics to track employment and job quality impacts of clean energy programs.

Building on the recommendations from the Barriers Study, Energy Commission staff identified a set of indicators to measure progress toward the following objectives for low-income residents and disadvantaged communities.

- **Access.** Advance access to clean energy, including actions to increase availability of product selection options, access to high-quality jobs, expansion of small business contracting opportunities, and improved access to nondebt financing offerings.
- **Investment.** Increase clean energy investment in low-income and disadvantaged communities, including technology development and demonstration funding, infrastructure investments, emergency preparedness, technical assistance, and local capacity building. Capacity building includes workforce development, small business development, outreach, and education for clean energy.
- **Resilience.** Improve local energy-related resilience, defined as energy services to support the ability of local communities to recover from grid outages and enjoy affordable energy in a changing climate. Local energy resilience includes energy reliability, energy affordability, health, and safety.

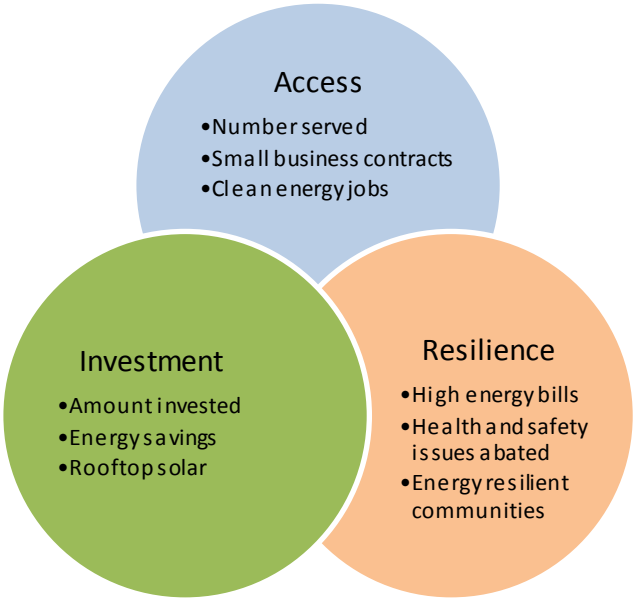
Energy Commission staff has worked with other state agencies, stakeholders, and the U.S. Department of Energy's Clean Energy for Low-Income Communities Accelerator (CELICA) initiative to develop the indicators described in this report. Staff issued a draft framework and indicators report for public comment in May 2017. An update on development of draft indicators was presented at the August 2017 business meeting. Staff plans to publish an update of this Tracking Progress report for energy equity indicators in late 2018 and annually thereafter, improving the report over time as indicators are refined and additional data become available.

This report is organized around the following questions consumers may ask when considering whether and how to seek greater access, investment, and resilience through clean energy:

- Why is my electricity bill so high in the summer (August bill)?
- How can I lower my bill with the smallest investment (energy efficiency)?
- What else can I do to lower my bill (renewable energy)?
- How can I further reduce emissions (clean transportation)?
- How will climate change affect asthma and heat-related illness in California (health and safety)?
- What other energy-related steps can be taken to improve the resilience of my community and encourage local innovation (energy resilient communities)?

Figure 1 uses a Venn diagram to illustrate how the indicators map to each objective, recognizing some indicators help advance more than one objective. For example, energy savings result from investment and access to energy efficiency. Energy savings can also improve resilience if designed to help match energy demand with supply. This Venn diagram hints there are likely to be other interactions and benefits flowing from each indicator, with the aim of stimulating innovative program and technology design to support the three objectives described above.

Figure 1: California Energy Equity Objectives and Indicators



Source: Energy Commission staff

Another view of the objectives advanced by each indicator is shown in Table 2, which groups the indicators by energy resource starting with a consumer's bill moving out to public health, jobs, and innovation. Further information on clean energy transportation is under development through the California Air Resources Board's (CARB) SB 350 *Low-Income Barriers Study, Part B: Overcoming Barriers to Clean Transportation Access for Low-Income Residents Final*.[4]

Table 2: Clean Energy Equity Indicators Relationships to Energy Equity Objectives

Indicator	Access	Investment	Resilience
High energy bills			✓
Energy efficiency: savings, amount invested, number served	✓	✓	✓
Rooftop solar		✓	
Electric vehicles	✓	✓	✓
Health and safety issues abated	✓	✓	✓
Energy resilient communities	✓	✓	✓
Clean energy jobs	✓	✓	✓
Small business contracts	✓	✓	✓
Amount invested: Innovation	✓	✓	✓

Source: Energy Commission staff

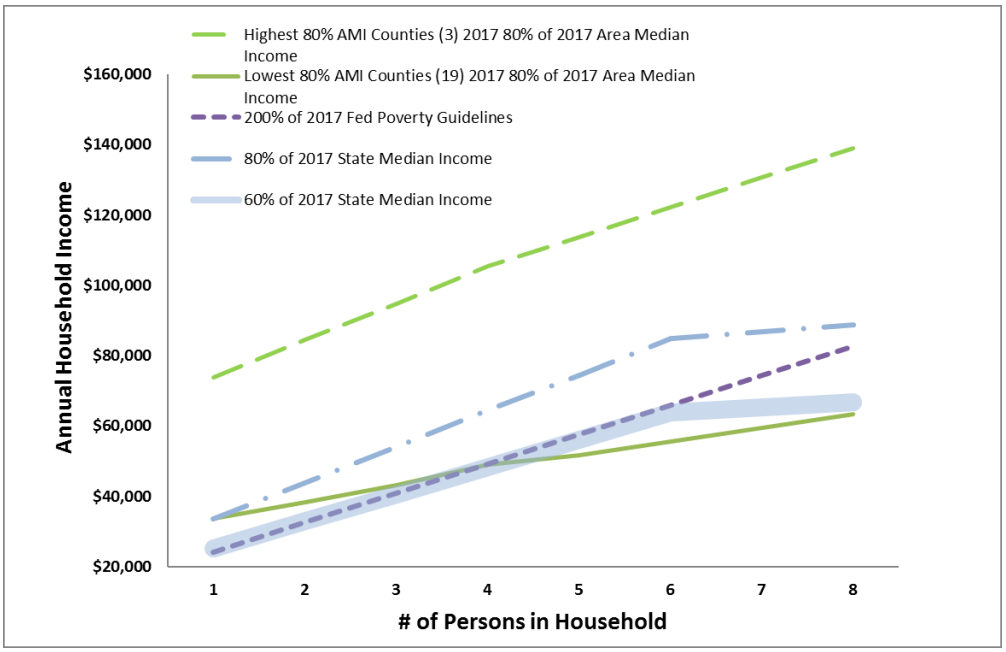
4 *Low-Income Barriers Study, Part B. Overcoming Barriers to Clean Transportation Access for Low-Income Residents Final Guidance Document*. California Air Resources Board. February 2018. Accessible at https://www.arb.ca.gov/msprog/transoptions/transoptions.htm.

Most indicators include a map to highlight geographic areas that warrant further consideration to improve clean energy access, investment, or resilience or a combination. Due to availability of data, some indicators are measured by census tract, some are measured by zip code, and others are measured by county. There are two main issues with determining low-income and disadvantaged communities by zip code: 1) there are multiple census tracts within a single zip code, and 2) a zip code boundary may transect a single or multiple census tracts. The census tract data are most appropriate for year-to-year comparison of changes to an indicator for each census tract. The county data may be evaluated this way but also lend themselves to county-to-county comparisons to help target areas for focusing attention.

California Low-Income Areas

One of the key drivers of recommendations from the Energy Commission's Barriers Study is to align program eligibility requirements. Figure 2 provides examples of eligibility requirements as translated to income per household.[5] This figure shows information for 2017. Three counties reached the highest 80 percent Area Median Income threshold. These counties were in urban and/or suburban areas. Nineteen counties reached the lowest 80 percent Area Median Income threshold. These counties were primarily in rural areas.[6]

Figure 2: Comparison of Low-Income Eligibility for Energy Programs (2017)



Source: Energy Commission staff based on data from U.S. Dept. of HHS and U.S. Dept. of HUD

5 Additional information on income eligibility requirements for affordable housing is available online at http://www.hcd.ca.gov/grants-funding/income-limits/state-and-federal-income-limits.shtml.

6 *Area Median Income* is determined by the U.S. Department of Housing and Urban Development (HUD) by county annually.

Census tracts with median income at or below 60 percent of statewide median income are likely to include many households that meet the income eligibility requirements for clean energy programs serving low-income customers (Figure 3). For example, many of the census tracts that are eligible for funding for Senate Bill 535 disadvantaged communities[7] have a median household income that is 60 percent or less of the statewide median income. However, many rural census tracts with a median household income at this level or below do not meet the definition of disadvantaged communities. In many cases this is because communities have good environmental quality, but this definition is also subject to a number of other complicating factors, such as being located on tribal lands. By highlighting opportunities to expand access to clean energy in areas at or below 60 percent of statewide median income, these indicators aim to simplify matchmaking between unmet low-income community needs and available program funding.

For 2011-2015, statewide median income was $61,818 per household per year.[8] Sixty percent of the 2011-2015 statewide median income is about $37,000. The median household income in the census tracts identified as low income is about $31,000.

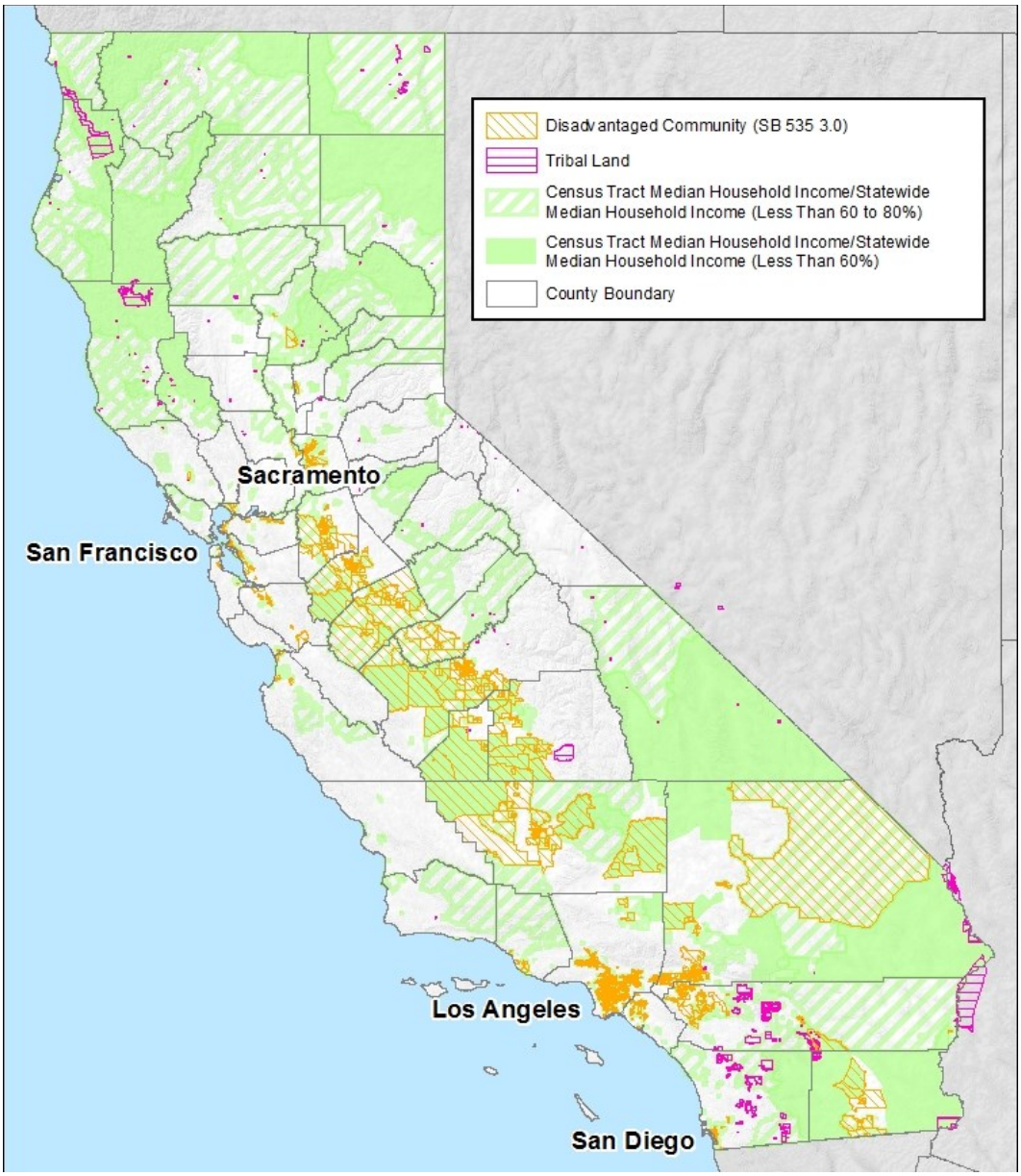
Table 3 illustrates the percentage of California low-income investor-owned utility customers that are renters and live in multifamily housing, as estimated by participants in the Energy Savings Assistance (ESA) and California Alternative Rate for Energy (CARE) programs for 2015. This table highlights the importance of state agencies designing clean-energy programs that target renters, with particular focus on addressing the unique challenges associated with multifamily buildings. Both arrangements require careful consideration of benefits for building owners in addition to tenants. The numbers shown in this table may not represent the entire low-income and disadvantaged population of each utility, as Southern California Edison has separately reported that 40 percent of households are in disadvantaged communities or have subsidized electric rates or both.[9]

Challenges to increasing energy investment in low-income areas, especially in multifamily housing, include diverse building characteristics and needs, complex ownership and financial arrangements, and limited budgets with restricted opportunities to take on additional debt. The

7 *Disadvantaged communities* are defined as California census tracts facing the highest environmental burdens, as determined by economic, environmental, and socioeconomic factors including low income, high unemployment, poor health conditions, air and water pollution, and hazardous wastes. SB 535 (De León, Chapter 830, Statutes of 2012) directs the California Environmental Protection Agency (CalEPA) to identify disadvantaged communities for funding, and as of April 2017, CalEPA uses the top scoring 25 percent of communities using the CalEnviroScreen 3.0 tool to make this determination.
8 American Community Survey (ACS) 5 Year Estimates (2011-2015) – California Census Tracts: https://www.census.gov/programs-surveys/acs/.
9 Presentation by Adam Smith of Southern California Edison at Integrated Energy Policy Report workshop on August 29, 2017. Slide 10. Available at http://docketpublic.energy.ca.gov/PublicDocuments/17-IEPR-09/TN220908_20170825T132632_SCE_Climate_Resilience_and_Disadvantaged_Communities.pdf.

Barriers Study recommended developing a comprehensive multifamily building distributed energy resource action plan to help identify detailed strategies to address these challenges. To inform this action plan and updates to this Tracking Progress report, benchmarking data for the state's largest multifamily buildings will be considered once they are made publicly available as required by Assembly Bill 802 (Williams, Chapter 590, Statutes of 2015).

Figure 3: California Tribal Lands, SB 535 Disadvantaged Communities, and Low-Income Communities



Source: U.S. Census Bureau 2010 census tract boundaries; 2011-2015 American Community Survey (ACS) five-year estimates; Bureau of Indian Affairs Pacific Regional Office 2017; CalEnviroScreen 3.0, 2017

Table 3: California 2015 Investor-Owned Utility Low-Income Customer Statistics

	PG&E	SCE	SCG	SDG&E
Percent of ESA Low-Income Customers That Are Renters[1]	56%	45%	46%	70%
Percent of ESA Low-Income Customers in Multifamily Households[1]	22%	21%	22%	48%
Percent of Total Customers on CARE[2]	26%	30%	29%	20%
Number of Customers on CARE[2]	1.4 M	1.3 M	1.6 M	0.3 M
Total Annual CARE Subsidy Amounts	$558.6 M	$372.6 M	$102.3 M	$76.4 M
Average Annual CARE Subsidy per Customer[2]	$392	$291	$66	$282

[1]Numbers based on ESA Program participants, which may not represent the entire low-income population of each IOU territory. The *ESA Program Multifamily Segment Study Report* (The Cadmus Group, Inc., 2013) contains additional information on low-income IOU customers in multifamily housing.
[2]CARE enrollment and number of active accounts vary slightly from month to month. These numbers are based on December.
Source: California Public Utilities Commission ESA/CARE information

High Energy Bills: August Electricity Bill and Rural Heating Bills

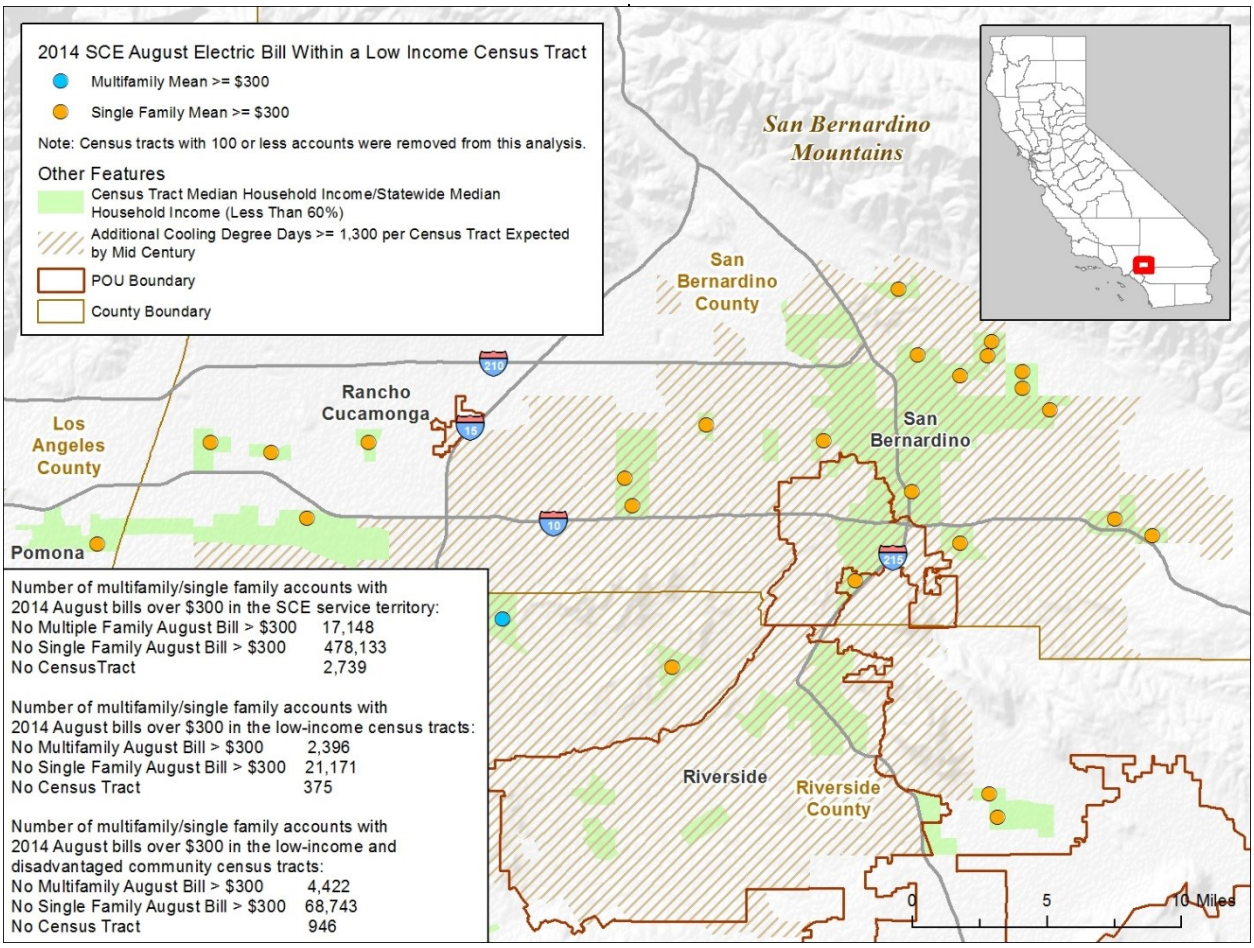
In the Southern California Edison (SCE) service territory, many low-income census tracts with low energy savings from existing energy efficiency programs also have August electricity bills of $300 or more. The average SCE August 2014 bill amount for low-income census tracts was about $148 for multifamily residences and about $270 for single-family homes. Greater awareness and access to energy efficiency programs, as well as development of new energy efficiency pilots focusing on these low-income areas, can strengthen energy resilience by improving affordability and relieving energy burden. The 2016 bill statistics for SCE, SDG&E, and PG&E on the summer bills by climate zone for CARE and non-CARE customers indicate the upper range of summer CARE bills rises above $300 in the following Title 24 building climate zones: 10 (Riverside and other inland Southern California areas west of mountains), 11 (Red Bluff and other areas of Northern Sacramento Valley), 13 (Fresno and other areas of Southern San Joaquin Valley), 14 (inland San Diego County near Palmdale and high desert east of the San Bernardino mountains), and 15 (Palm Springs, Salton Sea, and Colorado desert regions of southeastern California).

Figure 4 shows low-income census tracts in the SCE service territory with the top 20 percent of accounts with August 2014 electricity bills averaging $300 or more. This information can be used to identify high-priority areas for energy efficiency upgrades to improve energy affordability for low-income customers. If a census tract has fewer than 100 accounts, it is not included.

This map also shows census tracts expected to have 1,300 or more additional cooling degree days per year on average during the 2035-2064 period compared to the 1961-1990 period. Statewide, about 990 additional cooling degree days per year are expected on average during

the 2035-2064 period compared to the 1961-1990 period.[10] For comparison, the average number of cooling degree days in San Bernardino from 1961-1990 was 1,360.[11] The number of cooling degree days indicates how often local temperatures reach above 65 degrees and by how many degrees that base temperature is exceeded. Billing data for the area served by the Riverside publicly owned electric utility (POU) are not included in Figure 4.

Figure 4: Low-Income Areas With Highest August Electricity Bill (SCE, 2014)



Source: Energy Commission analysis based on CPUC historical data; CalAdapt for cooling degree days; U.S. Census Bureau 2010 census tract boundaries; 2011-2015 ACS

According to the Low-Income Needs Assessment[12] completed for the California Public Utilities Commission (CPUC) in December 2016, if home energy costs are 6 percent or more of

10 Energy Commission staff analysis using data from the Cal-Adapt Cooling Degree Days tool. HadGEM2-ES (warm/Dry) climate model. RCP 8.5. cal-adapt.org.

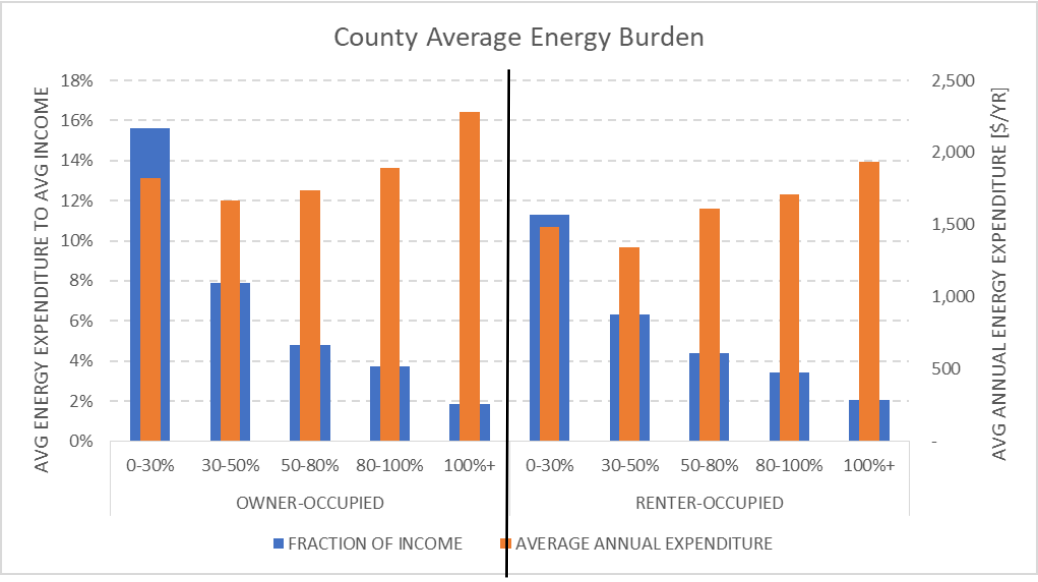
11 Energy Commission staff analysis using data from the Cal-Adapt Cooling Degree Days tool. Observed Data for the City of San Bernardino (Incorporated and Census Designated Places, 2015). cal-adapt.org.

12 *Needs Assessment for the Energy Savings Assistance and the California Alternate Rates for Energy*

household income, there is an energy burden. For the low-income areas shown in green on Figure 4, this burden would equate to a monthly energy bill higher than $180.[13] A threshold of $300, or a bill equal to almost 10 percent of monthly income for a family of two using the same definition, was selected to highlight those low-income areas in greatest need of energy efficiency to reduce summer electricity use, recognizing that monthly electricity bills vary substantially from month to month in Southern California. More than 23,567 households in low-income census tracts in the SCE service territory received an August electricity bill more than $300 in 2014, and the number of hot days is expected to increase due to climate change.

For comparison, Figure 5 shows low-income areas of Riverside County (with 80 percent or less of area median income) pay between 4 percent and 15 percent (or so) of average income for energy (about $1,500-$1,800 per year on average).[14] These data for Riverside County include areas served by SCE and areas served by Riverside Public Utilities.

Figure 5: Low-Income Energy Affordability Data: Riverside County (2015)



Source: U.S. Department of Energy, Clean Energy for Low Income Communities Accelerator

As illustrated by Figure 6, the average number of days with a high above 101.9 degrees Fahrenheit in San Bernardino was 4.3 from 1961-1990. From 2035-2064, this number is expected to increase to 30.[15] This scenario suggests that some areas with high August

Programs, Final Report, Evergreen Economics, December 15, 2016.

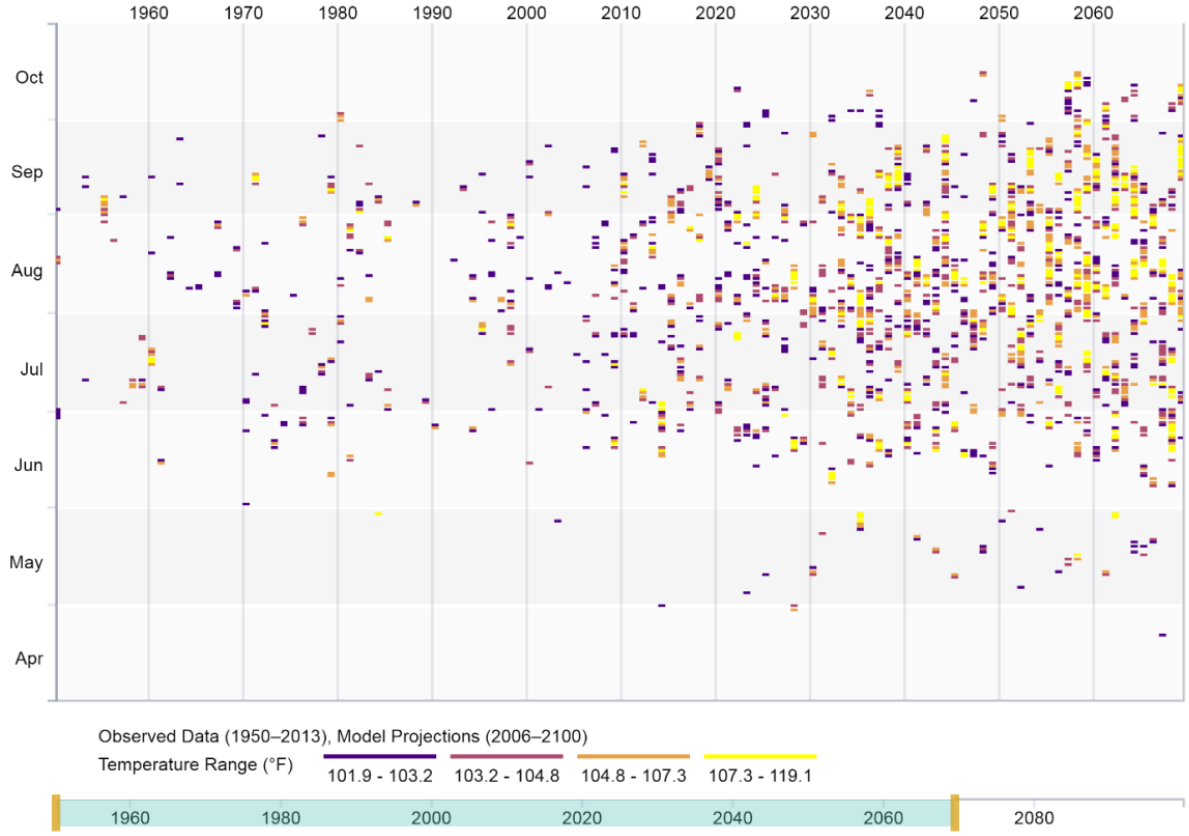
13 Census tracts with median income 60 percent or lower than the statewide median income, 2014 census estimate

14 The orange bars represent the average energy expenditure in dollars per year by percentage of area median income. The blue bars represent the average percentage of customer income devoted to energy expenses for the same area median-income segments.

15 Cal-Adapt Extreme Heat tool. RCP 8.5. cal-adapt.org.

electricity bills are expected have even larger bills as the number of extremely hot days increases over the next several decades and drives additional cooling demand.

Figure 6: Trend in Frequency and Temperature of Extreme Heat Days in San Bernardino Through Midcentury From HadGEM2-ES (warm/dry) Climate Model

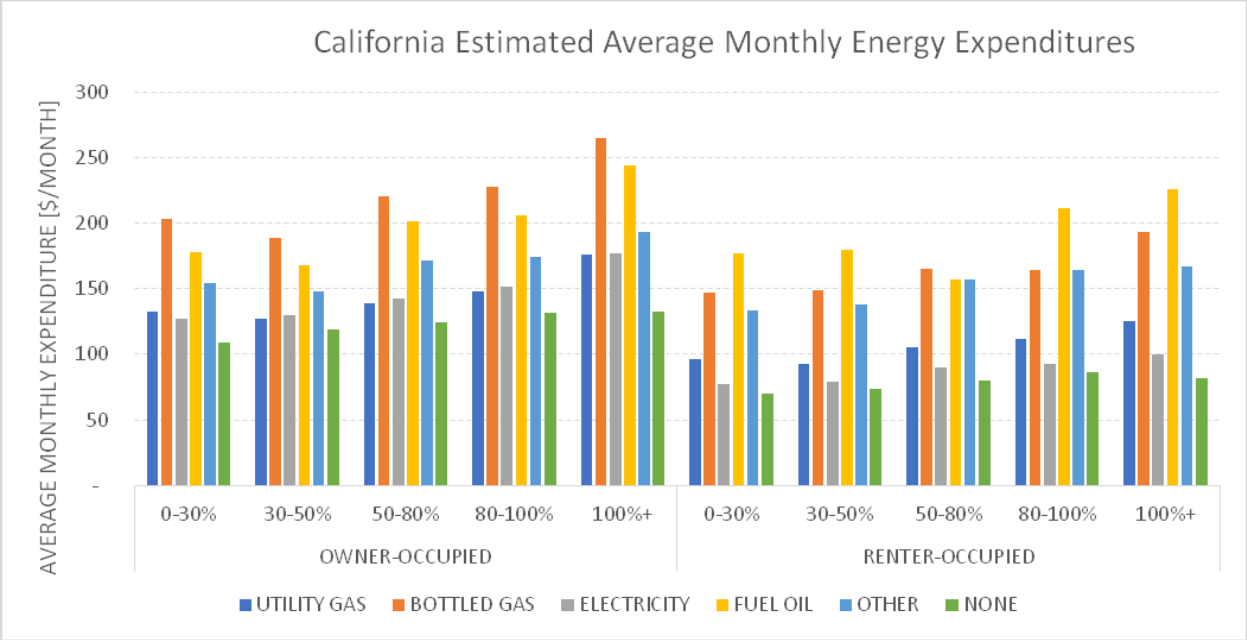


Source: Cal-Adapt Extreme Heat Tool. www.cal-adapt.org, RCP 8.5 Scenario. HadGEM2-ES (warm/dry) climate model

As additional data become available, it will be important to develop a similar indicator that tracks high heating bills for low-income customers in the coldest winter months. This could be an important indicator of energy burden, particularly for rural communities that use propane or other expensive fuels as a primary heating source.

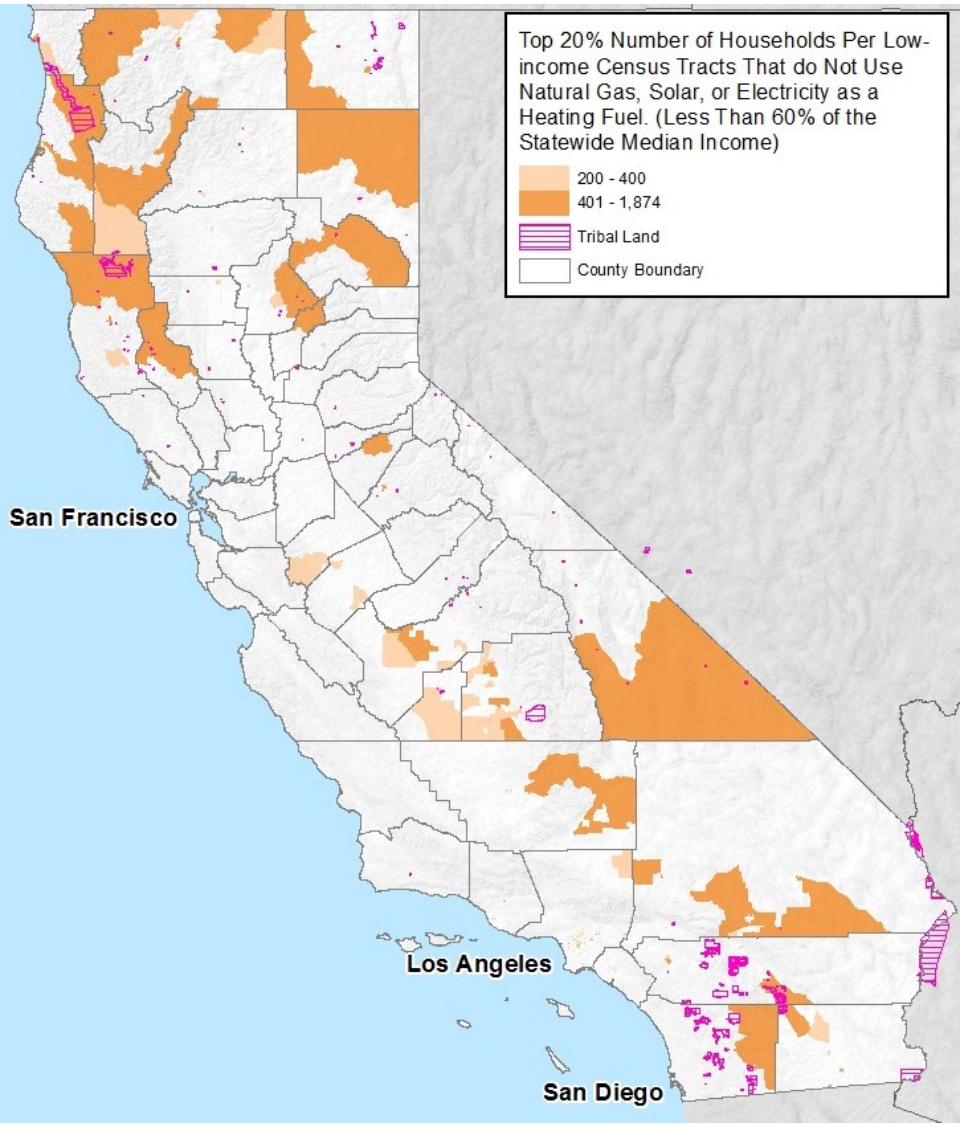
As illustrated by Figure 7, propane, fuel oil, and other fuels are generally more expensive than electricity and natural gas on a statewide average basis. Many rural and tribal areas have a high number of households that do not use natural gas or electricity for heating, which may result in a high winter energy bill and lead to indoor air-quality issues. For example, estimated average monthly energy expenditure ($/month in 2015) for heating with bottled gas or fuel oil in California range from about $150 per month to more than $250 per month. Estimated energy expenditures for heating with utility gas in California ranges from less than $100 per month to about $175 per month. Figure 8 shows use of high-cost heating fuel in low-income areas.

Figure 7: California Estimated Average Monthly Expenditure by Fuel Type (2015)



Source: U.S. Department of Energy, Clean Energy for Low Income Communities Accelerator

Figure 8: Use of High-Cost Heating Fuels in Low-Income and Tribal Areas (2016)



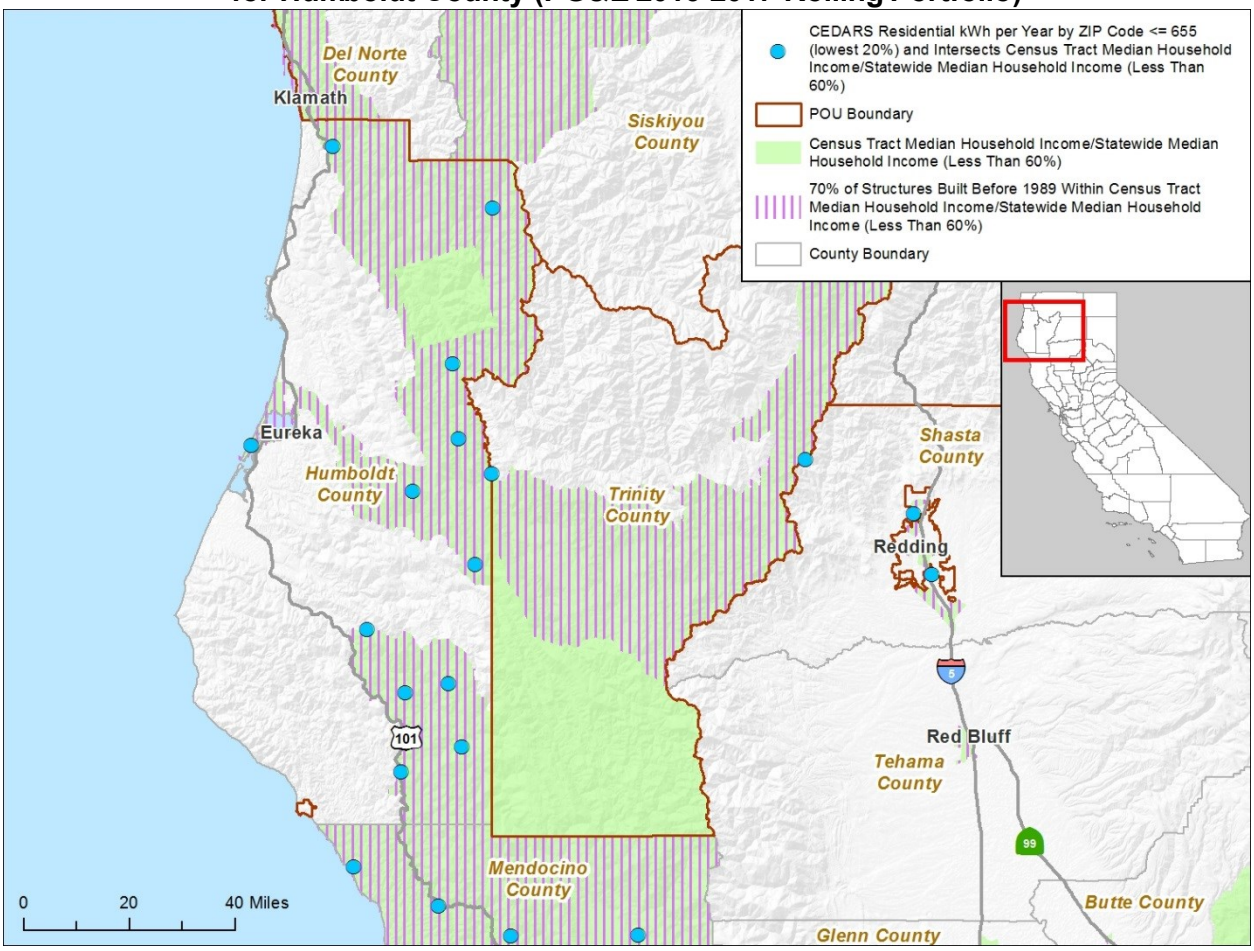
Sources: U.S. Census Bureau, 2012-2016 American Community Survey Five-Year Estimates, House Heating Fuel Table B25040; U.S. Census Bureau, 2016 TIGER/Line Shapefile Census Tract Boundaries; U.S. Census Bureau, 2011-2015 American Community Survey Five-Year Estimates, Median Income in the Past 12 Months Table S1903; Bureau of Indian Affairs Pacific Regional Office, 2017

Energy Efficiency: Savings

The Barriers Study included recommendations for a series of new energy upgrade financing pilots. The pilot programs would include the cost of health and safety measures required to accomplish energy efficiency upgrades. The energy savings indicator can be used to help track the effect of these programs to increase energy savings in low-income communities. Staff plans to add data for other areas of the state in updates of this indicator. Moreover, staff plans to track trends in energy savings across low-income and disadvantaged communities annually.

Figure 9 and Figure 10 show energy savings from the 2016-2017 rolling portfolio of IOU energy efficiency investments. Identifying areas with low energy savings can indicate which areas may benefit from additional energy efficiency upgrade investments and improved program offerings.

Figure 9: Low-Income Areas With Low Residential Energy Savings (Net Reported GWh) for Humboldt County (PG&E 2016-2017 Rolling Portfolio)

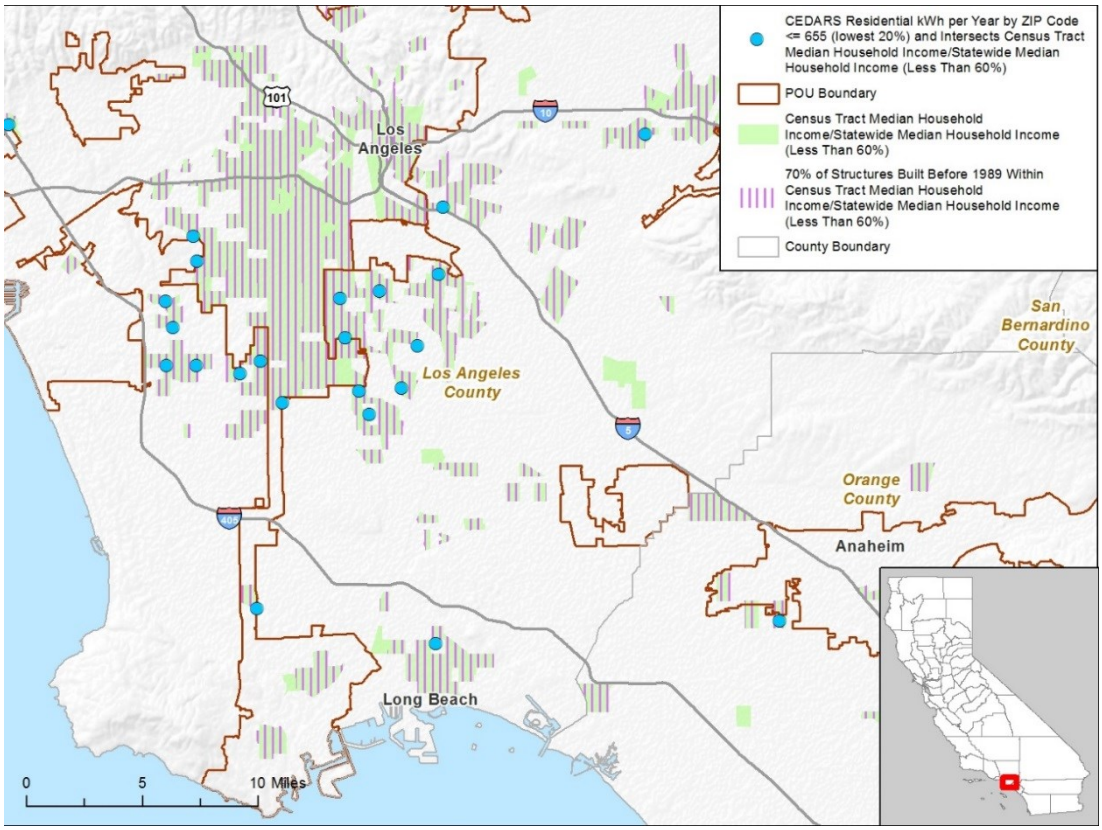


Sources: CPUC – California Energy Data and Reporting System (CEDARS), May 18, 2018; U.S. Census Bureau 2010 census tract boundaries; 2011-2015 American Community Survey (ACS) five-year estimates

Improving energy efficiency in the SCE service territory is a high priority to help maintain energy reliability as work to permanently close the Aliso Canyon natural gas storage facility moves forward.[16] Figure 10 highlights low-income areas with low residential energy savings (net reported GWh) for SCE Portions of Los Angeles Area (2016-2017 Rolling Portfolio).

16 For further information, please see the *2017 Integrated Energy Policy Report*, available online at http://www.energy.ca.gov/2017_energypolicy/.

Figure 10: Low-Income Areas With Low Residential Energy Savings (Net Reported GWh) for SCE Portions of Los Angeles Area (2016-2017 Rolling Portfolio)

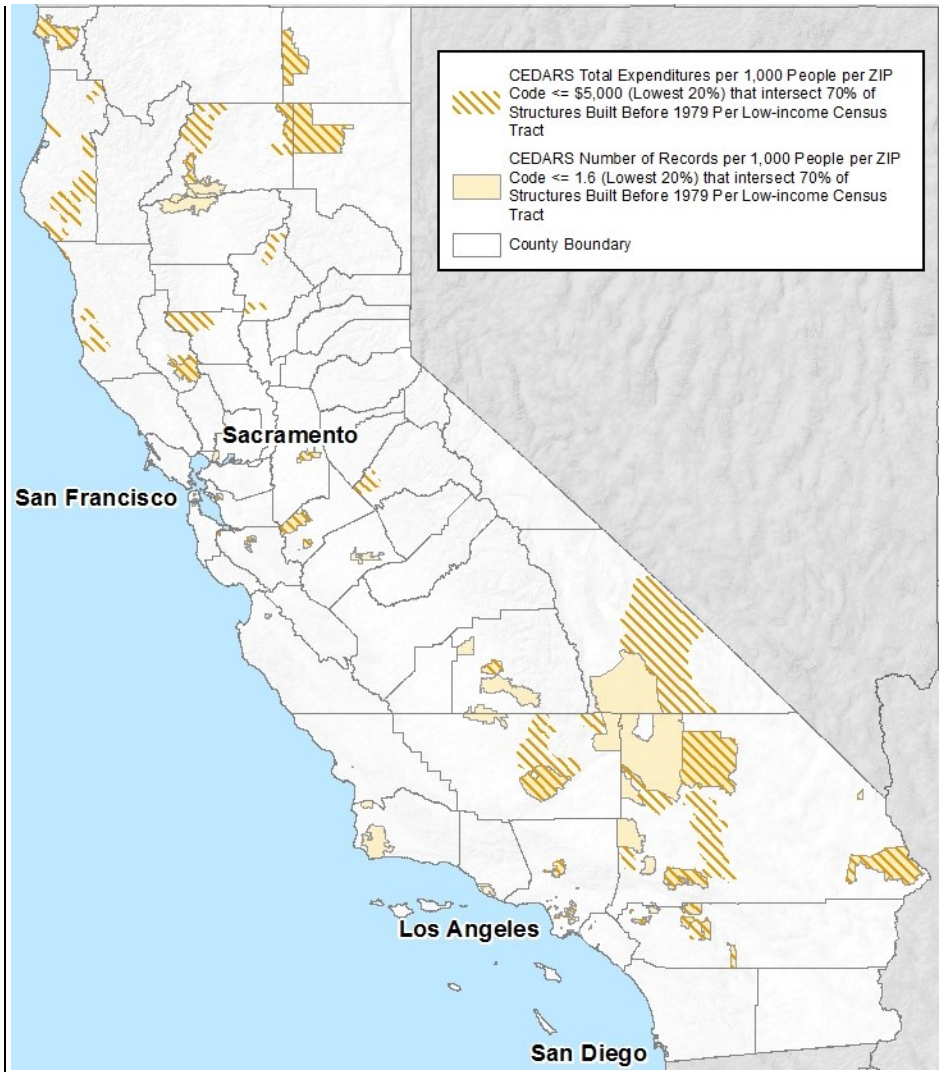


Sources: CPUC – CEDARS, May 18, 2018; U.S. Census Bureau 2010 census tract boundaries; 2011-2015 American Community Survey (ACS) five-year estimates

Energy Efficiency: Amount Invested and Number Served

Figure 11 shows low levels of participation and low levels of investor-owned electric utility energy efficiency investments near low-income areas that are also near areas with more than 70 percent of structures built before 1979. For 2016-2017 data (downloaded November 7, 2017), investor-owned electric utility energy efficiency investments averaged more than $8,760 per 1,000 people in their service territories. The locations (indicated by orange stripes) shown in this figure have $5,000 or less per 1,000 people. Also, for 2016 and much of 2017, on average about 8 households per 1,000 people per zip code in the investor-owned electric utility service areas participated in energy efficiency programs. This figure highlights areas with 1.6 or less (lowest 20 percent) participating household per 1,000 people per zip code (shown in solid beige). The locations noted on this map may be good candidates for energy efficiency upgrades. These locations may also highlight opportunities for launching additional regional service centers or one-stop shop pilots to improve market delivery and streamline services, potentially driving increased participation in energy efficiency programs and resultant efficiency savings. Publicly owned utility (POU) territories have been excluded from this analysis.

Figure 11: Areas With Lowest IOU Energy Efficiency Investments (2016-2017)



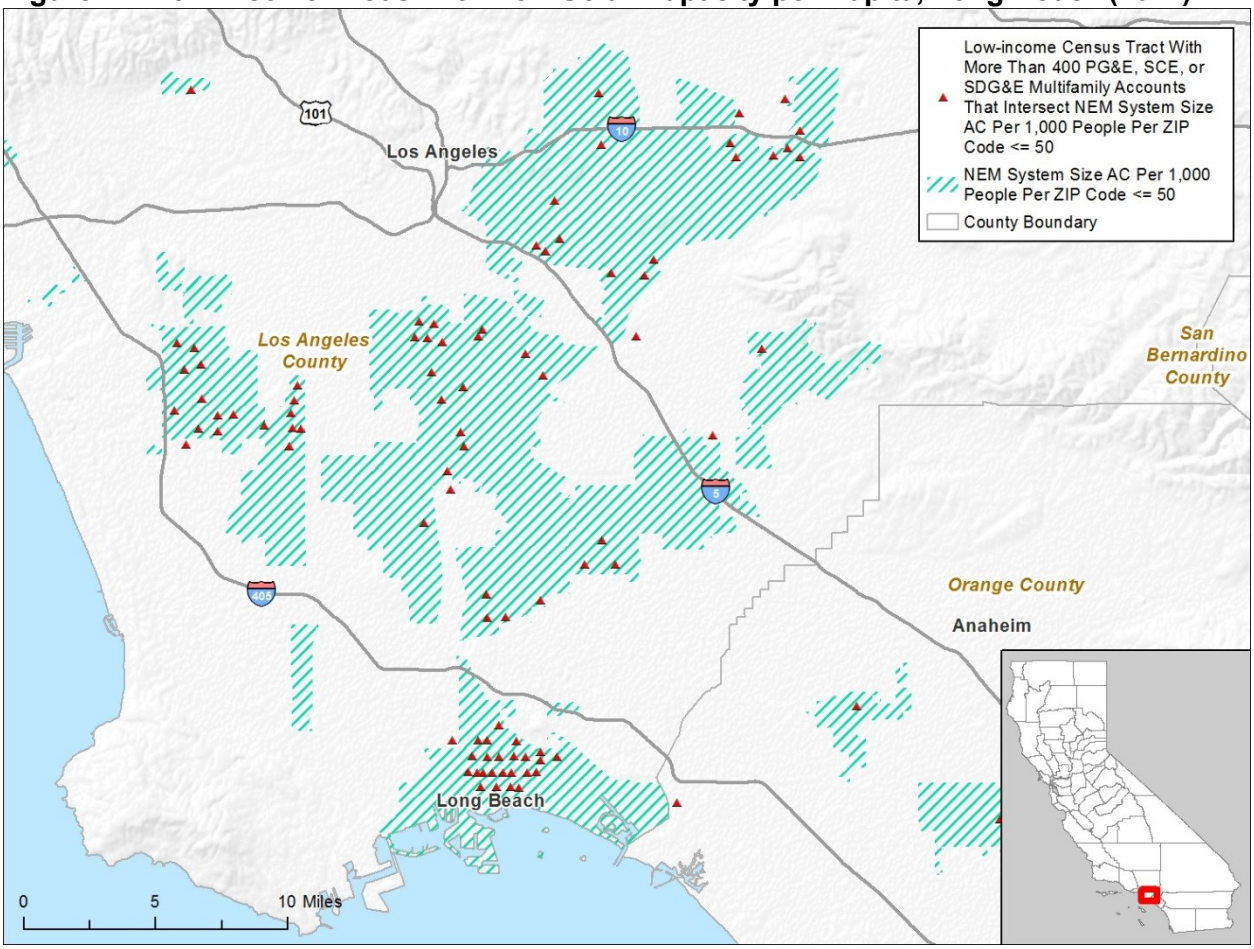
Source: CPUC – California Energy Data and Reporting System (CEDARS); U.S. Census Bureau 2010 census tract boundaries; 2011-2015 American Community Survey (ACS) five-year estimates; ESRI zip codes – 2015 population estimate

Rooftop Solar

Figure 12 and Figure 13 show low-income census tracts with the lowest number of installed kilowatts of rooftop photovoltaic system capacity per thousand people in investor-owned utility territories. The average number of multifamily accounts per zip code (indicated by red triangles) is about 1,220. The average number of multifamily accounts per zip code in investor-owned electric utility areas (SCE, San Diego Gas & Electric Company [SDG&E], and Pacific Gas and Electric Company [PG&E]) is about 660. Publicly owned electric utility data are not displayed. These maps include net-energy-metering (NEM) rooftop solar capacity installed in the SCE service territory. This information can be used to identify high-priority areas for expansion of

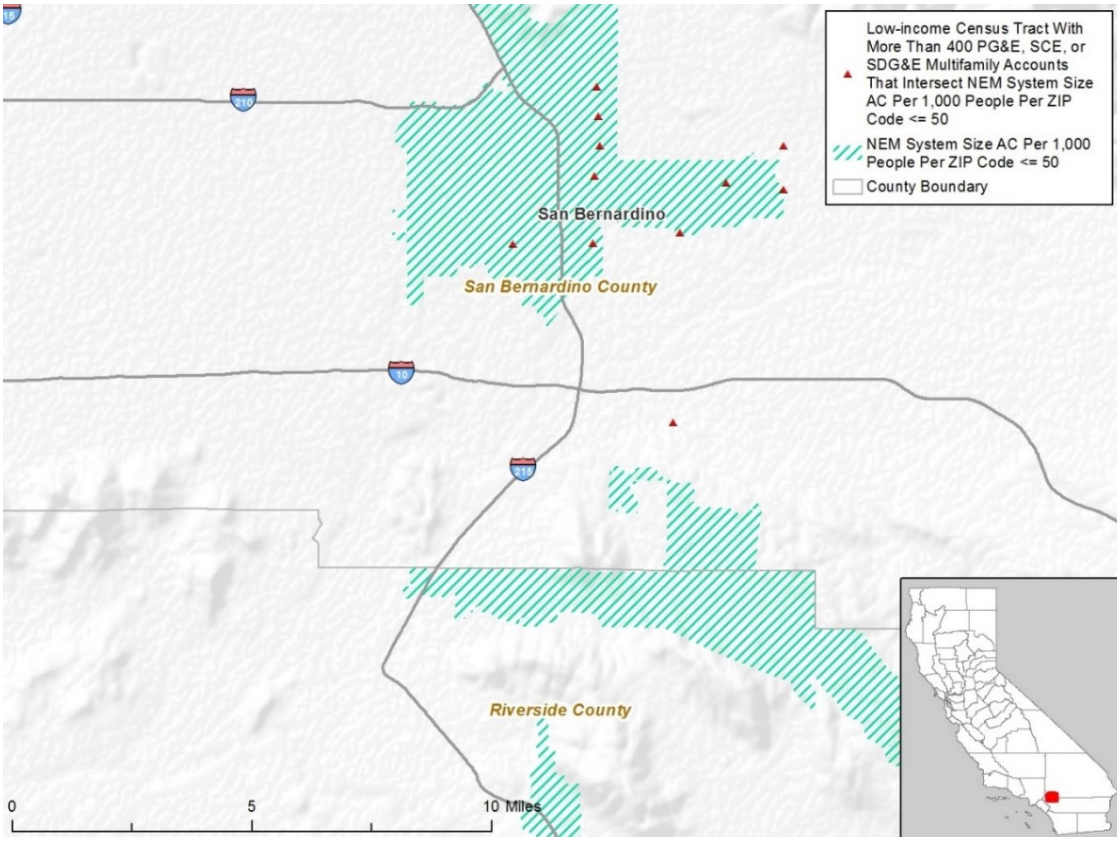
rooftop solar access and tracking of low-income customer adoption of rooftop solar. Increasing access to rooftop solar for low-income customers can reduce energy burden, especially in summer months, if energy use coincides with periods of sunshine or rooftop solar is combined with energy storage that can be discharged after the sun sets.

Figure 12: Low-Income Areas With Low Solar Capacity per Capita, Long Beach (2017)



Source: California Distributed Generation Statistics; Energy Commission analysis based on CPUC historical data; U.S. Census Bureau 2010 census tract boundaries; 2011-2015 American Community Survey (ACS) five-year estimates; Esri zip codes

Figure 13: Low-Income Areas With Low Solar Capacity per Capita, San Bernardino (2017)

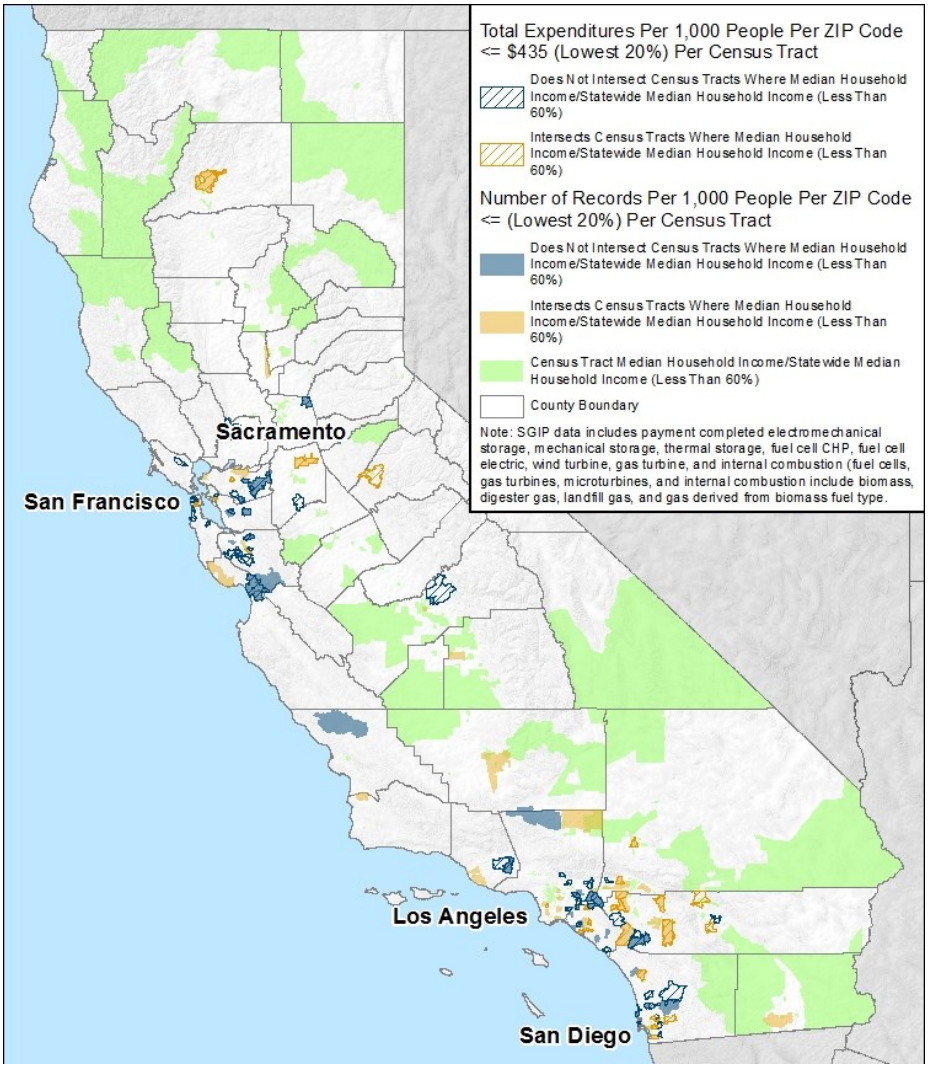


Source: California Distributed Generation Statistics; Energy Commission analysis based on CPUC historical data; U.S. Census Bureau 2010 census tract boundaries; 2011-2015 American Community Survey (ACS) five-year estimates; Esri zip codes

Investments in Other Renewable Self-Generation Technologies

In addition to rooftop solar, other renewable self-generation technologies, including associated energy storage, are eligible for incentives in California. As directed by the CPUC, California's investor-owned utilities have invested about than $250 million in completed systems using the following self-generation technologies for businesses and homes: wind turbines; fuel cells, gas turbines, microturbines, and internal combustion engines using renewable fuels; and associated eligible energy storage systems. The statewide average investment per zip code per 1,000 people is about $54,800, with the lowest 20 percent per 1,000 people receiving $435 or less per 1,000 people through April 17, 2018. In low-income areas, the average investment per 1,000 people is about $21,400 during this period. Of the zip codes in investor-owned utility service territories with the lowest 20 percent of SGIP investments per 1,000 people per zip code, those zip codes in low-income areas are shown in Figure 14. These areas indicate opportunities to expand outreach and raise awareness of available renewable self-generation incentives for residential and commercial customers in California's investor-owned utility service territories.

Figure 14: Self-Generation Incentive Program Opportunities for Further Investment



Source: California Self-Generation Incentive Program. https://www.selfgenca.com/; U.S. Census Bureau 2010 census tract boundaries; 2011-2015 American Community Survey (ACS) five-year estimates

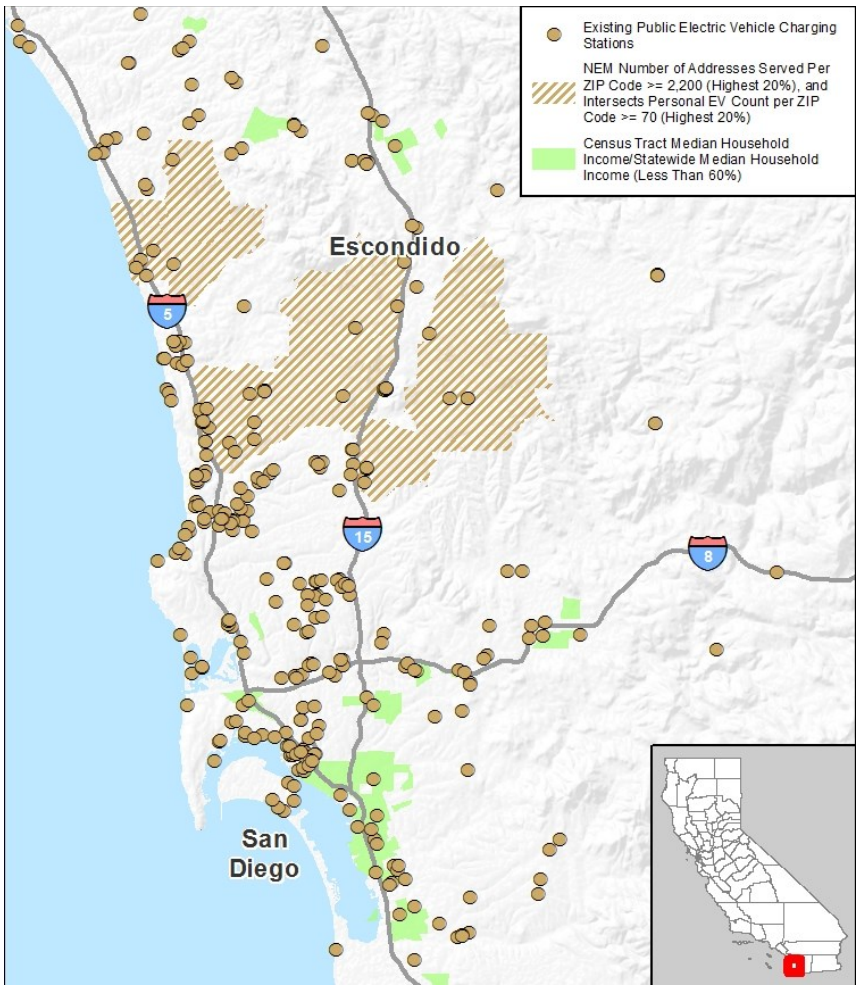
Electric Vehicles

As illustrated in Figure 15, areas of high electric vehicle (EV) counts per zip code coincide with areas of high NEM participation in San Diego, indicating rooftop generation during the day may be pulled from the grid at night to charge EVs. This suggests a potential opportunity for investment in distributed energy storage as rate structures move to reward midday energy use, when rooftop solar generation is plentiful. For further discussion of the benefits of energy storage, refer to the Energy-Resilient Communities section. In 2017, the NEM number of addresses served in investor-owned electric utility service areas averaged about 480 per zip code. The areas shown (in stripes) in Figure 15 averages more than 2,600 NEM addresses

served per zip code. In 2016, the number of PEVs per zip code statewide averaged about 4.4. For the area shown (in stripes), the number of PEVs per zip code averaged about 4.9 in 2016.

Public charging stations in San Diego are available along major transportation corridors, providing important infrastructure to encourage growth of electric vehicle (EV) transportation ownership and car-sharing options across highly populated areas of the region, including low-income areas along these corridors (Figure 15). Expansion of transportation electrification may provide significant non-energy benefits for disadvantaged communities near these corridors due to a reduction in associated localized air pollutants. Car-sharing programs and other clean transportation options may have the added benefit of reducing parking effects from employees of local businesses in the region.

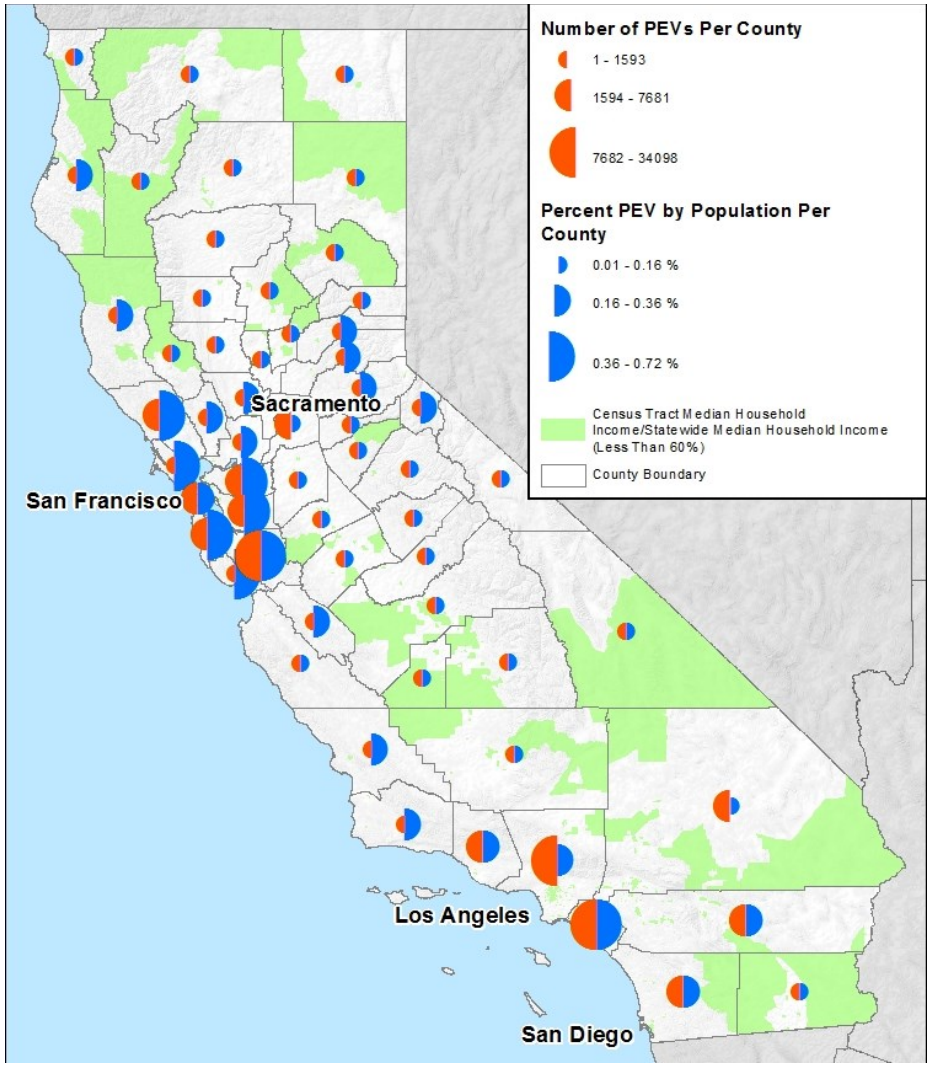
Figure 15: Opportunities Related to Electric Vehicles in San Diego



Sources: Energy Commission staff analysis; Department of Motor Vehicles; California Distributed Generation Statistics; U.S. Census Bureau 2010 census tract boundaries; 2011-2015 American Community Survey (ACS) five-year estimates; Esri zip codes

Figure 16 shows the number of plug-in EV sales in 2016 aggregated, or assembled, at the county level, including both total number of sales with the orange-shaded semicircles and levelized by population with the blue semicircles. The average number of plug-in EVs per county in 2016 was about 2,020. The average percentage of plug-in EVs per person by county in 2016 was about 19 percent. The semicircles are placed in the center of each county but represent data for the whole county. The number and percentage of EV ownership are lower in the Central Valley than in other parts of the state, suggesting an opportunity for programs to focus on this region to provide greater access to EVs, and supporting charging infrastructure, through ownership or car-sharing incentives.

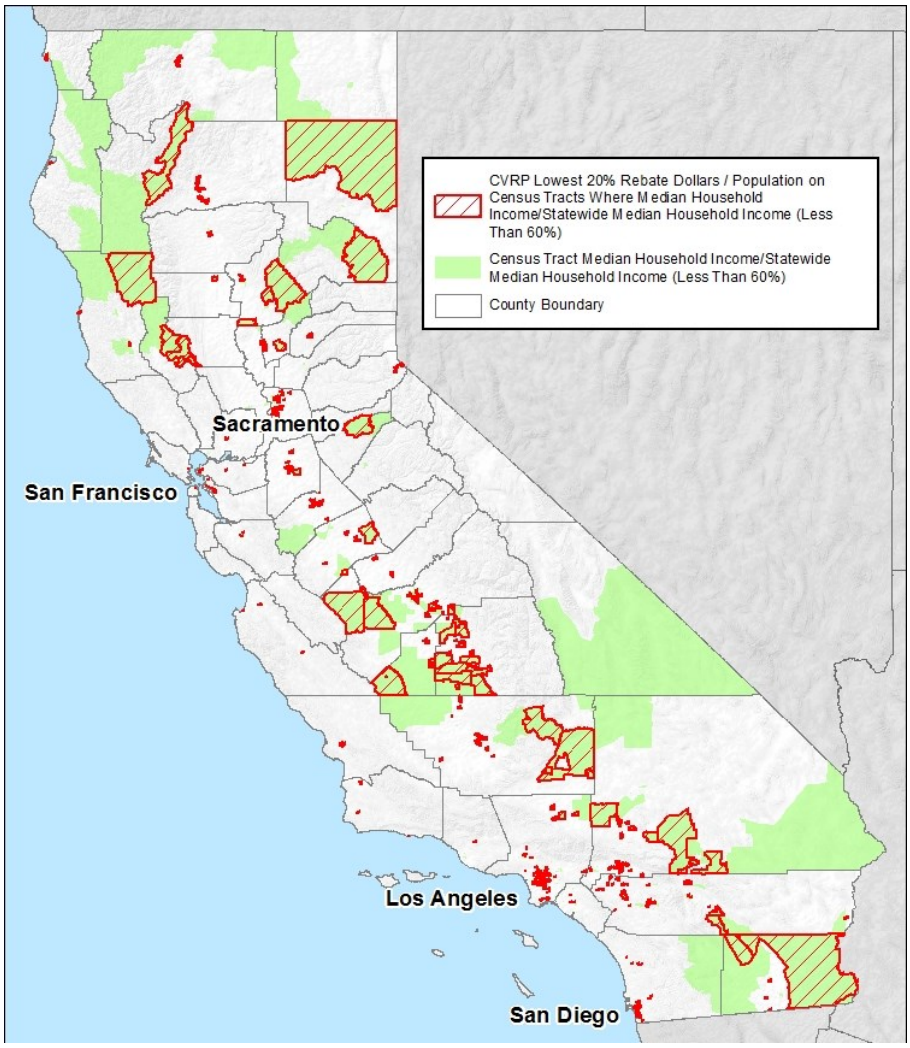
Figure 16: Number of Cumulative Plug-In Electric Vehicle Sales as of 2016 by County



Source: Department of Motor Vehicles; U.S. Census Bureau 2010 census tract boundaries; 2011-2015 American Community Survey (ACS) five-year estimates. Semicircles are placed in the center of each county but represent data for the whole county

Incentives have been a key driver of growing EV sales and adoption. Over the first five years of the program, roughly three-quarters (>74 percent) of eligible vehicle purchases and leases received Clean Vehicle Rebate Program (CVRP) rebates.[17] Figure 17 highlights low-income census tracts with the lowest uptake of CVRP funding, indicating opportunities for additional investment to promote EV adoption in these communities. One example area is the Central Valley, which has low-income areas with low sales and low uptake in EV incentives.

Figure 17: Clean Vehicle Rebate Program Incentive Opportunities in Low-Income Areas



Source: California Clean Vehicle Rebate Project; U.S. Census Bureau 2010 census tract boundaries; 2011-2015 American Community Survey (ACS) five-year estimates

17 Center for Sustainable Energy (2018). California Air Resources Board Clean Vehicle Rebate Project, Rebate Statistics. Data last updated April 11, 2018. Retrieved April 2018 from https://cleanvehiclerebate.org/eng/rebate-statistics.

As of March 2016, higher-income consumers became ineligible to participate in the CVRP, and low-to-moderate-income consumers became eligible for increased rebate amounts.[18] This approach may promote opportunities to increase access to clean transportation and associated air quality benefits in low-income and disadvantaged communities. Similarly, the CVRP Public Fleet Rebate Program offers increased rebates for electric vehicle fleets to public agencies in disadvantaged communities. The maximum rebate amount is $7,000 for fuel-cell EVs, $4,500 for battery or range-extended EVs, and $3,500 for plug-in hybrid EVs.[19]

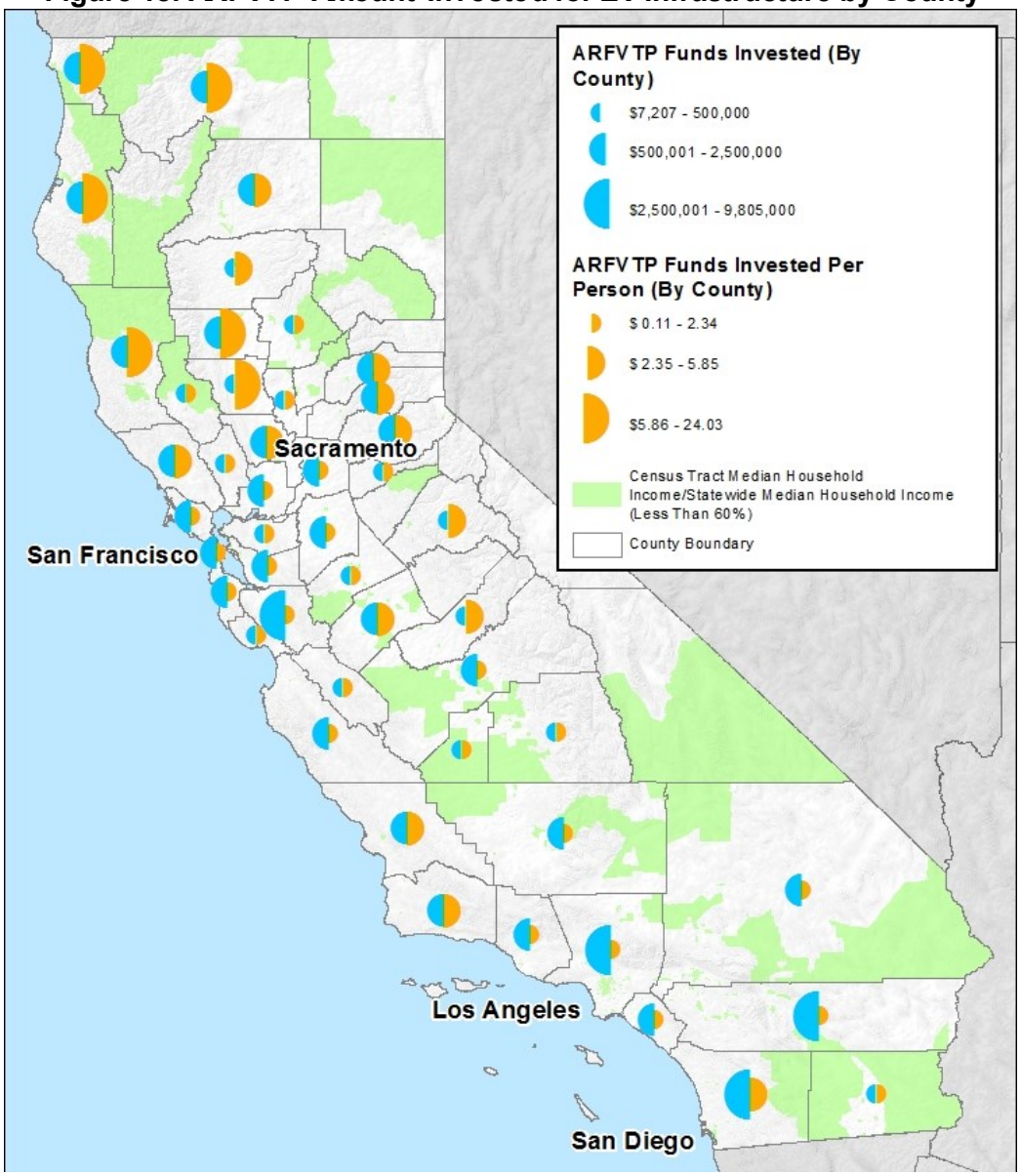
As noted by stakeholders, other EV incentive programs exist in California and provide benefits to low-income customers. In an update to this report, Energy Commission staff plans include a more comprehensive list of programs. Another highlight is the launch of CVRP Rebate Now! pilot in the San Diego area, which allows consumers to get preapproved for a rebate before purchasing/leasing an eligible vehicle.[20]

In January 2018, Governor Edmund G. Brown Jr. announced a new target of 5 million zero-emission vehicles (ZEVs) in California by 2030 and proposed a new ZEV initiative to provide $2.5 billion over eight years.[21] California uses a variety of strategies to expand access to clean transportation and to ensure adequate infrastructure is in place to support the growing number of EVs, including the CVRP and EFMP programs described above.

Figure 18 shows the amount invested through one of these programs, the Alternative and Renewable Fuel and Vehicle Technology Program (ARFVTP). This competitive grant program provides as much as $100 million each year for clean transportation projects. Through 2017, the program has invested more than $600 million for more than 540 clean transportation projects. The average investment per county is $1.3 million. The average investment per person per county is $4.

18 More information on CVRP income eligibility: https://cleanvehiclerebate.org/eng/income-eligibility.
19 For additional information, visit https://cleanvehiclerebate.org/eng/pfp.
20 See https://cleanvehiclerebate.org/eng/rebatenow.
21 See http://www.ebudget.ca.gov/2018-19/pdf/BudgetSummary/ClimateChange.pdf and https://www.gov.ca.gov/2018/01/26/governor-brown-takes-action-to-increase-zero-emission-vehicles-fund-new-climate-investments/.

Figure 18: ARFVTP Amount Invested for EV Infrastructure by County



Source: California Energy Commission; U.S. Census Bureau. Semicircles are placed in the center of each county but represent data for the whole county

Among other ARFVTP projects, the Energy Commission has established the California Electric Vehicle Infrastructure Project (CALeVIP) to help target specific gaps in the availability of electric vehicle charging infrastructure. The first round of available funding is anticipated to provide $4 million to support the installation of Level 2 charging stations at businesses and multiunit dwellings throughout Fresno County. The first CALeVIP project in Fresno was launched in December 2017.

Health and Safety Issues Abated

The Barriers Study recommended steps to heighten coordination among energy, housing, and other programs to address health and safety issues facing California's low-income and disadvantaged communities. Two health and safety indicators were selected for this initial Tracking Progress report to help identify high-priority locations for energy-related actions to improve local resilience: asthma and heat-related illness.

Based on a 2016 study by Drehobl and Ross, the Barriers Study reported that high energy bills relative to income may drive low-income households to make do with insufficient heating or cooling, which can increase the incidence of asthma, especially in children.[22] Figure 19 shows counties in California with a high number of emergency room visits for asthma in 2015, shown as large red circles. The average percent of ER visits due to asthma in 2015 was about 0.5 percent of ER visits per county population. This map also shows the counties with the lowest investment from investor-owned electric utility energy efficiency programs, as represented by the orange dashed areas.

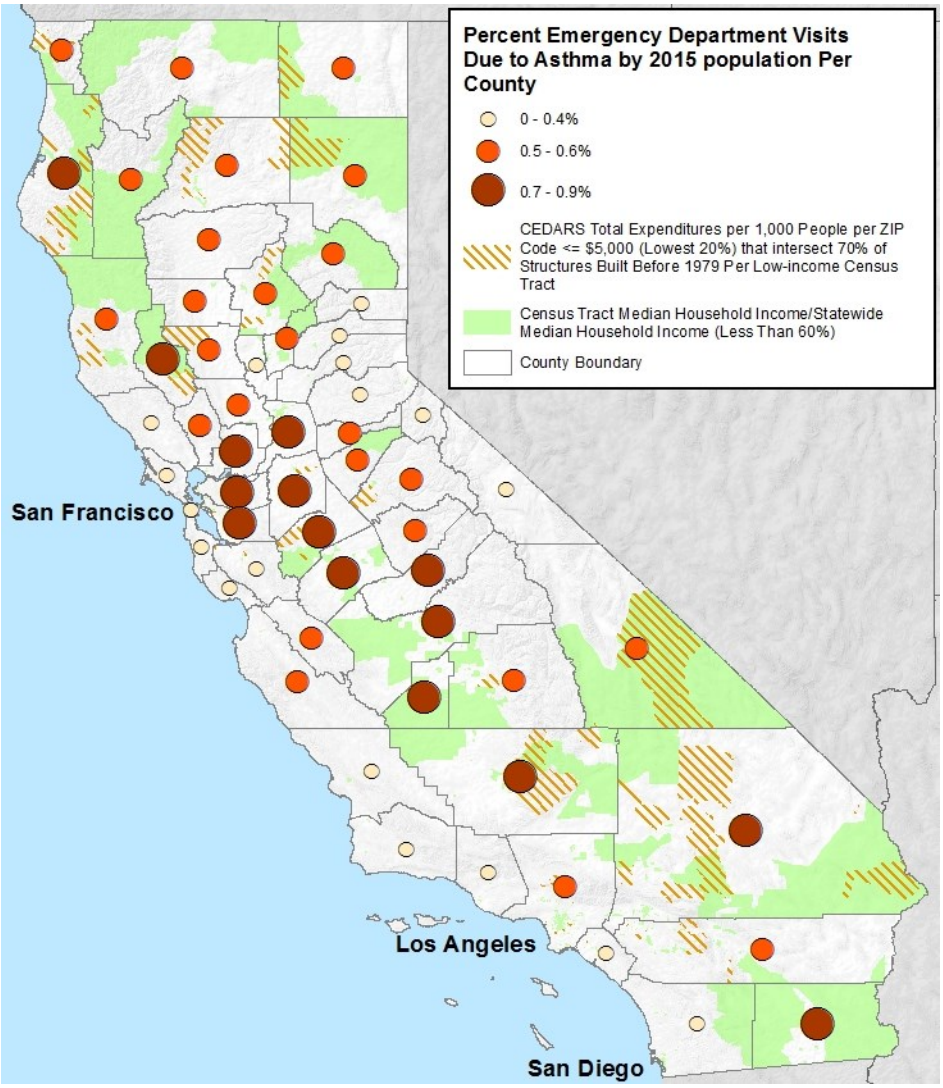
Areas with poor air quality, such as the San Joaquin Air Basin in Central California, experience high numbers of asthma-related emergency room visits. Such areas may experience periods with little mixing of air between altitudes and serve as major traffic corridors for passenger vehicles and freight. A 2015 study supported by CARB reports asthma-related hospital visits are elevated in populations living near areas with high traffic-related air pollution.[23] This information is useful for targeting areas to implement clean vehicle and sustainable freight programs, as well as energy efficiency upgrades.

---

22 Scavo, Jordan, Suzanne Korosec, Esteban Guerrero, Bill Pennington, and Pamela Doughman. 2016. *Low-Income Barriers Study, Part A: Overcoming Barriers to Energy Efficiency and Renewables for Low-Income Customers and Small Business Contracting Opportunities in Disadvantaged Communities.* California Energy Commission. Publication Number: CEC-300-2016-009-CMF, page 13. This statement is based on information provided in Drehobl, Ariel and Lauren Ross. 2016. *Lifting the High Energy Burden in America's Largest Cities: How Energy Efficiency Can Improve Low Income and Underserved Communities*.

23 Delfino, Ralph J., M.D., Ph.D., and Michael J. Kleeman, Ph.D., University of California, Irvine, University of California, Davis. April 7, 2015. *Risk of Pediatric Asthma Morbidity From Multipollutant Exposures*. Contract No. 10-319. California Air Resources Board final report. https://www.arb.ca.gov/research/apr/past/10-319.pdf.

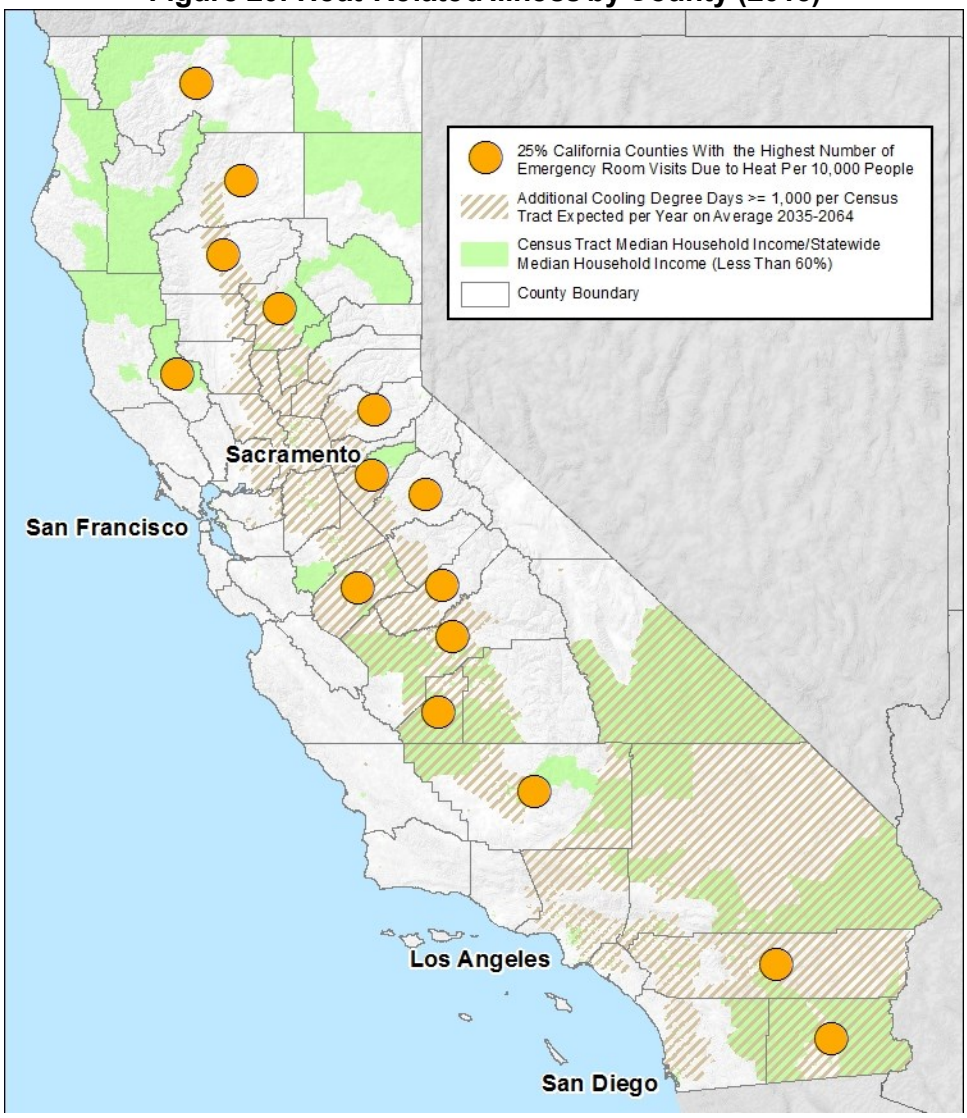
Figure 19: Asthma-Related Emergency Room Visits by County (2015)



Source: California Environmental Health Tracking Program; CPUC – California Energy Data and Reporting System (CEDARS), U.S. Census Bureau; Esri zip codes. Circles are placed in the center of each county but represent data for the whole county

Figure 20 shows potential opportunities in the Central Valley and Southern California deserts for energy efficiency investments to alleviate heat-related illness and improve the efficiency of space cooling. The number of emergency room visits due to heat was about 15 per 10,000 people on average statewide in 2015. This figure also shows areas expected to see more than 1,000 additional cooling degree days (average daily temperature minus 65 degrees) per year on average by midcentury (2035-2064) compared to 1961-1990 due to climate change.

Figure 20: Heat-Related Illness by County (2015)



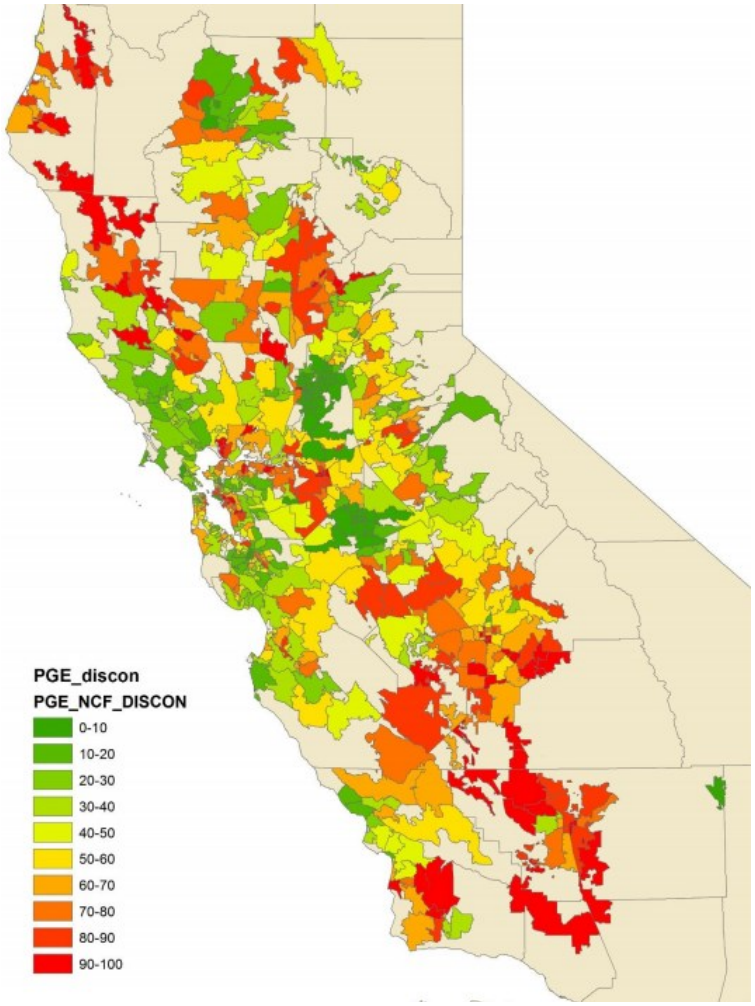
Sources: California Environmental Health Tracking Program; CalAdapt; U.S. Census Bureau; Circles are placed in the center of each county but represent data for the whole county

In addition to energy savings, energy efficiency can provide improved indoor comfort, increased property value, and reduced illness. The Barriers Study recommended greater coordination among state agencies to incorporate non-energy benefits into energy efficiency program offerings. For example, a 2017 CPUC study on utility disconnections included maps showing non-CARE disconnections in 2016 by zip code for SCE, Pacific Gas and Electric Company (PG&E), San Diego Gas & Electric Company (SDG&E), and Southern California Gas Company (SoCalGas).[24] Figure 21 shows the percentile of PG&E non-CARE disconnection rates. Many of

24 White, Richard. December 28, 2017. *A Review of Residential Customer Disconnection Influences and Trends.* California Public Utilities Commission, Policy and Planning Division. See http://www.cpuc.ca.gov.

the zip codes with the highest number of disconnections are in counties with high levels of heat-related illness in 2015, indicating an opportunity for targeted efforts to ensure disconnections are minimized during periods of extreme heat.

Figure 21: PG&E Non-CARE Disconnections (2016)

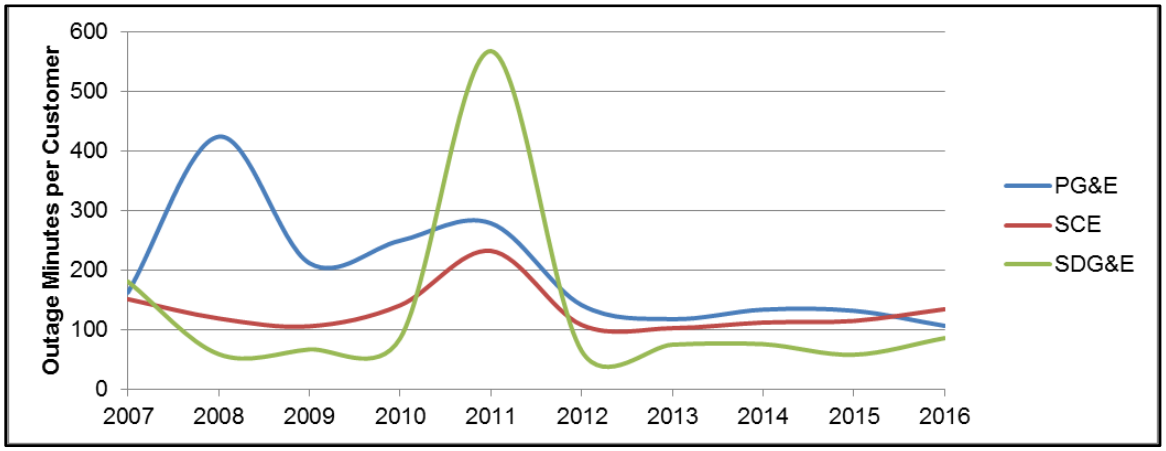


Source: CPUC

Energy-Resilient Communities

In 2008, PG&E service was affected by strong storms. In 2011, SCE and PG&E system outages were affected by storms and SDG&E service was affected by the Pacific Southwest electrical outage (Figure 22). Electrical grid reliability and outages can have a significant impact on the health and safety of customers, especially in regions affected by extreme heat and in need of cooling. More granular information is needed in updates to this report on the local reliability as it relates to low-income and disadvantaged communities specifically.

Figure 22: System Average Interruption Duration Index for California Investor-Owned Electric Utilities Including Major Event Days (2007-2016)



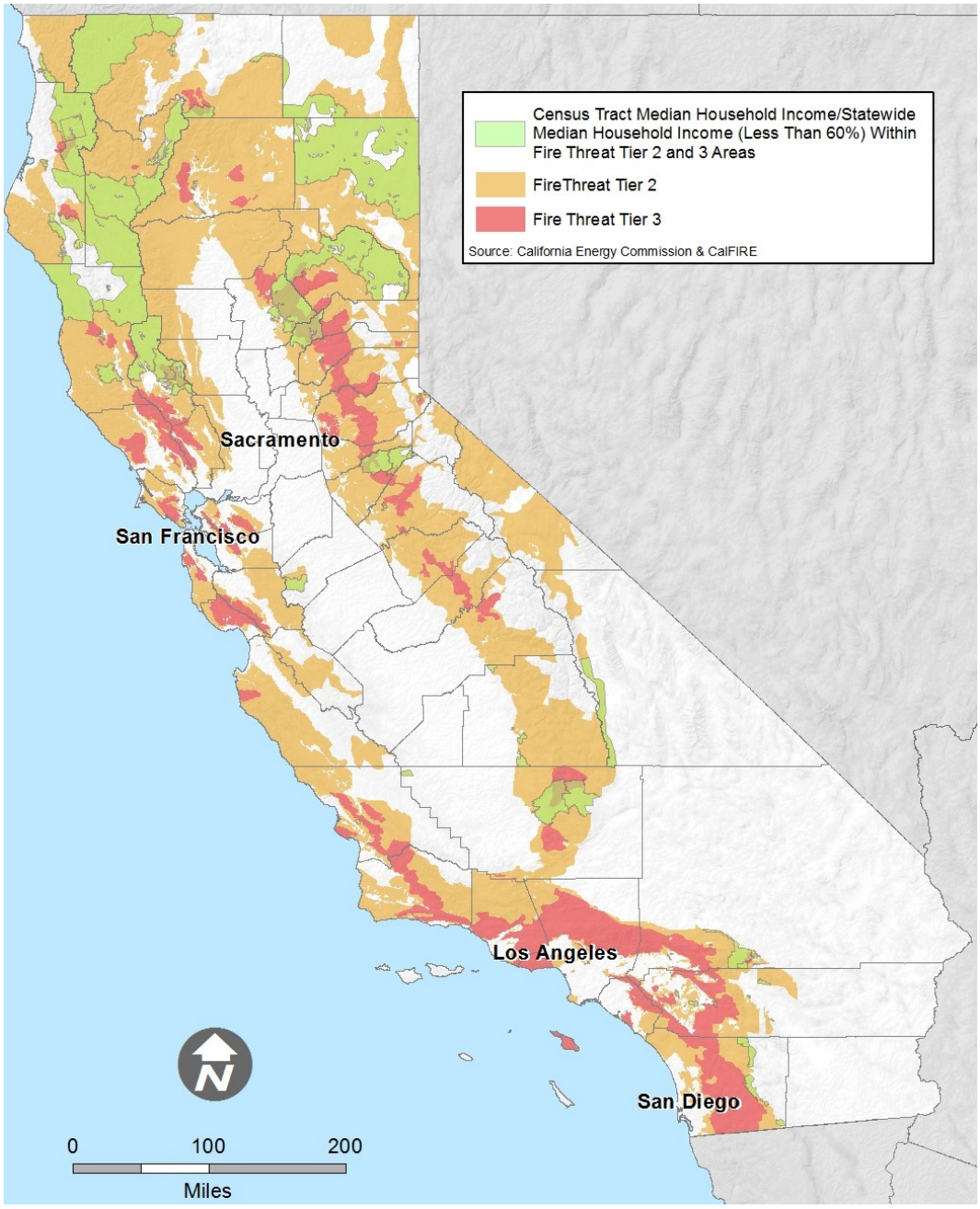
Source: California Public Utilities Commission, *Annual Electric Reliability Report*, cpuc.ca.gov/2016_aers

One impact of climate change is increased frequency and intensity of wildfires and severe weather. Steps to strengthen the energy resilience of communities and supporting energy infrastructure, especially in low-income areas, are highlighted in the *Safeguarding California Plan* report,[25] as well as the *2017 Integrated Energy Policy Report (IEPR)*[26] and other California climate adaptation reports.[27] In addition, the CPUC has set new fire-safety standards, including de-energizing transmission and distribution lines under specified conditions to reduce the risk of fire. The CPUC anticipates holding discussions of preferred options, potentially including energy storage or other energy infrastructure, to balance access to energy for water pumping, telecommunications, and other critical infrastructure with the need to reduce the risk of fire.

Figure 23 shows the low-income areas of California that intersect Tier 2 or Tier 3 fire-threat areas. Census tracts representing a total of 5.3 million people are in areas designated by the CPUC as Tier 2 or Tier 3 fire-threat areas, or 13.7 percent of California's population. About 6 percent of these census tracts are low income, representing a total of about 500,000 people. Population numbers were normalized by tract area within and outside fire threat areas.

25 http://resources.ca.gov/wp-content/uploads/2018/01/CNRA-releases-2018-upate-to-Safeguarding-Report.pdf.
26 http://www.energy.ca.gov/2017_energypolicy/.
27 http://opr.ca.gov/clearinghouse/adaptation/. See also, http://www.opc.ca.gov/webmaster/ftp/pdf/docs/rising-seas-in-california-an-update-on-sea-level-rise-science.pdf.

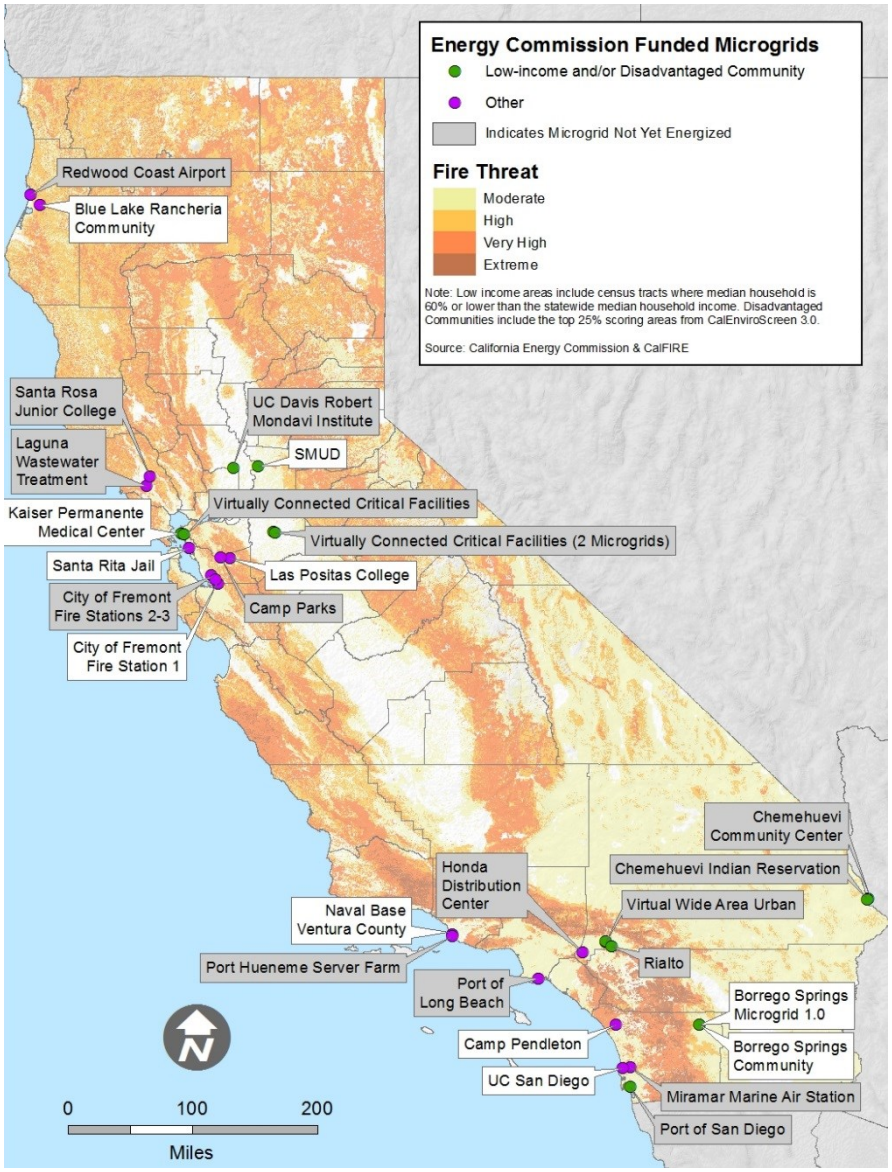
Figure 23: Low-Income California Areas That Intersect Tier 2 or Tier 3 Fire Threat Areas



Source: CPUC Fire-Threat map; U.S. Census Bureau 2010 census tract boundaries; 2011-2015 American Community Survey (ACS) five-year estimates

Figure 24 illustrates the locations of microgrids in California that have received funding from the California Energy Commission to develop and demonstrate this innovative approach to energy resilience. Microgrids can be designed to maintain critical loads safely, even if the surrounding area is without electricity.

Figure 24: California Microgrid Development and Demonstration Projects (June 2018)

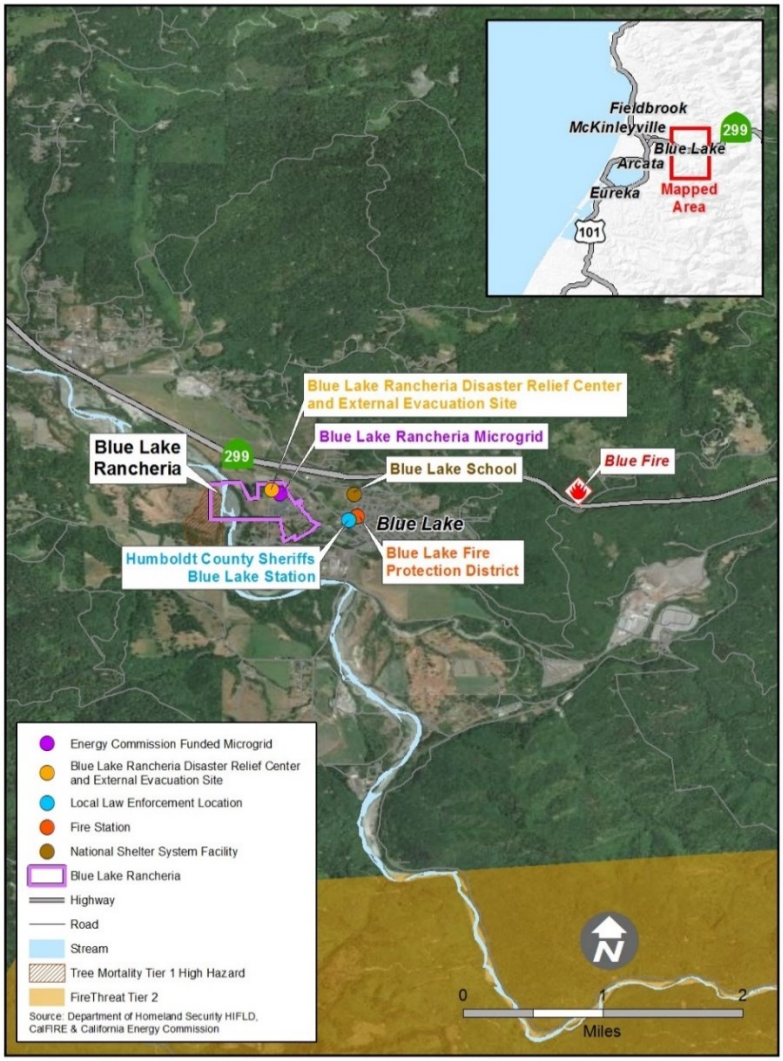


Source: California Energy Commission and CAL FIRE

Figure 25 shows the location of a microgrid in a rural, forested area of Northern California that maintained power to critical facilities during a fire-related outage. On October 8, 2017, a fire started about a quarter-mile from the Blue Lake Microgrid. The blaze caused the power to go out for about an hour and a half. Just under 1,900 customers were without power, according to PG&E. The microgrid detected the outage and islanded and kept the microgrid facilities, including a local emergency response center, from experiencing a blackout. No power was exported outside the microgrid. The microgrid automatically reconnected to the grid when grid

power was restored. This was all done automatically and transparently as part of the standard operation of the microgrid. The area is near a Tier 2 Fire Threat area. The CPUC defines Tier 2 fire threat areas as "areas where there is an elevated risk (including likelihood and potential impacts on people and property) from utility associated wildfires." For more information, see http://www.cpuc.ca.gov/firethreatmaps/.

Figure 25: Microgrid Provided Resilience for Critical Facilities During the Blue Fire

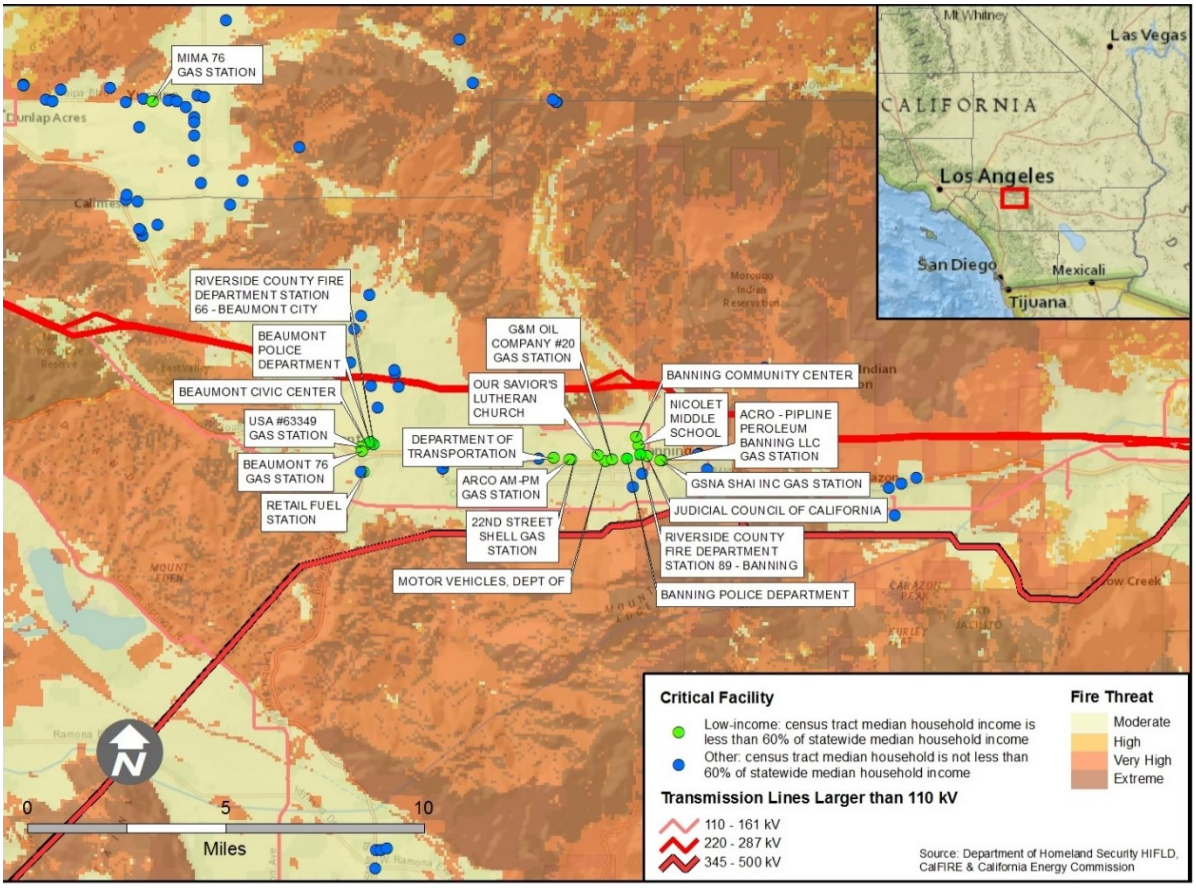


Source: Department of Homeland Security HiFLD, CAL FIRE, California Energy Commission

Figure 26 shows opportunities to increase resilience of energy infrastructure serving critical facilities in a low-income area of western Riverside County. Green dots indicate critical facilities in low-income census tracts, including microgrids, hospitals, gas stations, aircraft landing facilities, police stations, fire stations, national shelter system facilities, colleges/universities,

nonconfidential state-owned structures, prisons, and military bases. Blue dots indicate critical facilities outside low-income areas. The map includes areas subject to hot, dry Santa Ana winds in the fall. Under such conditions transmission and distribution lines may be de-energized for days at a time, if necessary, to reduce the risk of wildfire.

Figure 26: Opportunities to Increase Energy-Resilience of Critical Facilities



Source: Department of Homeland Security HiFLD, CAL FIRE, California Energy Commission

More than 25 percent of SCE's service territory is within CPUC Tier 2 and 3 boundaries, including mountainous areas in and around the Los Angeles metropolitan area. As noted at the CPUC Wildfire en banc panel on January 31, 2018,[28] options are needed to maintain critical services such as water pumping and telecommunications to firefighters and other emergency responders in the event of planned or unplanned grid outages because of extreme events. Beyond forest fires, this approach may be relevant for other disasters such as extreme weather, flooding, or earthquakes.

28 For more information, see http://www.cpuc.ca.gov/2018FireEnBanc/.

Clean Energy Jobs

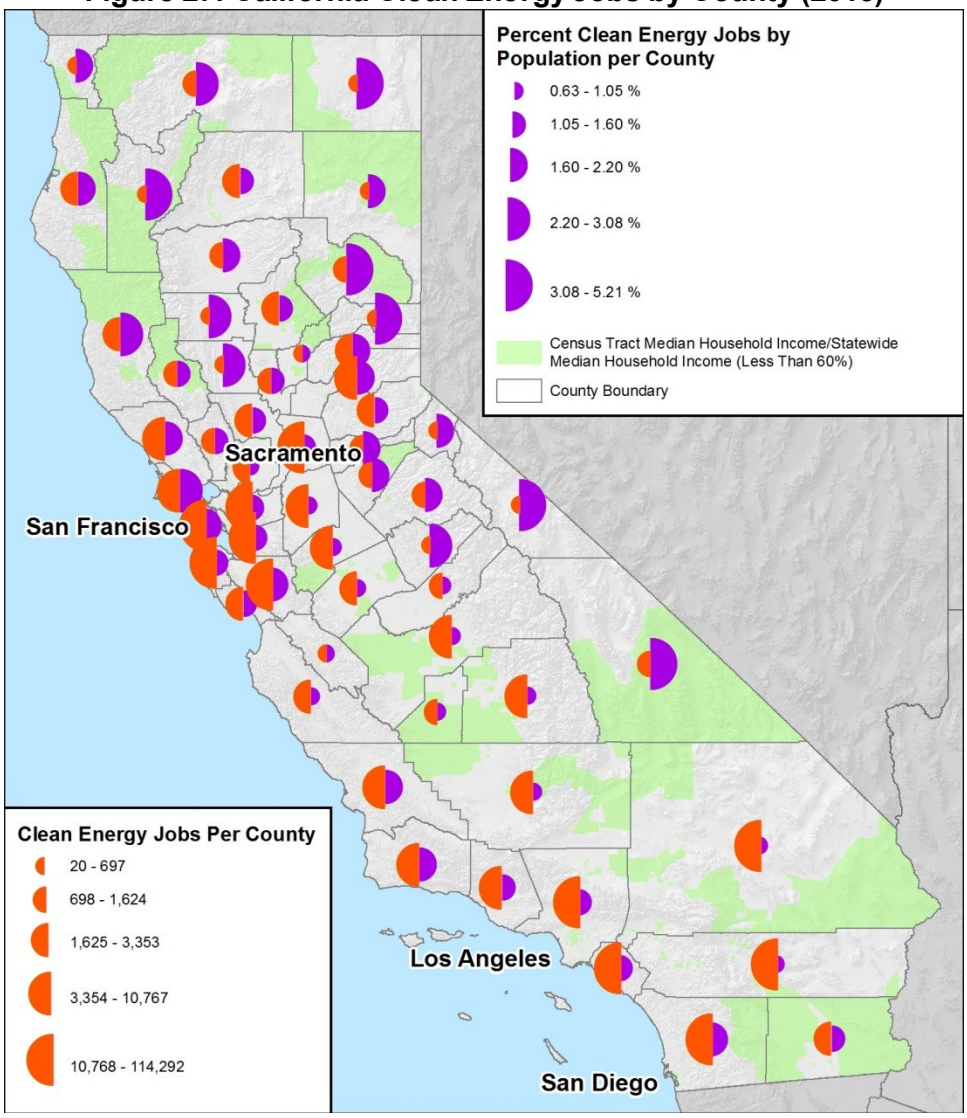
Figure 27 shows statewide clean energy jobs in California by county for 2015. The data in this figure are from the Advanced Energy Employment survey, which defines clean energy jobs by North American Industry Classification System (NAICS) codes, consistent with the U.S. Department of Energy's U.S. Energy and Employment Reports.[29] The average number of clean energy jobs per county in 2015 was about 8,750. Counties with a large number of clean energy jobs include Fresno and Tulare Counties. These two areas show that although there are many clean energy jobs available compared to surrounding counties, they have a low number of jobs compared to the size of the population in the area. This finding suggests a need for local hiring, job creation, clean energy investment, and workforce development efforts consistent with local priorities.

San Bernardino, Riverside, Sacramento, the San Francisco Bay Area, the Greater Los Angeles Area, and the San Joaquin Valley also have a large number of clean energy jobs. However, while the San Joaquin Valley scores well in terms of clean energy jobs, in 2015 it did not keep pace with other areas. As this is an area with many low-income and disadvantaged communities, this conclusion indicates an opportunity to invest in the local workforce through educational institutions and additional clean energy job opportunities.

Missing from this workforce indicator is information on job quality (wages and working conditions), workforce development, and whether people living in low-income and disadvantaged communities are getting jobs in clean energy. Also, this indicator does not include information on apprenticeship and preapprenticeship opportunities, as well as the number, trend, and location of community workforce agreements. In addition, it is important to consider and encourage entry-level clean energy positions to empower people with limited education and skills to access career growth opportunities. If this information becomes available, it may help identify adjustments needed to job training services and energy-related investment to match workforce and small business development with anticipated job availability.

29 The U.S. Department of Energy *2017 U.S. Energy and Employment Report* is available online at https://energy.gov/downloads/2017-us-energy-and-employment-report.

Figure 27: California Clean Energy Jobs by County (2015)



Sources: Advanced Energy Economy Institute; U.S. Census Bureau. Semicircles are placed in the center of each county but represent data for the whole county

California's largest investor-owned utilities administer extensive workforce, education, and training programs. The Energy Commission will continue to collaborate with the CPUC and investor-owned utilities to identify potential program and policy improvements to strengthen energy-related workforce development opportunities for small businesses and employees in low-income and disadvantaged communities.

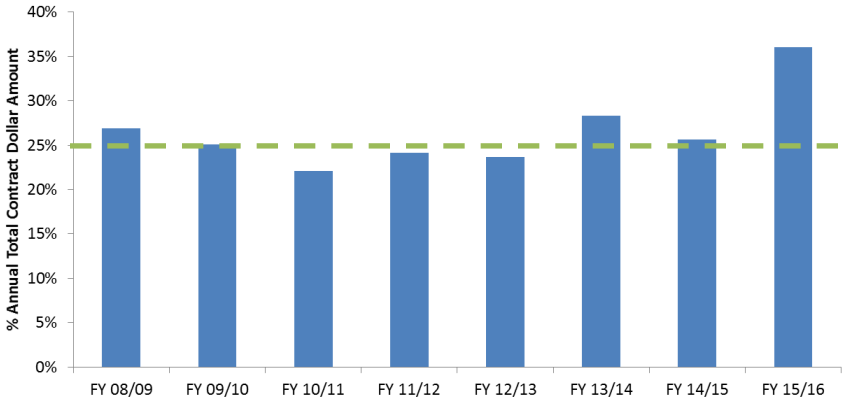
The Barriers Study recommended that state agencies collaboratively develop a comprehensive clean energy workforce development strategy. As this recommendation is implemented, tracking metrics will be refined, and additional data will likely become available to monitor more fully the status of clean energy jobs in California. In support of this goal, the California Workforce

Development Board is taking the lead to develop a report laying out key elements of a comprehensive workforce and labor strategy related to implementation of SB 350 and other greenhouse gas-focused policies, including Assembly Bill 398 (Eduardo Garcia, Chapter 135, Statutes of 2017). This report is being developed in coordination with CARB, the Energy Commission, and other agencies.

Small Business Contracts

Small businesses in California can receive a certification through the Department of General Services (DGS) to qualify for California's Small Business Participation Program. This program has a goal that at least 25 percent of California state government contract dollars go to small businesses annually. As part of this program, small businesses are eligible for a 5 percent bid preference on applicable California state government solicitations. California state government has met the 25 percent minimum goal for small business participation for the past three fiscal years (Figure 28).

Figure 28: Percentage of California State Government Contract Dollars Awarded to Small Businesses and Microbusinesses: Annual Results (Fiscal Year 2009-2015)



Source: Department of General Services [30]

To help increase participation of small businesses in state government contracts, the CaleProcure[31] website offers information and technical assistance with certification, registration, and navigation of the online marketplace. In addition, DGS conducts numerous workshops each year to raise awareness and improve understanding of how to participate in state government contracting procedures. As part of its supplier diversity program, the CPUC hosts two small business expos each year. In 2016, the expos were held in Pasadena and Fresno. Hundreds of diverse/small business owners took advantage of the opportunity at each expo to meet with

30 http://www.dgs.ca.gov/pd/Programs/OSDS/ContractReporting.aspx.
31 https://caleprocure.ca.gov/pages/index.aspx.

buyers from the utilities.[32] In May 2018, many workshops were held in locations across California highlighting opportunities for small businesses to participate in state, local, and private company contracting.[33]

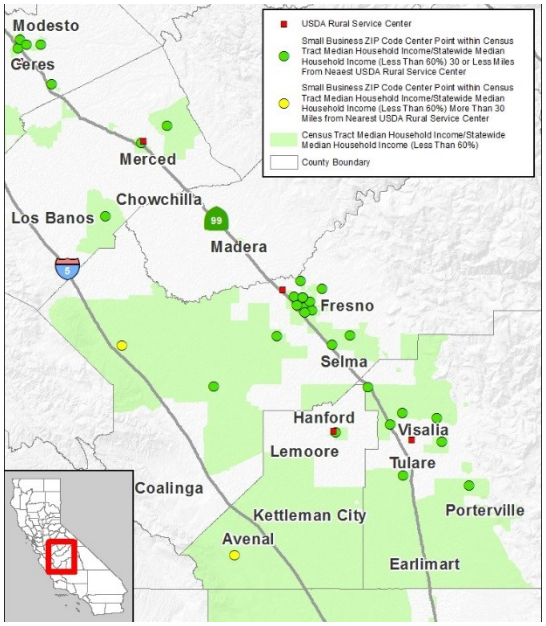
In its Low-Income Transportation Guidance Document, CARB outlines additional strategies to ensure small businesses are able to access and benefit from clean transportation and energy investments. These strategies include housing an ombudsman office working on issues specific to small businesses across clean energy and transportation and list the following related actions for state agencies:

- Streamline and simplify the grant and incentive application process to ensure rural and tribal communities, small businesses, governments, and organizations can better compete for clean transportation investments
- Design clean transportation and infrastructure projects to avoid substantial burdens, such as physical or economic displacement of residents or businesses in low-income and disadvantaged communities or increased exposure to toxics or other health risks.
- Develop a green mobility in schools concept to address air quality concerns and increase awareness in low-income and disadvantaged communities. Couple charging infrastructure with zero-emission vehicle incentives, working with original equipment manufacturers, dealers, air districts, and others. Increase exposure of students, small business, and communities to zero-emission technology.

Figure 29 shows low-income zip codes containing clean energy small and microbusinesses in Fresno and surrounding areas. This map indicates locations that may benefit from additional assistance through existing service centers and locations where new pathways for assistance may be needed. For example, USDA Rural Development offers business development grants for small and emerging private businesses in rural areas.[34] One of the recommendations of the Barriers Study called for further study to determine actions for increasing contracting opportunities for small businesses in low-income and disadvantaged communities. Results of that study will inform development of small business energy equity indicators.

32 http://www.cpuc.ca.gov/supplierdiversity/.
33 California Small Business Month Events: May 2018. http://calismallbizmonth.com/events.asp.
34 https://www.rd.usda.gov/programs-services/rural-business-development-grants/ca.

Figure 29: California Small and Microbusinesses in Low-Income Areas



Source: U.S Department of Agriculture Service Center Locator[35]; U.S. Census Bureau

For clean energy small businesses engaged in creating or developing innovative technologies, the Energy Commission's Electric Program Investment Charge (EPIC) program offers competitive funding opportunities to help connect entrepreneurs with the resources needed to bring innovations to market.[36] Also, the U.S. Department of Energy offers competitive clean energy research funding for small businesses through the Small Business Innovation Research program and the Small Business Tech Transfer program.[37]

Amount Invested: Innovation

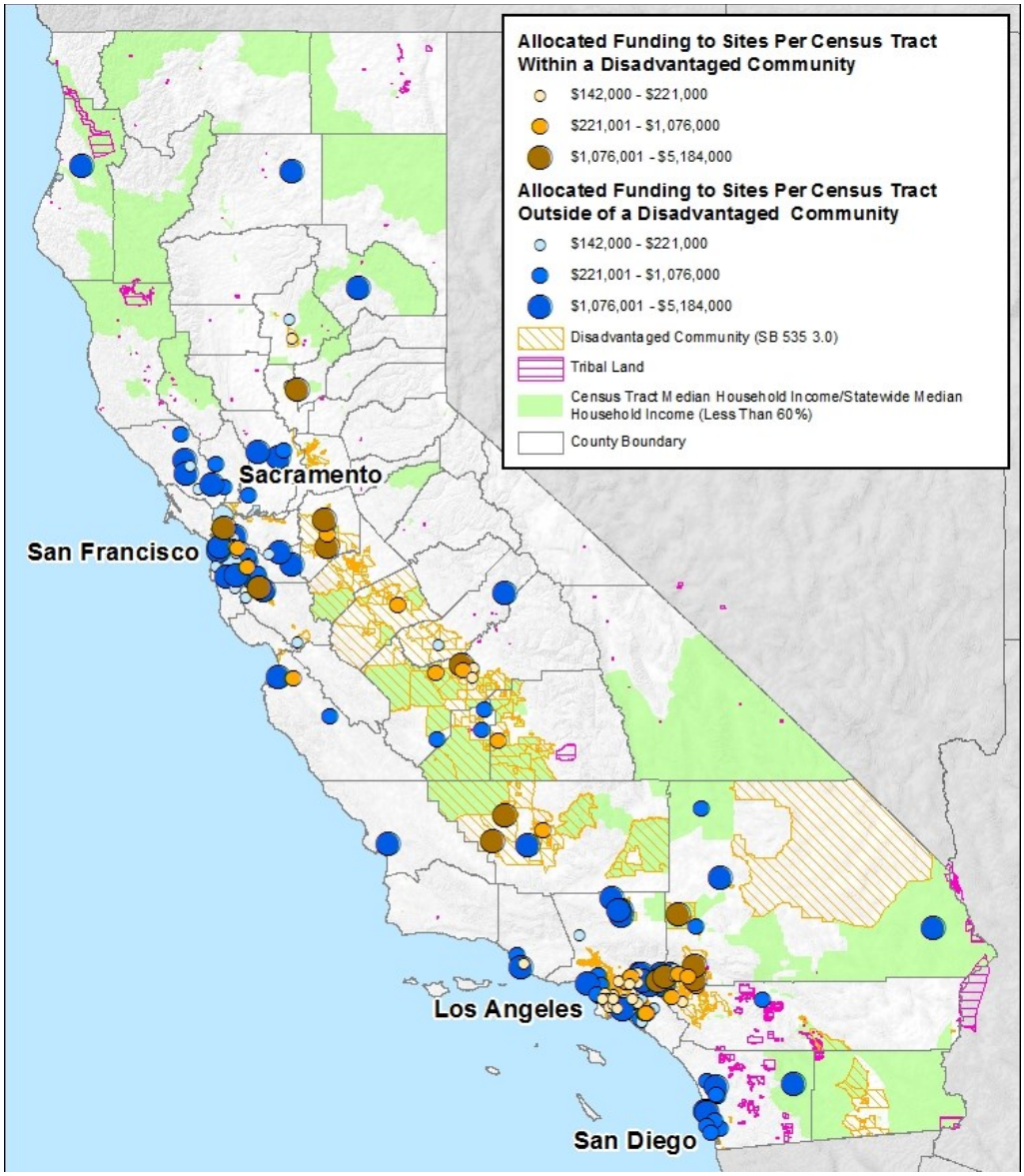
In October 2017, Assembly Bill 523 (Reyes, Chapter 551, Statutes of 2017) was signed into law. This law requires 25 percent of Energy Commission EPIC technology demonstration and deployment money to fund projects with sites located in, and benefiting, disadvantaged communities. In addition, 10 percent of these funds must be spent at sites located in, and benefiting, low-income communities, defined as census tracts with median household incomes at or below 80 percent of the statewide median income or the applicable low-income threshold identified by the Department of Housing and Community Development.

Figures 30 and 31 show the amount of Energy Commission EPIC technology demonstration and deployment funding invested by census tract, statewide and for Los Angeles County, respectively. The maps also show the location of disadvantaged communities, as well as low-

35 https://offices.sc.egov.usda.gov/locator/app?state=us&agency=rd.
36 More information about EPIC funding opportunities available at http://www.energy.ca.gov/contracts/epic.html.
37 https://science.energy.gov/sbir/.

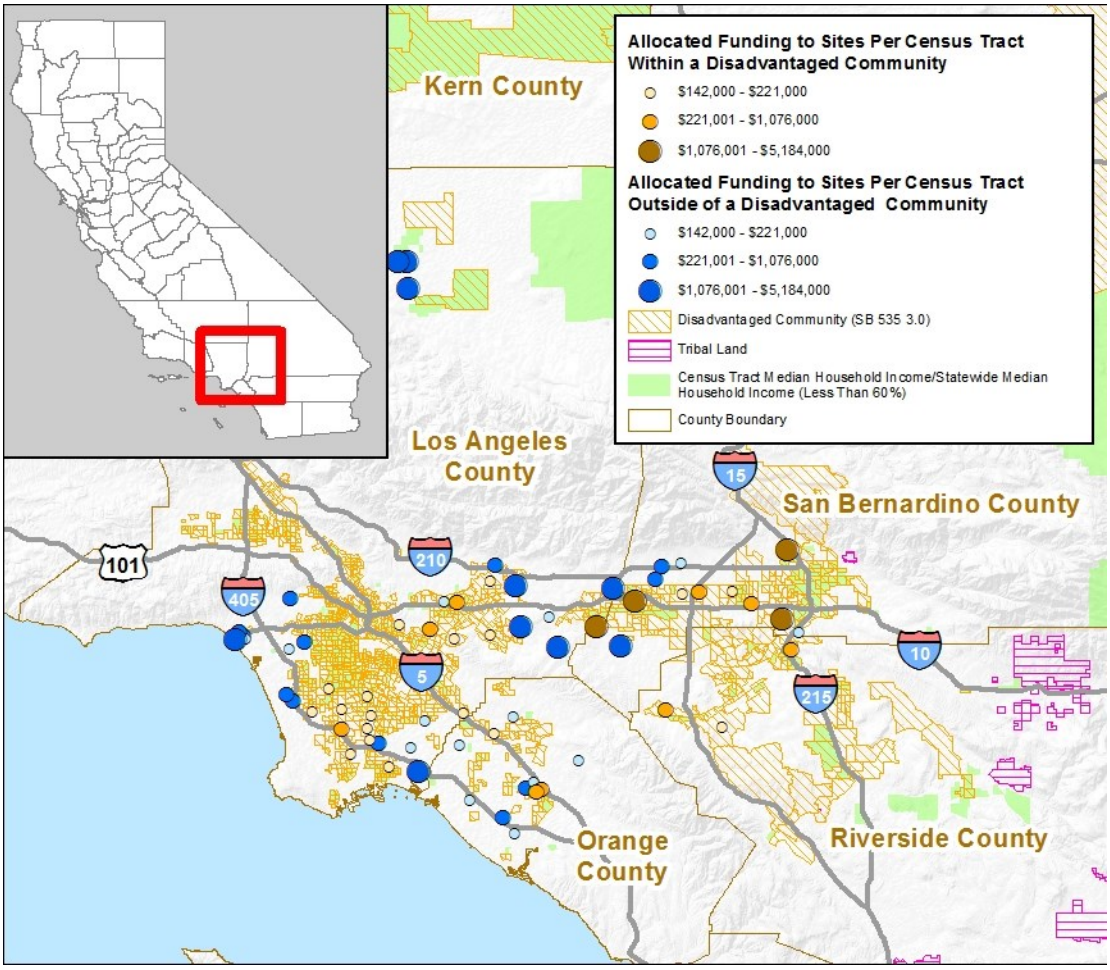
income areas and tribal lands, to give an idea of the geographic and socioeconomic diversity of EPIC project awards and the progress toward maintaining the 25 percent goal and beyond.

Figure 30: Energy Commission EPIC Technology Demonstration and Deployment Funding Through December 2017



Source: Energy Commission; U.S. Census Bureau; Bureau of Indian Affairs Pacific Regional Office 2017; CalEnviroScreen 3.0, 2017

Figure 31: Energy Commission EPIC Technology Demonstration and Deployment Funding Through December 2017, Los Angeles County



Source: California Energy Commission; U.S. Census Bureau; Bureau of Indian Affairs Pacific Regional Office 2017; CalEnviroScreen 3.0, 2017

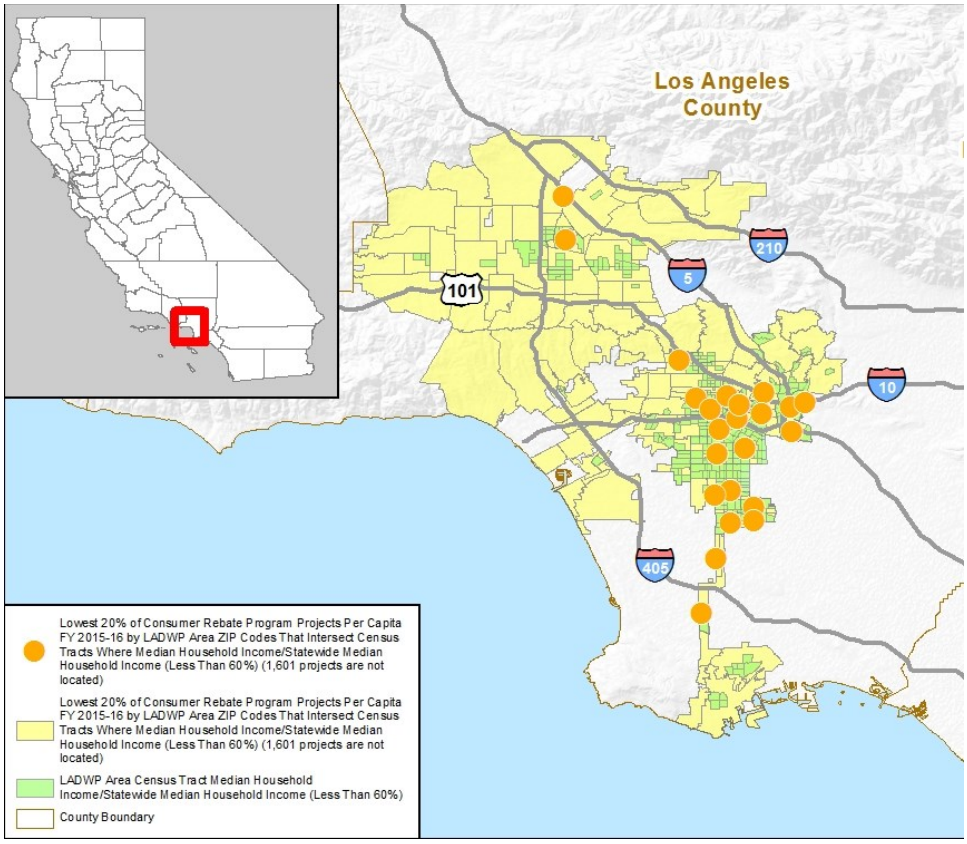
As of December 31, 2017, $194 million was awarded for technology demonstration and deployment agreements. Of this amount, more than $61.7 million was allocated to project sites in disadvantaged communities. In 2018, the Energy Commission plans to continue expanding access to demonstration projects to meet the requirements of AB 523.

Next Steps

Work is underway to implement the recommendations described in the Barriers Study, facilitated by the Governor's Office and representatives of key impacted agencies. As the recommendations are implemented, additional data may become available to support improvement of energy equity performance indicators and methods, as well as synergies with clean transportation access. Updates of this report will include these improvements.

Also, updates will include information on publicly owned electric utility energy equity indicators. Los Angeles Department of Water and Power (LADWP) is a leader in this area. For example, Figure 32 uses data from LADWP's equity metrics data initiative to show the low-income areas with the lowest participation per capita (lowest 20 percent) in LADWP's residential energy efficiency rebate programs per zip code in 2015-2016. LADWP leverages data from its equity metrics data initiative to identify opportunities for investment and service improvements. Additional information on LADWP's equity metrics data initiative is available at www.ladwp.com/equitymetrics.

Figure 32: LADWP's Consumer Rebate Program Residential Energy Efficiency Projects by Zip Code (2015-2016)



Source: Los Angeles Department of Water and Power Equity Metrics Data Initiative, U.S. Census Bureau

In some cases, indicators will be refined to better reflect low-income clean energy program objectives or align with related statewide mandates, such as the SB 350 energy efficiency savings doubling requirement or consideration of disadvantaged community impacts under utilities' integrated resource planning. In other cases, new data sources will need to be identified to ensure future energy equity Tracking Progress reports display meaningful information on the performance of clean energy programs in low-income and disadvantaged communities. This may include revisiting definitions and low-income thresholds that are described in this initial

report if superior alternatives are identified.

To help inform further development of energy equity indicators for California, staff has prepared a list of data gaps identified in preparing this report and next steps.

Data Gaps:

- More granular, accurate, and up-to-date income information at the individual customer level, if it can be made available
- Detailed multifamily building characteristic data, including:
  - Number of multifamily buildings across the state and per utility
  - Location of each building
  - Building vintage
  - Energy-use intensity (Some of this information will be available via Assembly Bill 802 building energy use benchmarking data)
  - Renter turnover rate
  - Latest energy efficiency retrofit data
  - Fuel use details – electricity versus natural gas
- Local economic development, such as local tax benefits from clean energy projects
- Clean energy small business contracting information through other procurement mechanisms, beyond those described in this draft
- Clean energy small business details and history:
  - Growth in profit per year
  - Growth in number of employees per year
  - Percentage of employees that live in low-income or disadvantaged communities
  - Percentage of small businesses that go out of business each year
  - Percentage of business that are purchased by other business each year
  - Percentage of small business that are minority- or women-owned
- Need more detailed workforce development data, including:
  - Are students actually getting into clean energy jobs after training?
  - Number of community workforce agreements in different regions across the state
  - Job longevity
  - Diversity in the workforce, who is getting clean energy jobs?
- Community solar systems locations, number of low-income and disadvantaged households served
- Microgrid systems location, any “critical infrastructure” (schools, hospitals, designated shelter facilities) served by a microgrid
- Include “Cool Center” (SCE)/“Cool Zone” (SDG&E) locations with cooling degree day data, possibly add cool center attendance data, which provide alternatives to customers unable to operate air conditioning at home
- More specific information on utility disconnections and reconnections as it relates to income levels, CARE subsidies, and disadvantaged communities

- Additional locational information for small-scale energy storage and other distributed energy resources across the state
- Natural gas interval meter data to inform development of a high heating bill energy burden indicator
- More granular local grid reliability and outage information to better understand the correlation with low-income and disadvantaged communities
- An updated and comprehensive list of critical facilities across the state, with supporting location information, especially as it relates to high fire risk areas

As potential data sources are identified to fulfill the needs identified above and data acquired, there are additional next steps that the Energy Commission envisions taking beyond publication of this initial energy equity indicators Tracking Progress report. A summary of next steps is included below.

Next Steps:

- Develop and use an advanced data and analytics platform to support future analyses related to energy equity and performance of clean energy and transportation programs across the state.
- Develop a refined energy burden indicator that factors in costs from both electricity and natural gas consumption, with consideration of other fuel types.
- Determine a method to more accurately and precisely track income data per specific household and census tract per year.
- Beyond the investor-owned utility data included in this report, work with publicly owned utilities and community choice aggregators[38] to incorporate data for additional areas into updates.
- Continue to work closely with other state, local, and federal agencies to identify and incorporate data sets that fill some of the gaps identified above and minimize duplicative or conflicting reporting from various entities.
- Determine a method for defining "clean energy" companies based on North American Industry Classification System (NAICS) codes.
- Consider additional indicators and data layers to be included in updates to the report, beyond those specifically identified in the list of data gaps above. One possible example is inclusion of additional information related to power plant locations in connection with local reliability needs, distributed energy resource expansion opportunities, and integrated resource planning.
- Leverage best practices and lessons learned from CPUC's supplier diversity program and small business outreach to coordinate further development of contracting

[38] In California, cities and counties outside the jurisdiction of a local publicly owned electric utility may combine the loads of residents, businesses, and municipal facilities in a communitywide electricity buyers' program to form a *community choice aggregator*. The CPUC regulates community choice aggregators. For more information, see AB 117 (Migden, Chapter 838, Statutes of 2002).

opportunities for small businesses in low-income areas and disadvantaged communities.

- Include results of the Health, Comfort, and Safety (HCS) Evaluation of the ESA program, if available (https://pda.energydataweb.com/#/documents/1965/view), such as:
    - The extent to which the measure eliminates combustion-related safety threat.
    - The extent to which the measure eliminates fire safety threat or improves home security (crime prevention) and building integrity or both.
    - The extent to which the measure reduces or eliminates extreme temperature and temperature variations inside the home/improves customer ability to manage in-home temperatures.
    - The extent to which the measure improves air quality, ventilation, and/or air flow (for example, reduces drafts and leakage).
- Pursue additional updates to the Energy Commission's Title 20 Data Collection Regulations, other regulations, and supporting data requests to fill the data gaps identified above and improve updates to this and other Tracking Progress reports.
- Following the publication of this energy equity Tracking Progress report, the Energy Commission envisions developing and making available an interactive mapping tool that stakeholders can use to visualize different mapping layers and focus on different regions of the state. Additional data layers would be added to this mapping tool once they become available. It is anticipated this tool will be made available by summer 2018.

Glossary

Term	Definition
Cooling-degree day	The number of cooling degree days indicates how often local temperatures reach above 65 degrees and by how many degrees. For example, if the average temperature is 10 degrees above 65 degrees for one day in a year, there are 10 cooling degree days for that year for that location.
Critical facilities	Based on available data, this report includes the following critical facilities: microgrids, hospitals, gas stations, aircraft landing facilities, police stations, fire stations, national shelter system facilities, colleges/universities, nonconfidential state-owned structures, prisons, and military bases.

Term	Definition
Disadvantaged community	SB 535 (De León, Chapter 830, Statutes of 2012) directs the California Environmental Protection Agency (CalEPA) to identify disadvantaged communities for funding, and as of April 2017, CalEPA uses the top scoring 25 percent of communities using the CalEnviroScreen 3.0 tool to make this determination. The CalEnviroScreen identifies California census tracts facing the highest environmental burdens, as determined by economic, environmental, and socioeconomic factors including low income, high unemployment, poor health conditions, air and water pollution, and hazardous wastes. See https://oehha.ca.gov/calenviroscreen/sb535.
Energy equity	The quality of being fair or just in the availability and distribution of energy programs.
Energy storage	Energy storage can capture electricity or heat for use later in the electric power sector. Energy storage is a key tool for managing fluctuations in electricity supply and demand. Examples include pumped hydropower, thermal energy (such as molten salt), batteries, flywheels, and compressed air and do not include natural gas storage facilities.
Microgrid	A microgrid is a small, self-contained electricity system with the ability to manage critical customer resources, provide services for the utility grid operator, disconnect from the grid when the need arises, and provide the customer and the utility different levels of critical support when needed.
Net energy metering	Net energy metering allows customers who generate their own energy ("customer generators") to serve their energy needs directly onsite and to receive a financial credit on their electric bills for any surplus energy fed back to their utility. In California, customers who install small solar, wind, biogas, and fuel cell generation facilities to serve all or a portion of onsite electricity needs are eligible for net energy metering.

Additional References

The following Web links provide additional information on various energy equity topics.

- Energy Commission SB 350 Low-Income Barriers Study, Part A. December 2016
  - http://www.energy.ca.gov/sb350/barriers_report/
- California Clean Energy Equity Framework and Indicators, staff draft. May 2017
  - http://docketpublic.energy.ca.gov/PublicDocuments/17-IEPR-08/
- California Air Resources Board SB 350 Low-Income Barriers Study, Part B: Overcoming Barriers to Clean Transportation Access for Low-Income Residents Final Guidance Document. February 2018
  - https://www.arb.ca.gov/msprog/transoptions/transoptions.htm

Contact:

Kristy Chew, Kristy.Chew@energy.ca.gov
Scott Flint, Scott.Flint@energy.ca.gov

Next Update:

June 2019 and annually