DOCKETED

Docket Number:	16-OIR-02
Project Title:	SB 350 Barriers Report
TN #:	213599
Document Title:	SB 350 Barriers Study Draft Report
Description:	Draft Report - A Study of Barriers and Solutions to Energy Efficiency, Renewables and Contracting Opportunities Among Low-Income Customer and Disadvantaged Communities
Filer:	Michael Sokol
Organization:	California Energy Commission
Submitter Role:	Commission Staff
Submission Date:	9/9/2016 4:00:22 PM
Docketed Date:	9/9/2016

DRAFT REPORT – FOR PUBLIC REVIEW AND COMMENT

California Energy Commission

DRAFT STAFF REPORT

A Study of Barriers and Solutions to Energy Efficiency, Renewables, and Contracting Opportunities Among Low-Income Customers and Disadvantaged Communities

California Energy Commission

Edmund G. Brown Jr., Governor

December 2016 | CEC-300-2016-009-SD

DRAFT REPORT – FOR PUBLIC REVIEW AND COMMENT

California Energy Commission

Jordan Scavo
Suzanne Korosec
Esteban Guerrero
Bill Pennington
Primary Authors

Christopher Wymer
Research Librarian

Alana Mathews
Michael J. Sokol
Project Managers

Robert P. Oglesby
Executive Director

ACKNOWLEDGEMENTS

California Energy Commission staff would like to thank the following groups and individuals for their invaluable assistance in developing and preparing this staff draft report:

ADD ALL ADVISORS

Asian Pacific Environmental Network
Parin Shah

California Environmental Justice Alliance
Strela Cervas

Center for Sustainable Energy
Stephanie Wang

Greenlining Institute
Sekita Grant
Stephanie Chen

ABSTRACT

Keywords:

Please use the following citation for this report:

Scavo, Jordan, Suzanne Korosec, Esteban Guerrero, and Bill Pennington. 2016. *A Study of Barriers and Solutions to Energy Efficiency, Renewables, and Contracting Opportunities Among Low-Income Customers and Disadvantaged Communities.* California Energy Commission. Publication Number: CEC-300-2016-009-SD.

TABLE OF CONTENTS

LIST OF FIGURES

Page

LIST OF TABLES

Page

EXECUTIVE SUMMARY

CHAPTER 1:
Purpose and Methodology

Governor Edmund G. Brown Jr. signed the Clean Energy and Pollution Reduction Act of 2015 (SB 350, de León, Chapter 547, Statutes of 2015) on October 7, 2015. The bill establishes new energy efficiency and renewable electricity targets for 2030 in order to support California's long-term climate goal of reducing greenhouse gas emissions by 80 percent below 1990 levels by 2050. The statute also finds that there is insufficient understanding of the barriers for low-income and disadvantaged communities to access energy efficiency investments, solar photovoltaic energy generation, weatherization, other forms of renewable generation, and contracting opportunities. For this reason, SB 350 directs the Energy Commission to conduct a study on the following topics:

- Barriers to and opportunities for solar photovoltaic energy generation as well as barriers to and opportunities for access to other renewable energy by low-income customers.
- Barriers for low-income customers to energy efficiency and weatherization investments, including those in disadvantaged communities, as well as recommendations on how to increase access to energy efficiency and weatherization investments to low-income customers.
- Barriers to contracting opportunities for local small businesses in disadvantaged communities.

California has established itself as a global leader in the development and deployment of energy efficiency and renewable technologies. The Renewables Portfolio Standard has the state on target to procure 33% of its electricity from renewable sources by 2020. SB 350 (2015) set new goals of doubling the state's energy efficiency measures and procuring 50% of electricity from renewable sources. However, the important gains that the state has achieved in energy efficiency and renewables are not evenly distributed, and low-income customers often are left behind as California races toward a twenty-first century energy paradigm.

Of course, low-income households with a diminished burden on their utility bills may choose to *increase* their energy consumption to improve the household's comfort or health (this situation is commonly referred to as the rebound or take-back effect).[1] Upgrades and repairs that allow a low-income household to consume more energy in order to improve family health and comfort are key drivers of such programs. Promoting energy equity means striking a balance between social justice and climate change mitigation.

1 Jeanne Clinton, CPUC, "SB 350 Barriers Study Workshop Public Comments," August 12, 2016; Nehemiah Stone, Stone Energy, "SB 350 Barriers Study Workshop Public Comments," August 12, 2016.

The findings of this study, therefore, represent a momentary pause in a march that is already in progress. It is a chance for reflection and reassessment. This study seeks to develop solutions for how California can achieve greater energy equity of efficiency and renewable technologies within low-income households, ensuring that all Californians enjoy the same opportunities to consume and conserve energy.

California energy programs do not use a standard definition for low-income households. For example, some programs are based on Area Median Income, while others are based on the federal poverty threshold. However, according to the California Poverty Measure, 21 percent of Californians live in poverty, and another 20 percent live near the poverty line.[2] And a 2016 study of 48 of the largest cities in the United States found that the median energy burden – the share of a household's annual income used to pay annual energy costs – was more than twice as high for low-income households as for all households (Drehobl and Ross, 2016).

This higher energy burden can force these households to choose between energy and necessities, like food or medicine. Insufficient heating or cooling, a choice some families may be forced to make, can increase the incidence of asthma, respiratory problems, heart disease, arthritis, and rheumatism, particularly in children and the elderly. Reduced lighting can make it difficult for children and adolescents to study and complete school assignments, which, in turn, affects their academic success (Drebohl and Ross, 2016).

> *"Effective climate policy will not only phase out fossil fuels… it will also make the transition as fair as possible. To ensure equity and self-sufficiency, policies must engage and empower communities."*
>
> -- Miller and Sisco, 2002

Low-income customers also face a disproportionate risk of utility disconnections. In 2010, utility disconnections by California's three largest investor-owned utilities for failure to pay energy bills represented 5.5 percent of low-income customers, compared with only 2.9 percent of non-low-income customers (DRA, 2011). The threat of or actual utility disconnection can lead to a host of other issues. A 2012 study found that paying utility bills was the most common reason for high-cost payday loans, which can worsen the cycle of poverty. Other studies have found that shutting off utilities can contribute to homelessness (Drehobl and Ross, 2016).

Low-income and people of color in urban areas are often disproportionately burdened by environmental and health impacts from the use of fossil fuels. At the same time,

---

2 The California Poverty Measure is a joint effort by the Public Policy Institute of California and the Stanford Center of Poverty and Inequality. It is based on U.S. Census data and accounts for local costs of living and family resources and needs. from These figures are from 2013, the latest data available. See "Poverty in California," Public Policy Institute of California, accessed September 8, 2016, http://www.ppic.org/main/publication_show.asp?i=261

Low-income households are often unable to access the benefits of clean energy resources, such as more comfortable homes, less pollution, and improved community resilience, but as ratepayers and taxpayers, they fund the very programs in which they are often unable to participate.

Policies that increase low-income adoption of energy efficiency measures and on-site renewable resources are needed to help reduce the risk of a so-called "green divide," in which the benefits of these resources are not equally available to all. For example, direct install efficiency programs run by the investor-owned utilities (IOUs) have served about one third of all eligible households over a nine year period, which is both a considerable achievement and an opportunity for further progress.[3] And Bovarnick and Banks (2014) note that "while falling prices for PV [photovoltaic] systems and cost reductions for installation have resulted in an expansion of solar deployment to middle- and upper-income households, the same benefits have not yet accrued for low-income households on a large scale." One estimate pegs just four percent of low-income households in California as having been served by a residential renewables program.[4]

Methodology

This report is focused on identifying barriers and potential solutions and opportunities that will ultimately be used to develop recommendations to address those barriers as stated above. The study process has involved in-depth research, analysis, and engagement of key stakeholders and members of the public.[5] The process for completing this study includes:

Literature Review

The Energy Commission has performed a literature review of over 100 available studies published by other parties (such as academia, social sector organizations) on the topic areas identified in the statue. Much of the discussion in this report on access to renewable technologies is focused on solar photovoltaic due to what is available in the literature. Lampton et al (2010) noted that "solar energy is just one type of several renewable energy resources that could be used to reduce the energy burden on low-income households. Factors such as resource availability, cost, climate, and accessibility (on-site versus off-site generation) should all be considered before selecting an appropriate renewable energy technology for residential energy assistance." It is

---

3 These program numbers are for Energy Savings Assistance programs between 2002-2010. See NRDC, 2011, "The Benefits of Energy Efficiency for California's Low Income Households,"

4 Kat Friedrich, "California Supports Solar Roofs for Multifamily Affordable Housing," California Energy Finance Forum, July 16, 2016, http://www.cleanenergyfinanceforum.com/2016/07/18/california-supports-solar-roofs-for-multifamily-affordable-housing.

5 All workshop notices, agendas, presentations, transcripts, and written comments from the Energy Commission's SB 350 Low Income Study workshops are available online at https://efiling.energy.ca.gov/Lists/DocketLog.aspx?docketnumber=16-OIR-02.

possible that most of the identified barriers and opportunities for solar in low-income communities could also apply to other renewable technologies, but additional analysis will be necessary to identify the unique characteristics, challenges, and opportunities associated with other technologies.

This review highlights that the most common barriers are high up-front costs, financing, program design, ineffective information and outreach, high rental populations, and physical home attributes.

Public Engagement

Meetings Facilitated by Community-Based Organizations

Energy Commissioners and staff participated in a series of statewide meetings facilitated by community-based organizations. These meetings provide an opportunity for community members to speak about their experiences with renewable energy, energy efficiency and weatherization programs, as well as roundtable discussions with representatives of program delivery partners about barriers to and opportunities for improved delivery of such programs.

Energy Commission Workshop on Barriers

On August 12, 2016, the Energy Commission hosted a workshop to gather input from state agencies, community organizations, industry, and local government. This workshop provided a venue to identify and discuss barriers to solar photovoltaic, renewable energy, and energy efficiency for low-income customers and disadvantaged communities, and the workshop also included a discussion on opportunities for addressing barriers for local small businesses located in disadvantaged communities. The discussion provided useful input to help identify additional opportunities and solutions.

Energy Commission Workshop on Draft Study

The Commission anticipates publishing the draft SB 350 Barriers Study in September 2016, and holding a draft workshop to solicit public input on the draft shortly thereafter.

A list of the public outreach and workshops is provided in Appendix B. A significant degree of this study is informed by the stakeholder feedback provided by environmental justice advocacy groups, industry partners, and members of the public. These inputs proved invaluable to the study. The public workshop generated robust feedback on the technical aspects and on-the-ground implementation of various programs and initiatives, as well as targeted suggestions for overcoming key barriers. And public comments at the community meetings revealed crucial insights that were not well-emphasized in the literature, such as grassroots desire to participate in community solar projects, potential participants' interest in energy upgrades for their non-energy benefits, and a degree of skepticism toward government action and program offers.

Recommendations

This report provides an in-depth discussion of the barriers identified and some potential solutions and opportunities to address those barriers. Ultimately, the discussion included in this report will be used to develop policy recommendations based on the information from the literature review, community-based meetings, and workshops. These preliminary recommendations will contribute to the transformative objectives of the SB 350 Barriers Study to address barriers for low-income and disadvantaged communities.

Companion Study on Clean Transportation

The Energy Commission is coordinating with the Air Resources Board, which is tasked under SB 350 with developing a similar study that will examine the barriers faced by low-income and disadvantaged communities for access to clean transportation options. Given that there are significant intersections between clean transportation, renewable energy, and energy efficiency, it is unsurprising that a number of the barriers are cross-cutting. For example, a number of the financial barriers that have been identified in this study including high up-front costs and difficulty securing financing also impact access to clean transportation opportunities for these communities. Additionally, an outstanding need for community access and insufficient education and outreach continues to be a barrier to expanding clean transportation, energy efficiency, and renewable energy.

CHAPTER 2: State of California Energy-Related Financial Support Programs for Low-Income Customers

This chapter provides a description of the energy-related programs administered by the State of California that provide financial support to low-income households, as background for discussion later in the report of potential ways these programs could be improved. These programs fall into three categories: utility bill payment assistance, direct installation weatherization services, and other investor owned utility programs that provide funding to encourage investment in energy efficiency or renewable energy on the customer side of the meter.

This chapter describes the following programs.

California Department of Community Services and Development (CSD) Programs

- Low Income Home Energy Assistance Program (LIHEAP)
- Weatherization Assistance Program (WAP)
- California Low-Income Weatherization Program (LIWP)

California Public Utilities Commission (CPUC) Programs

- California Alternate Rates for Energy (CARE)
- Family Electric Rate Assistance Program (FERA)
- Energy Savings Assistance Program (ESA)

Renewable Energy Programs –CPUC or California Energy Commission

- California Solar Initiative (CSI)
  - Single-family Affordable Solar Homes Program (SASH)
  - Multi-family Affordable Solar Homes Program (MASH)
  - New Solar Homes Partnership (NSHP - California Energy Commission Program)
  - CSI Solar Thermal Program
- Green Tariff Shared Renewables Program
- Multifamily Affordable Housing Solar Roofs

In addition to these programs, there are many federal, state, and local government funding programs that are targeted at expansion of the availability of affordable housing or mitigation of health and safety dangers in low-income homes. Among these are State of California programs administered by the State Treasurer's Office

(e.g., federal and state tax credits for affordable housing development and rehabilitation, bond financing for affordable housing, loan loss reserve funding to reduce risk for lenders who support Property Assessed Clean Energy (PACE) financing), the Department of Housing and Community Development affordable housing financial assistance programs (see http://www.hcd.ca.gov/financial-assistance/), and California Housing Finance Authority (CalHFA) home loan programs, and federal financing programs for upgrades to low-income housing, such as U.S. Housing and Urban Development (HUD) Federal Housing Administration (FHA) Insured Energy Efficient Mortgage Program. Often funding from these additional sources can be extremely important when used in combination with funding from the programs described in this chapter to maximize the scope of energy efficiency and renewable generation projects in housing for low-income persons and disadvantaged communities.

California Department of Community Services and Development Programs

Low Income Home Energy Assistance Program

The U.S. Department of Health and Human Services (U.S. HHS) Low Income Energy Assistance Program (LIHEAP) was created in 1981 "to assist low-income households, particularly those with the lowest incomes, that pay a high proportion of household income for home energy, primarily in meeting their immediate home energy needs" (HHS, 2015a). Assistance is provided through formula-based block grants to states, Indian tribes and tribal organizations, and U.S. territories. Funds are provided to low-income households through programs administered, under the oversight of the CSD, by CSD or county governmental agencies. The maximum income level for eligibility is 150 percent of the poverty level, except where 60 percent of state median income is higher, and income eligibility may not be set lower than 110 percent of the poverty level (ACF, 2016).

LIHEAP allocations to California were estimated at $152.3 million in 2014, $172.2 million in 2015, and $162.8 million in 2016. The majority of that funding provides assistance for payment of utility bills. States also have the discretion to spend up to 25 percent of LIHEAP funding on energy efficiency measures in conjunction with weatherization programs. Although this is a limited percentage, when applied to the substantial total LIHEAP allocation to California, it results in by far the largest source of federal weatherization funding administered by CSD.

California has used LIHEAP funding also to help develop renewable energy resources. The "Solar for All California" pilot program launched in 2010 used $14.7 million of California's annual LIHEAP allocation along with more than $3.5 million leveraged through local and other partners to install rooftop solar systems on low-income homes. The pilot program, which ended in 2012, resulted in systems installed on 545 single-

family homes and 14 multifamily apartment buildings with 937 units, far surpassing the original program goal of reaching 500 households. (CSD, 2016g)

Weatherization Assistance Program

The U.S. Department of Energy (U.S. DOE) Weatherization Assistance Program (WAP) was created in 1976 with the goals of increasing the energy efficiency of low-income homes, reducing energy costs, and improving health and safety. (Lampton et al, 2010) WAP has provided 7 million households with assistance since it was established (U.S. DOE, 2016b). Improvements in energy efficiency lower energy bills, decrease debt, reduce utility shutoffs and reconnections, increase property value, and generate local jobs (Lampton et al, 2010).

WAP provides grants to states, territories, and Indian tribes to improve energy efficiency in low-income homes. Funds are disbursed by the Community Services and Development Department (CSD) through contracts with local government and community agencies to provide direct installation weatherization services. Each state sets its own income requirements within U.S. DOE guidelines (U.S. DOE, 2016b). Typical annual funding is less than $200 million (Henderson, 2015). The program funds improvements to the building envelope such as weatherstripping doors and windows, air sealing, and installing insulation. It can also include upgrades or repairs to heating and cooling systems, but these are less common (Drehobl and Ross, 2016).

To be eligible for the California Weatherization Assistance Program, applicants must be a California resident, need financial assistance for home energy costs, and have an annual pretax household income that is below 60 percent of the state's median income. For example, the maximum annual income level for a family of four is $48,500 (CSD, 2016b).

The WAP allocation to California for 2016 is $4,577,898 (Garcia, 2016). The California Department of Community Services and Development provides an interactive map of California through which applicants can obtain information on weatherization services provided in their area (CSD, 2016d). Services are provided by community action agencies, energy agencies, and other local providers.

California Low-Income Weatherization Program

California cap-and-trade auction proceeds are dedicated to the California Low-Income Weatherization Program (LIWP) to extend the reach of the federal WAP program to install an expanded level of energy efficiency measures, and add the installation of solar photovoltaics, and solar hot water heaters in low-income single- and multifamily homes to reduce greenhouse gas emissions and save energy (CSD, 2016c). The program also aims to provide other benefits to disadvantaged communities like workforce training, employment, lower energy bills, and improved health and safety. $154 million of cap-and-trade auction proceeds were allocated to LIWP in the 2014/2015 and 2015/2016 state budgets.

To be eligible, single-family homes and small multifamily dwellings (fewer than 20 units) must be within a disadvantaged community identified in the California Communities Environmental Health Screening tool (CalEnviroScreen)[6], and residents "must meet income qualifications of 60 percent of state median income or income eligibility requirements under the California Solar Initiative's Single Family Affordable Solar Homes Program" (CSD, 2016c).

For owners of multifamily properties with more than 20 units, the LIWP Large Multi-Family Program provides incentives for up to 80 percent of energy efficiency upgrades and 100 percent of solar installations (CSD, 2016e). Participating properties must also install energy improvements equal to at least 15 percent energy savings above existing conditions, be prepared to have supporting capital to finance the project, and complete construction by the first quarter of 2017 to receive the highest incentives, although projects completed after April 30, 2017, are still eligible at lower incentive amounts (CSD, 2016f).

California Public Utilities Commission Programs

California Alternate Rates for Energy

The California Alternate Rates for Energy (CARE) program was established in 1989 by the California Legislature and is funded through a surcharge on non-CARE customers' monthly bills. The program provides a monthly discount on energy bills for income-qualified households based on the number of persons in the household and total gross household income, with an upper limit of 200 percent of the federal poverty guidelines. Customers may also be eligible if they are enrolled in certain public assistance programs, including LIHEAP. In December 2015, the California Public Utilities Commission authorized Pacific Gas and Electric Company (PG&E), Southern California Edison Company (SCE), San Diego Gas & Electric Company (SDG&E), and Southern California Gas Company (SoCal Gas) to spend up to 50 percent of their 2015 authorized budget ($1.281 billion) to continue the CARE program from January 1, 2016, to June 30, 2016 (CPUC, 2015).

Family Electric Rate Assistance Program

The Family Electric Rate Assistance Program (FERA) provides bill discounts for families whose income slightly exceeds the CARE allowances and is available for customers of

6 In 2012, the Legislature passed Senate Bill 535 (de León, Chapter 830) directing that, in addition to reducing greenhouse gas emissions, a quarter of the proceeds from the Greenhouse Gas Reduction Fund must also go to projects that provide a benefit to disadvantaged communities. A minimum of 10 percent of the funds must be for projects located within those communities. The legislation assigned responsibility for identifying disadvantaged communities for the purposes of the legislation to the California Environmental Protection Agency (CalEPA). To meet this mandate, CalEPA developed the California Communities Environmental Health Screening Tool (CalEnviroScreen), a tool that assesses all census tracts in California to identify the areas disproportionately burdened by and vulnerable to multiple sources of pollution. Additional information can be found at http://www.calepa.ca.gov/EnvJustice/GHGInvest/

PG&E, SCE, and SDG&E. The upper income limit for FERA is 250 percent of the federal poverty guidelines.

Energy Savings Assistance Program

The Energy Savings Assistance program (established in 1990) is overseen by the California Public Utilities Commission and administered by PG&E, SCE, SDG&E, and SoCal Gas. The program provides direct installation weatherization services to eligible low-income households at no cost. Services provided may include "attic insulation, energy-efficient refrigerators, evaporative coolers, air conditioners, weather stripping, caulking, low-flow showerheads, water heater blankets, and door and building envelope repairs" (Evergreen Economics, 2013a). The program provides services to all housing types and both renters and homeowners. Participants must live in a house, mobile home, or apartment that is at least five years old. A residential customer's household income must be at or below 200 percent of the federal poverty guidelines. In areas where at least 80 percent of the population is at or below 200 percent of the federal poverty level, a household is eligible if already enrolled in certain public assistance programs.[7]

Preliminary estimates for 2015 indicate that PG&E, SCE, SDG&E, and SoCal Gas treated more than 240,000 homes at a cost of more than $277 million (PG&E et al, 2016). CPUC Decision 15-12-024 authorized the investor-owned utilities to spend up to 50 percent of their 2015 authorized budget (nearly $391 million) to continue the ESA Program from January 1, 2016, to June 30, 2016 (CPUC, 2015).

Renewable Energy Programs – CPUC or California Energy Commission

California Solar Initiative

The California Solar Initiative (CSI), established by Senate Bill 1 (Murray, Chapter 132, Statutes of 2006), set goals of installing solar energy systems with a generating capacity equivalent to 3,000 megawatts (MW), establishing a self-sufficient solar industry within 10 years, and placing solar energy systems on 50 percent of new California homes by 2020. The CSI directed the CPUC, the California Energy Commission, and publicly owned utilities to provide incentives to achieve these goals. The CPUC's CSI Program provides incentives for onsite solar in investor-owned utility areas for existing residential and existing and newly constructed commercial buildings. The Energy Commission's New

7 Customers may be eligible if they are enrolled in public assistance programs such as Medicaid/Medi-Cal, Women, Infants and Children Program (WIC), Healthy Families A & B, National School Lunch's Free Lunch Program (NSL), Food Stamps/SNAP, Low Income Home Energy Assistance Program (LIHEAP), Head Start Income Eligible (Tribal Only), Supplemental Security Income (SSI), Bureau of Indian Affairs General Assistance, and Temporary Assistance for Needy Families (TANF) or Tribal TANF. See "Energy Savings Assistance Program," Energy Upgrade California, accessed August 25, 2016, http://www.energyupgradeca.org/en/find-programs-and-assistance/find-a-program/programs/energy-savings-assistance-program.

Solar Homes Partnership (NSHP) Program provides incentives for onsite solar on newly constructed homes in IOU territories. The publicly owned utilities provide incentives for onsite solar in their jurisdictions for existing residential and existing and newly constructed commercial buildings.

SB 1 was followed closely by Assembly Bill 2723 (Pavley, Chapter 864, Statutes of 2006), which requires a minimum of 10 percent of the CPUC's CSI budget to be used for solar on low-income residential housing. This led to creation of the Single-Family Affordable Housing Program (SASH) and the Multifamily Affordable Housing Program (MASH), which together had a budget of $216 million through the end of 2016. In 2013, the California Legislature authorized an additional $108 million for the SASH and MASH programs in Assembly Bill 217 (Bradford, Chapter 609, Statutes of 2013) and extended the programs through the end of 2021 or until funds are exhausted, whichever is first.

Single Family Affordable Solar Homes Program (SASH)

Under the oversight of the CPUC, the SASH program provides incentives to qualified low-income homeowners served by investor-owned utilities, to further buy-down the cost of a solar electric system beyond the incentives generally available through CSI, and is administered by GRID Alternatives, a nonprofit organization based in Oakland, California. Sanders and Milford (2014) note that "GRID Alternatives has focused its program on installing solar panels in low-income households since 2001, emphasizing broad community engagement and homeowner energy education."

According to the CPUC's website, the program has installed and interconnected 4,883 PV systems, with 308 projects in the installation or interconnection queue and 248 applications under review. Together, these projects represent 16.5 MW of solar capacity and $90 million in incentives. Annual energy bills for participants in the first year decreased by $756 in 2011-2013 (Navigant, 2015b), and the program helped enroll 5,145 low-income homeowners in the ESA program. The program also contributed to workforce development by training nearly more than 17,000 volunteers; by using volunteer labor, GRID Alternatives has reduced installation costs, since labor normally represents about 10 percent of system cost (McCormick, 2015).

A 2015 Navigant study found that SASH customers "expressed extremely high levels of satisfaction with the program overall" and that having a single program administrator "streamlines communication and decision-making" between the administrator and the CPUC (Navigant, 2015a). In addition, the study concluded that GRID Alternatives "has implemented an effective job training program," with representatives from job training organizations commenting on the quality of GRID Alternatives' programs. Finally, the study found that program participants' awareness of energy efficiency "dramatically increased after program participation," with 95 percent of respondents indicating an increase in their awareness and 68 percent of SASH participants enrolled in the ESA program. Barriers to program participation identified in the analysis were income

eligibility requirements, requirements for financial contributions from homeowners, and the need for structural home repairs before installation.

Multifamily Affordable Solar Homes Program (MASH)

Similar to the SASH Program, the MASH Program provides incentives to qualified affordable multi-family housing served by investor-owned utilities to further buy-down the cost of a solar electric system beyond the incentives generally available through CSI, and is administered by PG&E, SCE, and the Center for Sustainable Energy in SDG&E territory. Program funding is fully subscribed, and the program is closed to new applications. More than $76 million has been paid to completed projects, with another $14.7 million reserved for projects in the queue, and nearly 23 MW of solar capacity (353 projects) is interconnected to serve multifamily affordable housing. In addition, more than 6,770 tenant units are participating in virtual net metering because of the MASH program. Annual energy bills for MASH tenants that received direct benefits from the program were reduced by around $484 in 2011-2013, while building owners averaged first-year savings of $404 per kilowatt of capacity (Navigant, 2015b).

The 2015 Navigant CSI Market and Program Administrator Assessment suggests improving the effectiveness of program administration by making staff roles and communication challenges more clear and by having a single point of contact for installer questions and requests. Navigant also noted that "delays in rebate processing and a lack of transparency in program changes affect both the installers and the property owners." Like the SASH Program, MASH participants indicated a high awareness of energy efficiency opportunities but did not credit the MASH Program itself with their knowledge. However, tenants were generally satisfied with the solar system and nearly all said they would encourage their property manager to participate in the program if they moved to another building. Barriers to program participation included difficulty in identifying favorable project financing, the need for electrical upgrades to properties, complex program applications, and dependence on solar installers for project success.

One potential downside of MASH is for households living in HUD-subsidized housing, in which rent plus utilities is less than 30 percent of income. If utility costs are reduced due to virtual net metering tariffs, the proportion of rent could increase, which would lead to no net monthly financial benefit to the household (IREC, 2016).

New Solar Homes Partnership Program (NSHP)

The California Energy Commission established the NSHP Program in 2007 with a goal of providing incentives to 360 MW of solar on newly constructed homes by the end of 2016. The originally authorized program budget was $400 million, but the program was funded through the state's Public Goods Charge, which expired at the end of 2011, leaving the program underfunded. In 2016, the CPUC authorized an additional $111.78 million to continue to fund the NSHP program through its statutory expiration date of December 31, 2021 (CPUC, 2016b).

The NSHP Program has two incentive structures, one for market rate housing and a higher incentive for affordable housing projects, with both incentives declining over time as required by SB 1. For affordable housing projects, incentives are available for up to 75 percent of total system cost. As of February 2016, the NSHP Program had installed 6.22 MW of solar on affordable housing, representing around 9 percent of total program installed capacity (Energy Commission, 2016). In addition, although the NSHP Program is not subject to the AB 2723 requirement, the Energy Commission has worked toward and exceeded that goal with 13.5 percent ($19 million) of NSHP funds paid to affordable housing projects.

California Solar Initiative -- Thermal/Solar Water Heating Program

In 2006 as part of the implementation of CSI, the CPUC authorized $100.8 million of the total CSI funds to be used for incentives for solar water heating and other solar thermal technologies that reduced electricity usage. In 2007, the California Legislature passed Assembly Bill 1470 (Huffman, Chapter 536, Statutes of 2007), which authorized the CPUC to create a program to provide incentives for solar water heating systems in homes and businesses that displace natural gas funded through a surcharge for natural gas ratepayers. The CPUC created the CSI-Thermal Program in 2010, and in 2011 created the CSI-Thermal Low-Income Program, which was originally allocated $25 million to promote installation of solar water heating systems displacing both natural gas and electricity on qualifying low-income single-family homes and multifamily buildings. An additional $25 million was shifted from the CSI-Thermal general market budget to the CSI-Thermal low-income budget in 2016, increasing the total low-income budget to $50 million.

Funding is available first come, first served for single-family and multifamily projects (CPUC, 2016c). Low-income customers in the CARE or FERA programs are exempt from paying the surcharge that funds the program (Lampton et al, 2010). As of the date of this study, program funding allocated or under review for low-income single and multifamily residential systems is about $26 million (890 applications).

Green Tariff Shared Renewables Program (GTSR)

Senate Bill 43 (Wolk, Chapter 413, Statutes of 2013) required investor owned utilities to establish Green Tariff Shared Renewables (GTSR) Programs, which were first approved by the CPUC in early 2015. The GTSR program enables customers to invest in community-scale (up to 20 MW) renewable projects and receive a bill credit on their utility bill similar to, but not the same as, the NEM rate structure. The program has a statewide cap of 600 MW and requires that 100 MW are reserved for projects up to 1 MW that are located in the most impacted 20 percent of disadvantaged communities, as identified by CalEPA.[8]

8 According to one estimate, GTSR might reach one third of affordable housing units in California. See Kat Friedrich, “California Supports Solar Roofs for Multifamily Affordable Housing,” California Energy Finance

Multifamily Affordable Housing Solar Roofs Program

Assembly Bill 693 (Eggman, Chapter 582, Statutes of 2015), directed the CPUC to establish the Multifamily Affordable Housing Solar Roofs Program by authorizing $100 million through 2020, with the possibility of further extension of the program through 2026, for qualifying solar energy systems in affordable multifamily housing located in disadvantaged communities. The legislation includes a requirement for local workforce development.

Forum, July 16, 2016, http://www.cleanenergyfinanceforum.com/2016/07/18/california-supports-solar-roofs-for-multifamily-affordable-housing.

CHAPTER 3: Barriers to Energy Efficiency and Renewable Energy

This chapter summarizes the main barriers for low-income customers identified in the literature, community meetings, Energy Commission workshops and hearings, and stakeholder commentary. Many challenges are common to both energy efficiency and renewable energy, while others are unique to each area. Often, these barriers overlap, compounding one another, as will be discussed below. These barriers are structural, financial, informational, and/or programmatic. Comprehensive solutions to increasing energy efficiency and renewables equity in California require nuance and sensitivity to the differing challenges facing various communities and low-income customers.

There are many barriers to increasing energy equity in disadvantaged communities. Generally, these barriers all stem from a few principal issues. Financial barriers, unsurprisingly, limit low-income customers' access and means to energy upgrades. Structural issues rooted in the low-income housing sector complicate efforts to make progress. 64 percent of low-income Californians are renters, which presents challenges to promoting housing retrofits that appeal to the property owner while still benefiting the renter (Evergreen Economics, 2013b). And 43 percent of all low-income renters live in multifamily housing, which presents unique challenges, particularly if these units are master metered. Policy and programmatic barriers for prioritizing energy equity in disadvantaged communities limit the focus on low-income customers and hinders the potential for collaboration and innovative solutions. Community access barriers make it difficult for specific communities with varied needs to find relevant program information and to be reached by program representatives. Finally, these barriers are not discrete; they overlap, complicate, and exacerbate one another, meaning that developing solutions requires careful consideration.

Financial Barriers

Even for the minority of low-income customers who own their homes, their limited disposable funds make them more risk-averse and less capable of participating in programs with high up-front payments or copayments for energy efficiency or renewable equipment. Competing needs, such as child care or medical expenses, may further diminish a low-income household's ability to contribute up-front funding for an energy upgrade program. At the same time, lack of collateral and poor credit may restrict access to financing options.

This barrier precludes many Californians from participating in energy upgrade programs. 30 percent of working families in California are low-income (see Appendix A). Nationally, a recent study concludes that 61 percent of low-income working families

spent more than one-third of their income on housing costs, and that figure increases to 81 percent of working families below the federal poverty level (Roberts et al, 2012-2013).

Limited Disposable Incomes

Direct installation programs can only go so far; ESA, for example, is capped at $2,500 per unit, which could be spread among a variety of efficiency opportunities such as weatherstripping, attic insulation, lighting, and heating, ventilation, and air conditioning maintenance or replacement, among other things.[9] Often, this per-unit spending cap is not enough to install all needed measures, meaning that homeowners, landlords, and tenants must fund additional energy upgrades. However, low-income households with disposable funds are hard-pressed to commit to a comprehensive energy upgrade. One study concluded that a typical building shell efficiency retrofit might cost half of an average low-income family's annual noncore budget (Granade et al 2009).[10]

Nichols and Greschner (2013) argue that "for most low and middle income families to become solar adopters, solar must be cash flow positive from day one." This dynamic is a departure from the early adoption model within the solar market. While high-income early adopters could afford to make large upfront investments in solar, other Californians do not have the disposable funds available for such an expenditure.

This finding, therefore, presents a steeper obstacle for low-income families to buy into energy upgrade programs. This diminishes the chances of success for energy programs with high up-front costs, as one study concludes:

> Participant characteristics [in energy efficiency programs] appear to correlate with the program's "buy-in" - the amount a household is required to spend in order to participate. Programs with a high buy-in were more likely to have participants with high incomes, high educational attainment, who are white, or English-language speakers. Programs with no buy-in, or even with a negative buy-in (meaning the program pays an incentive or provides a service to the household without requiring any spend at all) were more likely to have participants with low or moderate incomes or a larger proportion of non-white participants (Frank and Nowak, forthcoming).

Large up-front expenditures for energy retrofits are exacerbated by long payback time frames. Property owners hesitate to invest in energy efficiency and renewable upgrades

---

9 Program offerings vary by utility. For a fuller list of eligible measures under ESA, see pages 32-34 of the *California Statewide LIEE Policy and Procedures Manual*, 2010, http://www.liob.org/docs/Statewide%20Low%20Income%20Energy%20Efficiency%20Program%20Policy%20and%20Procedure%20Manual%208-31-10.pdf

10 The study estimated that the shell retrofit would cost $910 for the average low-income home, and $1,820 for the average low-income single family home. The study defined a *noncore budget* as any money not allocated to housing, food, apparel, transportation, health care, education, insurance, and pensions.

if they cannot realize the full savings of such an investment. This is compounded for low-income families, even those who own their own homes, because the low-income households are far more likely to relocate.[11] This issue spills over to builders and homebuyers as well, since it complicates the commercial value of a home if a buyer does not expect to recoup the full value of an energy efficiency or renewable installation (Granade et al, 2009).

Utility Subsidies Discourage Energy Upgrades

Ratepayer assistance programs and other utility subsidies reduce the savings of energy retrofits. This discourages low-income customers' participation in energy upgrade programs (other than no-charge direct install programs), since customers receiving ratepayer assistance would experience a reduced economic benefit from such upgrades.

This issue exists in public housing and multifamily affordable housing as well, where the housing program may offer utility allowances to individually metered homes. Farley and Mazur-Stommen (2014) find that tenants might have to choose between energy upgrades and their utility allowance, a particularly difficult choice "if the allowance is generous enough to cover the entire bill."

Moreover, utility allowances might serve as a disincentive for building owners to pursue energy savings. Henderson (2015) points out that "owners of HUD-assisted housing receive payments based on utility expenses incurred by the owner that might otherwise have been passed through to tenants" through bill savings.

Difficulty Securing Financing

As discussed above, low-income families and affordable housing owners often lack the capital necessary to self-finance up-front costs for energy efficiency or renewable retrofits. One study notes that "with the exception of a few utility-operated residential loan programs, energy-efficiency financing from governments and utilities generally has reached only a very small subset of property owners, on the order of less than 1 percent to 5 percent of those eligible for a given program" (Palmer et al, 2012).[12]

High Price of Financing

Financing for energy retrofits typically comes at a premium. Granade et al (2009) conclude that such financing "is often at higher interest rates, especially for lower-

11 According to recent census data of the U.S. West, 14 percent of people below the federal poverty threshold moved in 2014-2015, more than 10 percent of people with above the poverty level but below 150 percent of the limit moved, and just 7 percent of people above 150 percent of the poverty limit moved. Furthermore, renters were more than four times more likely to move as homeowners, and low-income residents are disproportionately renters. See U.S. Census Bureau, *Geographical Mobility: 2014 to 2015*, Census.gov (accessed August 4, 2016), http://www.census.gov/data/tables/2015/demo/geographic-mobility/cps-2015.html.

12 However, that study contends that the limited financing options is due more to a lack of demand for energy efficiency improvements, stemming in part from transaction costs and lack of good information about energy options. See Palmer et al, 2012.

income households." As another study notes, this is partly due to the fact that "energy-efficiency loans are typically unsecured and thus inherently risky, leading to relatively high interest rates and lending that is mainly based on the credit-worthiness of the borrower—not the value of the investment" (Palmer et al, 2012). Moreover, while rooftop solar panels can be repossessed if a loan defaults, many efficiency measures are not discrete items, so they cannot serve as limited collateral to aid in financing.

The low margin of energy retrofit loans and of standardized loan products. Palmer et al (2012) point out that energy efficiency loans for homes and small businesses have low values in relation to the origination and processing costs. Small margins, therefore, limit the appeal of these loans to many lenders.[13] "Without a standardized energy-efficiency loan product," the study continues, "lenders are limited in their ability to take loans to a secondary market. Without access to secondary markets, there is no ability to recapitalize loan programs and increase the amount of money available" (Palmer et al, 2012).

Inadequate Data Among Financial Institutions

Inadequate data limit available capital and drive up loan costs. The causes for these data limitations vary by program, but some general characteristics apply to many programs. As one study puts it:

> Financial institutions lack access to adequate data to assess and price both energy savings and the improvement in borrower financing repayment trends that these savings may deliver. [Energy efficiency] financing programs have often been limited in scale, data recording methods have not been standardized and, since many programs were launched as part of ARRA [American Recovery and Reinvestment Act], have not existed long enough to capture default rates over a full loan cycle (Zimring et al, 2013).

On the other hand, another study argues that beyond insufficient data, financial instructions lack appropriate methods to interpret such data. Recently, Deutsche Bank concluded:

> Conventional lenders…treat energy savings projections skeptically and virtually never incorporate them in the underwriting models that determine the sizing of loans. Rather, they rely on historic building performance or industry standards, not forward-looking projections. Many lenders explain their reluctance to underwrite against savings by pointing to the lack of data by which to judge the accuracy of energy savings projections. Despite decades of investment in energy

13 This issue also limits the ability of small businesses and contractors to secure low-interest loans for energy retrofits. Community Energy Services Corporation, comments at the SB 350 Low-Income Barriers Study workshop, August 12, 2016.

> efficiency in multifamily buildings, there are no commonly accepted datasets, data standards, or third party verification practices to measure and confirm energy savings (Deutsche Bank 2012).

Consequently, Deutsche Bank states, lenders lack the means to conduct reliable risk assessment for energy improvement projects.

Credit Requirements

In addition to the obstacles to securing financing discussed above, poor credit scores create an additional barrier for low-income households' ability to secure low-cost, long-term financing for energy retrofits.[14] Sanders and Milford note that even "lease financing and PPAs [power purchase agreements], which avoid the upfront costs, are generally unavailable to low-income residents who often have an inadequate credit history to be able to enter into a solar lease agreement" (Sanders and Milford, 2014). In California, a FICO score of 650 is typically the threshold for accessing financing such solar arrangements.[15]

Structural Barriers

Building Age

Older buildings are more likely to have structural or design issues that make energy efficiency and renewable retrofits unviable, particularly for people in disadvantaged communities, who are more likely to live in such housing. 43 percent of California's housing stock was built before 1970, and 61 percent was built before 1980 (2014 U.S. Census). Although low-income customers are no more likely to occupy older homes than Californians more broadly (see Appendix A), this issue may be more pronounced for low-income customers. This is because programs subsidized by tax dollars, seeking to maximize their demonstrable results, tend to avoid or postpone more difficult projects (that is, they target low-hanging fruit). In the case of energy improvements, this means that older homes with more complex upgrade requirements may have even more limited access to program benefits, resulting in disparities *within* the sector of low-income Californians.[16]

Efficiency evaluations of older homes often reveal significant health and safety issues that must be addressed before energy upgrades can be implemented, such as the

14 California SEIA, comments at the SB 350 Low-Income Barriers Study workshop, August 12, 2016.

15 California SEIA, comments at the SB 350 Low-Income Barriers Study workshop, August 12, 2016.

16 As discussed in Appendix A, there are differences in the age of housing stock among various subsectors of low-income customers. For example, the average single-family home rented by a low-income tenant is eight years older than affordable multifamily housing units.

discovery of asbestos, lead, or mold (IREC, 2016). Structural issues, durability, and moisture may also dissuade property owners from pursuing energy upgrades.

Homebuilders may not have designed older properties to incorporate solar, resulting in physical barriers such as excessive tree shading and rooftop orientation (Grid Alternatives, 2016). Older rooftops are "more likely to need significant repairs to host a solar array on-site" (IREC, 2016). Furthermore, solar programs do not have easily accessible funding available to correct roof structural issues which might prevent solar installation.[17]

Even smaller issues present a hurdle. As Cluett and others note, "While major issues can render households ineligible for weatherization altogether, more-minor issues can add up to make the cost of energy efficiency improvements too high to meet cost–benefit tests" (Cluett et al, 2016).

Aging multifamily buildings have other needs that compete with the need for energy improvements. Low-income multifamily building owners "face increasing operational costs as their buildings age. Maintenance and improvement priorities often compete with energy efficiency upgrades for limited financial capital" (Drehobl and Ross, 2016). This often leads to circumstances in which multifamily property owners do not set aside funds for energy-related upgrades, opting instead to prioritize maintenance and repairs, as Henderson notes. Efficiency repairs, Henderson continues, are often "perceived as discretionary" by such property owners, even though this attitude will result in greater long-term costs for residents or HUD (in the form of HUD utility allowances) (Henderson, 2015). Indeed, one stakeholder at the Barriers Study workshop noted that building owners are reluctant to even consider efficiency retrofits because they are worried about uncovering health and safety issues which are not eligible for program funding.[18]

Low Home Ownership Rate

Low-income Californians are disproportionately renters: 64 percent of low-income Californians rent their homes, whereas just 44 percent of Californians as a whole are renters (Evergreen Economics, 2013b). This has two implications: first, existing programs may not sufficiently address the needs of renters, and second, the burden of insufficient energy efficiency and renewable energy programs for renters falls disproportionately upon low-income people.

Consequently, low-income renters face additional barriers to those of low-income homeowners. Renters lack the property rights to install energy upgrades, and may need the homeowner's permission even to accept fully subsidized upgrades like modest

17 California SEIA, comments at the SB 350 Low-Income Barriers Study workshop, August 12, 2016.

18 TRC, comments at the SB 350 Low-Income Barriers Study workshop, August 12, 2016.

weatherization improvements, let alone more extensive changes such as rooftop solar. And renters who "pay their own utility bills may be unwilling to invest in energy efficiency upgrades and on-site renewables because they may be unsure they will be there long enough to recoup their investment" (Drehobl and Ross, 2016). On the property owners' side, issues of getting the renter's permission or trying to plan energy retrofits around periods of vacancy can complicate matters.

The Split Incentive

The challenge of ensuring low-income renters benefit from energy upgrades while securing the property owner's participation results in a unique barrier commonly referred to as the split incentive. In effect, the split incentive describes situations in which the property owner fails to realize a benefit from the energy retrofit or the low-income resident fails to receive the financial incentive of the program.

The issue is particularly acute among the affordable multifamily housing sector because low-income Californians are 39% more likely to live in multifamily housing than the general population (Evergreen Economics, 2013b). For building units that are master-metered (which tend to be found in older buildings), utilities are either included in the rent or billed flatly by the property owner. In these cases, it is difficult to ensure that the energy savings realized by the property owner are conveyed to the low-income tenant through lower rents or utilities charges.

Challenges Specific to the Multifamily Sector

Residential energy efficiency programs often focus on single-family, owner-occupied housing (Drehobl and Ross, 2016). However, there is considerable potential for energy improvements in the multifamily housing sector. A study by Energy Efficiency for All estimates that increasing the energy efficiency of multifamily affordable housing could reduce electricity use in that sector by as much as 26 percent (Mosenthal and Socks, 2015, cited in Drehobl and Ross, 2016). Yet, the literature and stakeholder comments highlight a number of challenges to the multifamily housing sector that require special attention.

Lack of Information

Multifamily building owners may lack accurate information about the energy savings potential from building retrofits. One study concludes that "a good deal of uncertainty surrounds the payoffs from investments in insulation, air sealing, windows, HVAC equipment, new appliances, and more, and uncertainty about future energy prices" (Palmer et al, 2012). Even among building owners who do commit to energy retrofits, the properties may not achieve maximum efficiency because "building operators may not understand the equipment and therefore will not operate the building at optimal levels" (Markowski, 2014). Furthermore, building owners often have difficulty obtaining tenant

level and whole-building energy data from utilities, which make it difficult for building owners to make informed decisions about energy upgrades.[19]

Program Design and Transaction Costs

McKibben (2013) points out that "multifamily building common areas may be commercial accounts while tenant units are residential accounts. Or, a multifamily building's shared HVAC system may be a commercial account, while cooking gas and lighting for tenant spaces are residential accounts." Furthermore, McKibben continues, this "confusion is made worse in areas without combined natural gas and electric utilities." Consequently, energy upgrades for non-dwelling unit measures typically have access to efficiency "programs [that] have low budgets driven by poor cost effectiveness."[20] Finally, these issues create a considerable "hassle factor" on affordable multifamily building owners and managers with limited time and resources needed to create documentation and apply for programs (EPC 2013).[21]

Diverse Building Characteristics and Ownership Arrangements

The difficulty in developing standardized efficiency programs for multifamily buildings suggests that a one-size-fits-all model cannot be applied to the multifamily housing sector.[22] McKibben (2013) notes that "multifamily buildings vary widely in terms of heating, ventilation, and air-conditioning (HVAC) and other relevant systems; building age; building size; tenant incomes; financing structures; ownership structures; and other important factors that may affect energy efficiency and related decision-making (McKibben, 2013)." And affordable multifamily buildings can have dispersed or complex building ownership issues, which makes it difficult to develop suitable outreach and program guidance[23].

Financing

Affordable multifamily buildings are often constrained by the limited income generated by its operation. Affordable multifamily buildings are designed, contracted, built, and

---

19 NRDC, comments at the SB 350 Low-Income Barriers Study workshop, August 12, 2016.

20 NRDC, comments at the SB 350 Low-Income Barriers Study workshop, August 12, 2016.

21 See also TRC, comments at the SB 350 Low-Income Barriers Study workshop, August 12, 2016.

22 TRC, comments at the SB 350 Low-Income Barriers Study workshop, August 12, 2016.

23 EPC (2013) notes that "many multifamily buildings have several owners and multiple decision-makers who must be convinced before energy efficiency improvement work can be undertaken: owners, limited partners, managers, building staff, and sometimes tenants. Multifamily buildings may be owned by public housing agencies, nonprofit organizations, and for-profit individuals, partnerships, and housing management corporations. These owners, in turn, can be partnership syndicates, development companies, or institutions such as pension funds and insurance companies. The public housing authorities and nonprofits serve predominantly low-income households, but a great many low-income households live in conventional housing, rendering this category important to describe as well."

maintained with cost controls in mind, "so when cost overruns occur, energy efficiency is usually the first sacrifice made to keep the building within budget," especially when building owners need to make repairs to equipment and architecture for health and safety purposes. (Hynek et al, 2012).

In addition, NRDC notes that multifamily buildings typically operate around annual budgets, which make it difficult to invest in multiyear projects with long payback times.[24] Moreover, Henderson (2015) observes that "affordable housing owners typically have complicated financing arrangements that inhibit them from taking on any new debt except at the time of purchase or refinancing." This means that timing is a crucial issue, since opportunities for building owners to finance energy upgrades are limited.

Challenges that are Unique for Native American Communities

Native American communities, many of which are in rural areas, face additional barriers to those discussed above. Kronk (2010) notes that one significant hurdle to "alternative energy development is the lack of infrastructure, notably transmission lines, to move energy developed within Indian country, which tends to be located in more rural portions of the country, to areas of higher population density where there is a corresponding higher demand for energy."

Furthermore, sovereignty agreements can complicate the decision-making process for siting renewable energy improvements. The lengthy processes of leasing and siting solar facilities on Native American lands reservations can hinder these communities' access to renewable energy. Kronk (2010) observes that "Indian lands lease review and approval processes can easily take as many as two to three years longer than the comparable processes for projects outside of reservations, even in comparison with projects on federal lands."

In addition, Native American communities on reservations are often serviced by tax-exempt tribal associations or electric cooperatives, which are stymied by strict rules pertaining to the use of government incentives by such entities (Kronk, 2010).

Policy and Program Barriers

A number of existing programs have mechanisms for targeting low-income customers or goals for increasing disadvantaged communities' access to energy efficiency or renewables. However, various programs may have differing goals and objectives.

Reach Limitations Due to Program Design/Delivery

Programs may be designed and/or delivered in such a way that they disproportionately exclude low-income customers. For instance, programs may be designed without taking

24 NRDC, comments at the SB 350 Low-Income Barriers Study workshop, August 12, 2016.

the values and needs of specific disadvantaged communities into account.[25] On the national scale, Frank and Nowak (forthcoming) found that participants in whole-home retrofit and plug load/appliance programs were disproportionately "white, English-language speakers, homeowners, have incomes over $100,000, or have a college degree."

Lower participation by low-income customers is not necessarily intentional. Some programs, such as the New Solar Homes Partnership (NSHP) program, may feature higher subsidy rates for low-income compared to general customers,), and still may not reach as many low-income customers as much as may be desirable (as of February 2016, 13.5% of NSHP's total funding went to affordable housing projects[26]). This result may be due to several factors, such as slow growth of new affordable housing construction or higher subsidies for low-income customers are still not sufficient to overcome tight financial conditions for affordable housing building developers.

Stakeholder feedback indicates several limitations resulting from program rules. NRDC notes that a barrier arises when programs are confined to specific geographic boundaries, rather than being given the flexibility to work or collaborate across boundaries. [27] Properties or buildings that have the same level of income are often left out of the program even though the provider is serving buildings just across the street. Multiple commenters point out that ESA is hamstrung by a rule that does not allow further retrofits to homes that have already participated since 2001.[28] In addition, many programs target customers of the IOUs, leaving a sizeable portion of low-income customers without access to the same services.[29] CPUC notes the inconsistency of program eligibility; in particular, programs targeting households, rather than dwelling units, may have limitations because households are mobile.[30] At community meetings, members of the public expressed a fair degree of confusion about eligibility requirements (see Appendix B).

Barriers to Collaboration & Leveraging Opportunities

---

25 Marin Clean Energy, comments at the SB 350 Low-Income Barriers Study workshop, August 12, 2016.

26 New Solar Homes Partnership Market Report, Energy Commission, May 2016, http://www.energy.ca.gov/2016publications/CEC-300-2016-005/CEC-300-2016-005.pdf

27 NRDC, comments at the SB 350 Low-Income Barriers Study workshop, August 12, 2016.28 CHOC/EEC, comments at the SB 350 Low-Income Barriers Study workshop, August 12, 2016.;, Low Income Oversight Board, comments at the SB 350 Low-Income Barriers Study workshop, August 12, 2016.

28 CHOC/EEC, comments at the SB 350 Low-Income Barriers Study workshop, August 12, 2016.;, Low Income Oversight Board, comments at the SB 350 Low-Income Barriers Study workshop, August 12, 2016.

29 Leadership Counsel for Justice and Accountability, comments at the SB 350 Low-Income Barriers Study workshop, August 12, 2016.

30 CPUC, comments at the SB 350 Low-Income Barriers Study workshop, August 12, 2016.

Poor inter-program coordination results in funding silos and inter-jurisdictional overlap, which result in unrealized potential for energy upgrades for participants.[31] For example, there are two weatherization programs in California: one funded federally through LIHEAP and administered by CSD, and another run through the private utilities (the ESA program). Differences in program administration, contractors, jurisdiction, funding, eligibility requirements and other factors result in considerable difficulty overcoming collaboration barriers. A pilot program designed to leverage both programs between CSD and PG&E resulted in higher administrative costs, but increases in the participation rate and average energy savings per household (CSD/PG&E, 2014).

Tax Credits

The federal Low-Income Housing Tax Credit (LIHTC), established in 1987, has major potential to uniquely encourage energy upgrades in multi-family affordable housing. As Schweitzer (2016) points out, 90 percent of new affordable housing projects in the country are developed in part with LIHTC funds. Furthermore, Schweitzer (2016) notes that some "state-controlled housing finance agencies…are using the competitive nature of the tax credits —just one-quarter to one-third of projects are funded on average — to encourage developers to advance energy efficiency."

The State Treasurer's Office's California Tax Credit Allocation Committee (TCAC) facilitates the investment of private capital into the development of affordable rental housing for low-income Californians. TCAC allocates both federal (LITHC) and state tax credits to the developers of these projects. Corporations with large tax liability provide equity, as a major component of financing packages, to fund construction of the projects in return for the tax credits. TCAC verifies that the developers have met all the requirements of the program and ensures the continued affordability and habitability of the developments for the succeeding 55 years. They do this by providing federal and tax credits also at 15 year intervals throughout the life of the buildings for major rehabilitation projects.

During most of the past decade, TCAC has maintained ambitious minimum requirements and provided extra competitive points for incorporation of energy efficiency and renewable generation in new affordable housing facilities and rehabilitation projects. This has had a major impact on getting energy efficiency and renewables included in the state's affordable housing. Over the past few years, TCAC has opted to pull back on their prior push for efficiency and clean energy measures.[32]

Rate Setting and Regulatory Challenges

31 TRC, comments at the SB 350 Low-Income Barriers Study workshop, August 12, 2016.

32 Heather Larson, StopWaste, "SB 350 Barriers Study Workshop Public Comments," August 12, 2016.

Fixed Charges

The possibility of an exit fee for leaving a utility's customer base, such as the Power Charge Indifference Adjustment, may make joining a community solar program cost prohibitive, particularly for low-income customers with limited budgets.[33]

Net Metering

Net metering and virtual net metering have been instrumental in the success of SASH and MASH (Jospé et al, 2014). A particular barrier to low-income homeowners being able to afford onsite solar results from the low energy rates that they pay due to CARE subsidies. Payback periods can be double or even greater than general customers who receive NEM compensation based on the much higher energy rates for which they receive compensation.

In addition, potential changes to the net metering tariff (scheduled to be revisited by CPUC in 2019) may create further barriers for low-income customers, if they include reductions to customers' compensation for exporting onsite generation.[34] However, it should be noted that CPUC intends to address an alternative NEM treatment for disadvantaged communities in a future phase of the proceeding.

Insecure, Inadequate, or Inequitable Program Funding

Some low-income programs can have a limited transformative impact on the market due to short-term funding (or bridge) cycles. CPUC's ESA and CSI programs have had long-standing funding commitments. However, CPUC employs bridge funding to keep programs operating while the Commission considers policy or regulatory changes in how the fixed program funding is spent. However, some stakeholders have pointed out that one drawback to bridge funding is that programs may experience high employee turnover due to worker anxiety from insecure long-term funding, draining a program of its workforce capacity and technical expertise.[35]

Insufficient or inequitable spending on low-income energy improvement programs is an obvious barrier. LADWP noted at the Barriers Study workshop that 40% of its customers are eligible for some type of energy upgrade program, but they only have funding to

---

33 The Power Charge Indifference Adjustment is a fee, authorized by the CPUC and added to the bill of a customer that is located in an IOU territory but chooses to buy its electricity from a different source, such as a community choice aggregator or a community solar project. The fee represents the cost of power procurements made by the utility on the customers' behalf before the customer elected to receive electric service from a different entity.

34 California SEIA, comments at the SB 350 Low-Income Barriers Study workshop, August 12, 2016.

35 CHOC/EEC, comments at the SB 350 Low-Income Barriers Study workshop, August 12, 2016; Low Income Oversight Board, comments at the SB 350 Low-Income Barriers Study workshop, August 12, 2016. It should be noted that the CPUC recently issued an alternative proposed decision would authorize funding ESA and CARE for the years 2017-2020. If this decision is approved, these programs will not need to rely on bridge funding until at least 2021.

serve a miniscule portion each year. Without greatly increasing funding, LADWP observed, the challenge of retrofitting low-income homes could take a century.[36]

Data Limitations

A forthcoming meta-study of 67 California energy efficiency program evaluations and market studies concluded that "there is room for improvement in the collection, publication, and use in analysis of participant demographic data. So too are there opportunities to engage households that are largely lower and middle income, non-white, or non-English-language-speaking" (Frank and Nowak, forthcoming). The study found that 70 percent of the program evaluations reviewed in the study gathered demographic data of at least one variable. However, Frank and Nowak (forthcoming) point out, "that number drops precipitously when examining the proportion of studies that published those data, compared participant data to a general population baseline, or used demographic data to assess program performance."[37]

Furthermore, their study concludes that not only is there a dearth of data, but there is also a lack of good data collection and organization standards. Frank and Nowak (forthcoming) note that "despite the considerable number of evaluations that collected and published demographic data, two challenges impaired their utility: the lack of tabular data in evaluation reports and the lack of standardization in response types" (Frank and Nowak, forthcoming). They conclude that "even when demographic data is collected, it is not always used when evaluating program performance."

Also, commenters from the Barriers Study workshop agreed that a lack of data creates barriers. For example, CSD, the organization that administers federal LIHEAP funding in California, noted that it is difficult to assess market saturation and community needs and track program investments due to data constraints.[38]

Finally, another study contends that "there is a paucity of data about the extent to which energy efficiency financing can drive customer demand—and do so at lower cost than other demand-creation strategies (e.g., rebates, tax credits)" (Zetterberg and Ng, 2013). Ascertaining such data could inform future policy design.

Unrecognized Non-Energy Benefits

---

36 LADWP, comments at the SB 350 Low-Income Barriers Study workshop, August 12, 2016..

37 Frank and Nowak (forthcoming) further note that "the rate of collection and publication of demographic data varied by program type, with the greatest deficit among home energy report program evaluations, which failed to collect participant characteristics in six of seven evaluations, and did not publish any data. The rate of collection of the different types of demographic information also varied considerably. Among homeowner characteristics, income and education were the most frequently collected (83% of studies collecting demographic data) and primary language spoken the least frequently collected (20% of studies)."

38 CSD, comments at the SB 350 Low-Income Barriers Study workshop, August 12, 2016.

Cost-effectiveness tests and cost benefit analyses could include (or better include) non-energy benefits to fully account for the true value of energy efficiency and renewable energy low-income programs. Therefore, a fuller accounting of non-energy benefits may be necessary, especially given the multifaceted needs that low-income energy retrofit programs are intended to address.[39] In the case of weatherization programs, for example, improving the health, safety and comfort of treated homes are the paramount goals; saving energy is a co-benefit of these programs. Undue emphasis on achieving cost effectiveness of those energy savings can be a barrier to accomplishing the goals of SB 350. In fact, individual responses from the community meetings commonly listed family health as a stronger motivator for efficiency and weatherization upgrades than economic savings (see Appendix B). And recognizing non-energy benefits not only helps justify the costs of such programs, but can also convey a clearer picture of the societal benefits from such investments of public funds (McCormick, 2015).[40]

Therefore, an accurate accounting of non-energy benefits appears necessary, especially given the multifaceted needs that low-income energy retrofit programs are intended to address.[41] As McCormick notes, recognizing non-energy benefits not only helps justify the costs of such programs, but can also convey a clearer picture of the societal benefits from such investments of public funds (McCormick, 2015).[42]

Including non-energy benefits requires first to identify such benefits. This entails taking a broader view of what and to whom costs are born and benefits are received. The second hurdle is to develop a method for quantifying non-energy benefits. However, there is little agreement on the best practices for making these determinations (Sanders and Milford, 2014).

However, CPUC's points out that the enabling statutes for IOU energy efficiency programs emphasize program cost effectiveness, and the CPUC is bound to meet those requirements. Making changes to enable greater penetration of energy efficiency and renewable generation may require modification of those statutes.[43] CPUC

---

39 This idea was expressed by numerous stakeholders at the Barriers Study workshop. See, for example, Johns Mansville company, comments at the SB 350 Low-Income Barriers Study workshop, August 12, 2016; TRC, comments at the SB 350 Low-Income Barriers Study workshop, August 12, 2016.

40 Furthermore, Cluett et al (2016) observe that "non-energy benefits for low-income programs are often equal to the value of energy savings."

41 This idea was expressed by numerous stakeholders at the Barriers Study workshop. See, for example, Johns Mansville company, comments at the SB 350 Low-Income Barriers Study workshop, August 12, 2016; TRC, comments at the SB 350 Low-Income Barriers Study workshop, August 12, 2016.

42 Furthermore, Cluett et al (2016) observe that "non-energy benefits for low-income programs are often equal to the value of energy savings."

43 Hazlyn Fortune, CPUC, "SB 350 Barriers Study Workshop Public Comments," August 12, 2016.

representatives also point out that the CPUC is considering how non-energy benefits can be addressed in low-income programs both for energy efficiency and solar.[44]

Table 3: Sample Non-Energy Benefits (NEBs) for Low-Income Energy Retrofit Programs

Beneficiary	Examples
Utilities	Fewer bill problems and collection costs, reduced electric rate subsidies, avoided costs of terminations and reconnections, deferred investment in new generation, and reduced strain to electrical grid.
Low-Income Customers	Increased comfort and security, improved social mobility, and improved health.
Owners	Reduced tenant turnover, reduced maintenance needs, increased property values, and higher likelihood of on-time rental payments due to reduced energy bills.
Society	Fewer environmental impacts, economic benefits, increased energy security, and greater energy equity.

Sources: McCormick, 2015; Sanders and Milford, 2014.

Community Access Barriers

Outreach and Education

Insufficient outreach and education is a critical barrier to expanding energy efficiency and renewable energy resources in disadvantaged communities. Indeed, this theme recurred throughout the community meetings. While many participants at the meetings were aware of CARE, far fewer knew of specific energy efficiency or weatherization programs available to them (see Appendix B).

This barrier cuts a swath through a spectrum of other issues. It represents points of disconnection between policy intent and customer adoption.

Habitat for Humanity (2015) points to "studies [showing] that many low-income households are either unaware of existing programs, wary of getting involved with government agencies, or unwilling to take on the considerable paperwork burden of applying for weatherization or other available resources." CPUC observed at the Barriers Study workshop that some customers are hesitant to have data about them collected by government agencies.[45]

44 Shannon O'Rourke, CPUC, "SB 350 Barriers Study Workshop Public Comments," August 12, 2016.

45 CPUC, comments at the SB 350 Low-Income Barriers Study workshop, August 12, 2016.

California's diverse population makes language barriers part of the issue. According to the 2007 U.S. Census, more than 6.2 million Californians speak one of 12 non-English languages and are not proficient in English.[46] Language and education barriers can impede participation in energy retrofit programs, due to a lack of awareness or difficulty understanding program requirements.[47] Indeed, some programs have complex requirements and provisions that may not be simple to explain to potential applicants. Furthermore, time constraints on the part of low-income customers and resource constraints by utilities make it more difficult to bridge these gaps, limiting program participation (Cluett et al,2016).

The impact of language gaps is tangible. Evergreen Economics (2013b) points out that "there is higher awareness of the ESA program and its services among low-income households where English is the primary language based on our telephone survey (73% versus 57%) among low income households where English is not the primary language." And another study notes that "half of the participating households [in SASH] are multi-lingual" (Nichols and Greschner, 2013). In addition, CSE (2016) notes that "relatively few studies have sought to identify the most effective metaphor or linguistic frames for presenting energy efficiency to Hispanic, Asian American, and African American populations specifically."

In addition, low-income customers may be skeptical of energy programs marketed to them, and of the marketers themselves. Cluett et al (2016) comments that "utilities are not always perceived as helpful partners when interactions with them have previously been limited to payment and service disconnect notices." One study concludes that low-income customers "often do not think of themselves as having the option to go solar" (Nichols and Greschner, 2013). And such customers may be wary of "novel shared renewables offerings that have not historically been marketed to them, viewing them as potential scams" (IREC, 2016). Moreover, some stakeholders at one of the community meetings expressed · Some expressed frustration at feeling like they were being nudged to adopt expensive new technologies when they already struggle to conserve energy and money (see Appendix B).

The added outreach and education requirements for servicing low-income customers affect business practices as well. GRID Alternatives points out that "the additional effort and investment needed to serve the low-income market has limited the number of [solar] companies recruiting customers from these communities and therefore the education of and opportunities available to those communities" (GRID Alternatives et al, 2016).

---

46 "California's Top Twelve Languages After English," *Mercury News,* March 4, 2013, accessed August 8, 2016, http://www.mercurynews.com/health/ci_22715983/californias-top-12-languages-after-english?source=pkg.

47 Proteus, Inc., comments at the SB 350 Low-Income Barriers Study workshop, August 12, 2016.

Transaction Costs

Transaction costs are other, usually non-monetized costs associated with energy efficiency investment—for example, the time investment to learn about the technology and application process for an energy upgrade program (Granade et al., 2009).

The obstacles to securing energy efficiency financing can be onerous for borrowers and the contractors assisting them. One study points out "energy audits often are required before applying for a loan; the amount of paperwork can be substantial; there can be delays in getting loan approval; and repayment usually involves a new monthly bill for property owners" (Palmer et al, 2012). Unsurprisingly, such hurdles limit a borrower's interest in securing financing. Low-income working parents, many of whom may already find their time and energy already spread thin, could find these hidden costs to participating in energy retrofit programs untenable.

CHAPTER 4:
Potential Solutions and Opportunities

This chapter summarizes potential solutions and opportunities for low-income customers identified in the literature, community meetings, Energy Commission workshops and hearings, and stakeholder commentary. The potential solutions discussed here will ultimately serve as the basis for discussion for developing specific policy recommendations to address the barriers discussed in this report. The structure parallels the previous chapter, thematically tying potential solutions and opportunities to barriers. However, it should be stressed again that developing solutions may require crosscutting barriers, since some of these obstacles overlap.

Potential Solutions for Financial Barriers

The lack of capital and credit, as well as other obstacles to financing, pose critical barriers for low-income customers seeking to upgrade their homes. Renters face the added burden of considering fixed investments on a property they do not own. Still, a number of policies and program tools can be considered to overcome financial barriers and increase energy equity among low-income Californians. There is no silver bullet, though: not all approaches are accessible even to those who own their home or the rental property, and renters face even more challenges to accessing and paying for clean energy improvements.

Limited Disposable Incomes

The clearest method of getting energy upgrades into low-income homes is through no-charge and low-charge direct install programs. California has demonstrated the effect of such initiatives through programs such as ESA and SASH. And this method gets around the financing barriers facing low-income homeowners of adding a lien to the mortgage and for all low-income customers of finding an appropriate lender and having an acceptable credit score. Scaling up such programs (and thus increasing costs to ratepayers and taxpayers) may be the most straightforward method for increasing penetration of energy retrofits among the low-income sector.[48]

Financing Barriers

Potential Solutions for Low-Income Homeowners and Landlords

Property Assessed Clean Energy Financing (PACE)

California, which has long been a champion of PACE, has turned PACE into a success story for middle-income homeowners. PACE may offer opportunities to better reach low-

48 GRID Alternatives, comments at the SB 350 Low-Income Barriers Study workshop, August 12, 2016.

income homeowners and affordable multifamily building owners. PACE financing ties the repayment obligation to the property through the property tax bill. Local governments often have to pass authorization for the taxing and bonding authorities needed to make PACE work, Mueller and Ronen note (Mueller and Ronen, 2015). However, Ottinger and Bowie (2015) argue that PACE programs "allow municipalities to promote renewable energy and energy efficiency agendas" by providing a vehicle for local governments to enable private funding.

PACE has scaled rapidly in California among single-family homes, having now financed more than $2 billion in projects.[49] Multifamily housing is relatively to the PACE market. To ensure that PACE can meet the needs of multifamily building owners and tenants as well as low-income homeowners, better program outreach may be needed.

Power Purchase Agreements and Leases

Third-party ownership through power purchase agreements (PPAs) is another option for expanding residential solar in disadvantaged communities. Through a PPA, a solar developer installs a system and sells the power to the host customer which may be at a lower rate than that of the utility.

Leases are similar to PPAs, except in these cases, the participant directly leases the solar panels and owns the generation, leaving the possibility open for entering in to a net metering agreement with the utility.

Community Development Finance Institutions

Community development finance institutions (CDFIs) are a possible source of financing for energy efficiency improvements or on-site renewables.[50] As McKibben (2013) observes, "These lenders are often smaller than traditional lenders like commercial banks, but have important experience making nontraditional loans to meet both financial and social goals."

State Housing Finance Agencies

McKibben (2013) suggests that "state housing finance agencies help finance construction of buildings by administering federal affordable housing tax credit programs and other programs. The relationships these entities have with owners of affordable multifamily buildings can be leveraged to ensure that buildings are operated, maintained, and upgraded with energy efficiency in mind."

Bulk Purchasing and Crowdfunding

---

49 David Hochschild, "PACE: Protect Homeowners and the Environment." *San Diego Union-Tribute.* June 23, 2016. Accessed August 8, 2016. http://www.sandiegouniontribune.com/news/2016/jun/23/pace-environment-homeowners/.

50 Bovarnick and Banks (2014) note that "more than 80 CDFIs operate within the state."

Bulk purchasing and crowdfunding offer possible solutions for low-income homeowners and landlords.[51] One Block Off the Grid, a bulk purchasing organization based out of San Francisco, modeled its operations around organizing sufficient demand to leverage lower prices from solar installers.

Green Preservation Plus

The Green Preservation Plus financing program, developed by the Federal Housing Administration (FHA) and Fannie Mae to increase energy efficiency in multifamily housing, offers an additional source of funding for building owners looking to finance or refinance existing Fannie Mae loans. As Mueller and Ronen (2015) notes, "Under the recent expansion, owners can use the equity in the housing property, up to five percent of the loan amount, to cover the costs of the energy and water efficiency improvements."

Potential Solutions for Low-Income Renters (as well as Homeowners and Landlords)

On-bill Financing

On-bill financing may appeal to low-income customers because the cost of the energy upgrade is simply incorporated into a monthly utility bill. Zetterberg and Ng (2013) identify on-bill financing programs as potential financing solutions to address a range of barriers, including lack of confidence in energy savings, split incentives, long payback periods, and high up-front costs. Regarding the split incentive, Behles (2013) notes that "if on-bill financing stays with the property, it can provide a way for renters to pay the capital necessary to make upgrades" without investment from the property owner. Evaluating the potential for on-bill financing pilots is an item on the AB 758 Action Plan.[52]

On-bill financing still requires an outlay of capital, and financiers are likely to require that potential debtors meet a certain FICO threshold. Furthermore, on-bill financing may require permission from the landlord, and could be problematic because successor tenants would be obligated to continue payments for a financed improvement they did not agree to.

---

51 Sanders and Milford 2014) provide some examples: "DC Solar United Neighborhoods (DC SUN) has created six active neighborhood residential bulk purchasing groups for solar PV systems in Washington, D.C. Under this model, DC SUN organizes neighborhood groups of homeowners interested in "going solar." The program operates similarly to the Solarize model, which is a grassroots community approach to helping residents and business owners overcome the financial and logistical hurdles of installing solar PV systems by using discounted price bulk purchasing and an organized and streamlined development process. DC SUN prescreens and evaluates home sites before the contractor RFP process begins. DC SUN signs letters of commitment with participating homeowners before issuing an RFP, educates the homeowners) about their financing options, and issues the request for proposals (RFP on behalf of the neighborhood group."

52 Energy Commission. 2015. Existing Buildings Energy Efficiency Action Plan. http://docketpublic.energy.ca.gov/PublicDocuments/15-IEPR-05/TN205919_20150828T153953_Existing_Buildings_Energy_Efficiency_Action_Plan.pdf

A variant of on-bill financing called PAYS (Pay As You Save) might be more suitable, particularly for low-income customers. Under this model, the utility finances the energy installation and passes along savings to the customer (Ottinger and Bowie, 2015). The advantage of this model is that it obviates the need for the customer to pass a credit check or, in the case of low-income homeowners, take a lien on the property.

Green Banks

"A green bank," as one study describes it, "is a quasi-government agency that uses taxpayer or ratepayer capital to leverage private capital investments in renewable energy or energy efficiency investments." Green banks can directly offer loans, establish a loan-loss reserve, or feature other credit enhancements to attract private capital (Jospé et al, 2014).[53]

The state has some experience with green bank programs. In 2014, the California Infrastructure and Economic Development Bank (IBank) established the California Lending for Energy and Environment Needs Center (CLEEN Center) to utilize IBank's access to capital markets for State and local government clean energy projects (this initiative, however, was not designed to facilitate residential lending).[54]

And California has demonstrated the dramatic success with the PACE Loss Reserve Program.[55] According to one commenter at the Barriers Study workshop, California's PACE program was "dead in the water" before the loan-loss reserve was established by

53 California SEIA suggests that a loan-loss reserve program backing up 3rd party ownership models might facilitate a billion dollars of private investment for customers with credit scores in the range of 580-600. The program could be phased out after the program demonstrates that it does not produce higher default rates for providing energy retrofit financing to customers with low credit scores. See California SEIA, comments at the SB 350 Low-Income Barriers Study workshop, August 12, 2016. GRID Alternatives points to a successful example of a green bank in Connecticut that brought down the credit threshold to around 640 (where 670 was typical) for solar financing options. See GRID Alternatives, 2016.

54 The California Infrastructure and Economic Development Bank (IBank) was created in 1994 to finance public infrastructure and economic development that promotes a healthy climate for jobs, contributes to a strong economy and improves the quality of life in California communities. The IBank has broad authority to issue tax-exempt and taxable bonds, provide financing to public agencies, provide credit enhancements, acquire or lease facilities, and leverage State and Federal funds. IBank also conducts the California Small Business Finance Center that promotes the economic development of small businesses by making available capital, management assistance, and other resources, including financial services, personnel, and business education to small business entrepreneurs, including women, veteran, and minority-owned businesses. The goals of the Center are to 1) promote the health, safety and social welfare of the citizens of California, 2) eliminate unemployment of the economically disadvantaged of the state, and 3) stimulate economic development and entrepreneurship. See http://ibank.ca.gov/clean_energy.htm

55 In 2013 Governor Brown signed SB 96 (Chapter 356) into law authorizing the California Alternative Energy and Advanced Transportation Financing Authority (CAEATFA) of the Treasurers' Office to establish a PACE Loss Reserve Program to assist in addressing the Federal Housing and Finance Agency's (FHFA) financial concerns in order to support residential PACE financing programs. The Loss Reserve is designed to protect first mortgage lenders from losses that might arise from the first-priority lien position of PACE financing in cases of default. Many California PACE administrators have enrolled in the PACE Loss Reserve Program, and are offering PACE financing in a growing number of areas in the State.

the state.[56] Instead, $10 million loan-loss reserve has unlocked 200 times that amount in private financing, all without having to issue any reimbursements for loan defaults.[57]

New Market Tax Credits

The New Market Tax Credits (NMTC) Program, established by Congress in 2000, provides investors with a tax credit in exchange for extending credit to disadvantaged communities. Sanders and Milford (2014) note that several energy equity projects have developed with the help of the NMTC Program.

Potential Solutions for Structural Barriers

Structural barriers present some of the most intractable problems. Aging housing stock and low homeownership rates, for instance, are issues that are beyond the scope of energy policy. Consequently, creative solutions are needed to promote energy equity despite these circumstances.

Low Homeownership Rate

Efforts to increase energy equity require strategies that target renters. In addition to other barriers addressed in this study, these customers reflect structural conditions of the housing market for low-income residents—namely, that most low-income Californians live in rental units, which discourages them from investing in long-term energy improvements.

Target Low-Income Households in the Armed Services

Households in the armed services could be an area of opportunity. Some of these households will qualify under low-income energy retrofit programs, especially when the serviceperson is deployed overseas. On-bill financing and collaboration with base housing administration may be an effective financing strategy for incentivizing these households, since military families are redeployed to other bases periodically.

Community Solar

Bovarnick and Banks (2014) suggest that community solar projects can benefit low-income communities that are more likely to rent or live in apartments than the average household. Community solar also presents a potential solution for low-income homeowners with older rooftops.[58] Such a system can reduce entry costs because solar power can be purchased in smaller amounts than are generated by most multi-kilowatt

56 Clean Path Ventures, comments at the SB 350 Low-Income Barriers Study workshop, August 12, 2016.

57 David Hochschild, "PACE: Protect Homeowners and the Environment." *San Diego Union-Tribute.* June 23, 2016. Accessed August 8, 2016. http://www.sandiegouniontribune.com/news/2016/jun/23/pace-environment-homeowners/.

58 Vote Solar, comments at the SB 350 Low-Income Barriers Study workshop, August 12, 2016.

rooftop systems, and subscribers can take advantage of bulk panel purchases to reduce prices. A community solar project, if designed properly, can offer several benefits:

- Lower costs for individuals due to economies of scale
- Overall energy savings
- Local jobs
- Access to clean energy for renters, and for homeowners with poor roof conditions

Moreover, Clean Path Ventures argues that community solar programs are geared toward targeting specific community needs.[59] Community solar targeting low-income customers might be sited in local disadvantaged communities, presenting opportunities to address issues of environmental justice

However, for a community solar project to be appealing to low-income customers, it would have to be organized such that it required little or no up-front investment, eased credit check requirements, and lowered the household's electric utility bill.[60] As noted in Chapter 3, the current community solar offerings organized under the GTSR program can be hindered by fixed charges such as the PCIA, which make community solar prohibitively expensive for low-income customers in California.

Address Split Incentive Challenges

The split incentive is a unique challenge for increasing energy equity in disadvantaged communities. The literature and stakeholder feedback suggests variety of strategies for overcoming the split incentive, some of which have been highlighted in the AB 758 Action Plan[61]:

- *Modified On-Bill Financing:* Bird and Hernández (2012) recommend designing an on-bill financing program with modifications specifically to address efficiency upgrades in privately supplied low-income housing (for example, Section 8 housing). To provide incentive for landlords to take part, a monthly payment would be charged on the utility bill for the first five years, commensurate with the loan size and term. The payment would go to a landlord annually in the form of a check.

---

59 Clean Path Ventures, comments at the SB 350 Low-Income Barriers Study workshop, August 12, 2016.

60 See, for example, IREC's methodology for crafting a community solar model that would work for low-income households. IREC, 2015, *Proposal for Alternative for Growth in Disadvantaged Communities of the Interstate Renewable Energy Council, Inc.*, http://docs.cpuc.ca.gov/PublishedDocs/Efile/G000/M154/K225/154225576.PDF

61 Energy Commission. 2015. Existing Buildings Energy Efficiency Action Plan. http://docketpublic.energy.ca.gov/PublicDocuments/15-IEPR-05/TN205919_20150828T153953_Existing_Buildings_Energy_Efficiency_Action_Plan.pdf

- *Green Leases:* McKibben (2013) suggests that green leases can be used to "realign tenant and owner incentives so that improvements are mutually beneficial for the tenants and owners." For example, EPC (2013) points to a recent example in New York in the commercial sector in which the city allowed landlords to make efficiency improvements and "pass the cost through to tenants based on the projected savings. The clause requires a 20 [percent] buffer in projected energy savings versus additional tenant cost, to protect tenants in case the project doesn't perform as expected."
- *Appliance and Equipment Incentives:* Increase funding for the Multifamily Energy Efficiency Rebate program (MEER), a program run by private utilities that provides sufficient incentives to make energy efficient in-unit equipment the "least expensive alternative for the building owner."[62] Utilities can be encouraged to expand their programs to include additional types of appliances and equipment rebates, such as refrigerators and clothing dryers.
- *Allow Energy Upgraded Buildings to be Marketed as Affordable Housing:* To extend a benefit to owners of submetered market-rate properties, landlords could be allowed to market the rental units as affordable housing due to lower energy bills.[63]
- *Require Rent Control Agreements*: NRDC recommends requiring the owners of market rate affordable housing to enter into rent control agreements as a condition of energy retrofit services, such as is already practiced by LIWP.[64]

Target Affordable Multifamily Housing

Forty-three percent of low-income Californians live in multifamily housing (Table 4), which represents a sizeable opportunity for energy improvements. Multiple studies indicate that energy-efficient improvements in multifamily housing could achieve household energy savings of 20-30 percent (Henderson, 2015 and Schweitzer, 2016).

As discussed in the previous chapter, multifamily housing has a number of unique barriers that require special attention. One common message in the literature and stakeholder comments is that multifamily housing must be treated as a discrete category with dissimilar circumstances to single family homes.[65]

---

62 McKibben notes that, collectively, the four largest private elecgtric and gas utilities spent $14.8 million on MEER rebates in 2011. See McKibben, 2013.

63 Yolo Housing, comments at the SB 350 Low-Income Barriers Study workshop, August 12, 2016.

64 Such a provision is also used in energy retrofit programs in Massachusetts and New York. See GREEN-EEFA, written comments, August 25, 2016, http://docketpublic.energy.ca.gov/PublicDocuments/16-OIR-02/TN212956_20160825T164946_Caroline_McCormack_Comments_COMMENTS_OF_THE_GREENENERGY_EFFICIE.pdf

65 See, for example, TRC, comments at the SB 350 Low-Income Barriers Study workshop, August 12, 2016.

Master Metered Buildings

Master-metered multifamily buildings benefit from energy upgrades in a number of ways, and better methods for conveying this information are needed. McKibben (2013) concludes that "energy efficiency improves the bottom line for a multifamily building in three ways: by direct energy savings, lower maintenance and equipment costs, and lower tenant turnover. In addition, improved building comfort and savings attract tenants."[66] Educating building owners of master-metered units about these benefits may encourage investment in energy retrofits.

Establish Standards

Henderson (2014) notes that the multifamily housing market suffers from a dearth of standards used to gauge efficiency retrofits and maintenance. Henderson suggests establishing such standards, "such as a minimum standard for air sealing and periodic testing of central heating and cooling systems. Such a standard could then be used to identify basic repairs that keep a building in good working order, are likely to be cost-effective from a utility-expense perspective, and [does] not have unreasonable capital requirements." Periodic benchmarking can validate the owner's efforts and track building performance metrics over time.

Deed Restrictions

The state could focus on multifamily buildings that have deed-restriction in place to allow energy upgrades to be made and to ensure that public funds are invested in buildings with long-term commitments to providing affordable housing.[67] However, this suggestion could leave a significant portion of the housing market serving low-income customers unreached, since 75% of low-income households rent from market-rate housing.[68]

Potential Solutions for Policy and Program Barriers

State legislatures, federal/state/local governments, utility regulators, and publicly owned utility boards have an important role in developing, promoting, and implementing effective low-income energy efficiency and renewable energy programs. A first step might be to reevaluate programs for how well they accomplish their goals and

66 See also Clean Path Ventures, comments at the SB 350 Low-Income Barriers Study workshop, August 12, 2016.

67 67 CHOC/EEC, comments at the SB 350 Low-Income Barriers Study workshop, August 12, 2016.

68 Stone Energy, comments at the SB 350 Low-Income Barriers Study workshop, August 12, 2016.

how they can be improved.[69] This may involve setting specific energy savings goals for each program.[70]

Reach Limitations Due to Program Design/Delivery

Provide Clear and Consistent Eligibility Criteria

Income Eligibility

Energy programs for low-income commonly call for determination of income eligibility on a dwelling unit by dwelling unit basis. This creates several barriers to program delivery that reduce participation and substantially increase transaction costs. Installers have to jump around the community doing direct installs in individual dwelling units that qualify in disparate geographic locations. Digging into the income qualification of households is intrusive to the privacy of tenants, and difficult for building owners to accomplish and document for the substantial number of households in multi-family facilities. Also, income eligibility criteria tend to be different across energy programs, and tend to be different than those used by housing programs, making program coordination difficult.

Several potential solutions have been suggested by stakeholders. Yolo County states that for many state and federal housing programs qualification in one housing program automatically qualifies the household for other programs. Also, many programs only require 51% of the dwelling units in the program's geographic area to income qualify in order for all homes in the area to be eligible.[71] TRC Energy Services notes that the LIWP program is considering using rents below a threshold as an alternative to income qualifications. This is much easier for the building owner to determine, and has the side benefit of encouraging owners to lower rents in order to qualify for the program.[72] NRDC and Greenlining Institute recommend universally using a specific percent of AMI for qualification across programs.[73] And reporting on their Coachella Valley project funded by the South Coast Air Quality Management District, Johns Mansville and NEST Labs, Inc. recommends the delivery of retrofits to entire disadvantaged communities,

---

69 Greenlining Institute, comments at the SB 350 Low-Income Barriers Study workshop, August 12, 2016.

70 GREEN-EEFA Coalition, written comments, August 25, 2016, http://docketpublic.energy.ca.gov/PublicDocuments/16-OIR-02/TN212956_20160825T164946_Caroline_McCormack_Comments_COMMENTS_OF_THE_GREENENERGY_EFFICIE.pdf

71 Yolo Housing, comments at the SB 350 Low-Income Barriers Study workshop, August 12, 2016.

72 TRC, comments at the SB 350 Low-Income Barriers Study workshop, August 12, 2016.

73 GREEN-EEFA Coalition, written comments, August 25, 2016, http://docketpublic.energy.ca.gov/PublicDocuments/16-OIR-02/TN212956_20160825T164946_Caroline_McCormack_Comments_COMMENTS_OF_THE_GREENENERGY_EFFICIE.pdf

not just those households who qualify as low-income to make programs more accessible and ease transaction costs for potential participants.[74]

Disadvantaged Community Definition

Stakeholders recommended that CalEnviroScreen, the CalEPA tool required for use to identify disadvantaged communities for prioritization for Cap-and-Trade auction proceeds funding and other programs, should be used more extensively in determining program eligibility criteria.[75] However, LADWP pointed out that not all low-income customers live in disadvantaged communities, so it is important for programs to address them as well.[76]

Understanding Community Characteristics and Needs

Several studies emphasized the importance of understanding housing characteristics of targeted households and consumer needs when designing energy efficiency programs to serve low-income customers. Cluett et al (2016) noted that "by understanding appliance, equipment, and use characteristics, and how they differ from those of the general population, program developers can design energy efficiency programs that best address the needs of low-income households and, ultimately, more equitably serve the ratepayer base." Attention to use characteristics and equipment baselines of low-income households is also important for accurate planning and evaluation of programs, including calculation of appropriate baseline energy use and appliance types." (Cluett et al, 2016).

Programs should be guided by the real energy needs of low-income customers, rather than "relying on established qualified product lists such as ENERGY STAR, one study argues" (Cluett et al, 2016). This might entail developing new program criteria or qualified appliance lists. For example, the study notes, "many smaller and midsized top-freezer models do not qualify for ENERGY STAR or ENERGY STAR Most Efficient, even though their annual energy consumption is lower than that of comparably sized bottom-freezer and side-by-side models" (Cluett et al, 2016)

McKibben (2013) suggests that program designers and utilities consider the following questions:

---

74 Johns Mansville, and NEST Labs, Inc., comments at the SB 350 Low-Income Barriers Study workshop, August 12, 2016, and written comments, August 25, 2016, http://docketpublic.energy.ca.gov/PublicDocuments/16-OIR-02/TN212963_20160826T085140_Johns_Manville_and_Nest_Comments_On_August_12_2016_Workshop.pdf

75 Communities for a Better Environment, comments at the SB 350 Low-Income Barriers Study workshop, August 12, 2016; Marin Clean Energy, comments at the SB 350 Low-Income Barriers Study workshop, August 12, 2016.

76 LADWP, comments at the SB 350 Low-Income Barriers Study workshop, August 12, 2016.

- "(1) What are the most important local residential uses for fuels provided by my utility and by other utilities?
- (2) What are the architectural characteristics of local multifamily buildings and how do they relate to energy efficiency?
- (3) How old are the multifamily buildings and typical multifamily HVAC and lighting installations in my area?"

Performing such surveys will allow programs to increase efficiency and service, as well as enable utilities to tailor programs to overcome barriers for specific "building types, ages, and split incentive structures" (McKibben, 2013).

Discussing community solar programs with a mixed customer base, IREC (2016) suggests that it may be beneficial to allocate incentives based on the percentage of low-income customers subscribing to a community solar facility.

To better understand targeted communities, NRDC recommends establishing a statewide advisory board or working group that can provide a feedback loop between low-income customers and program administrators.[77]

Determining the Most Effective Program Administration

Another potential solution is to consider evaluating program administration and selecting optimal administrators can improve program performance. Behles (2013) suggests that choosing a nonutility entity may be beneficial. That study notes the successes of the nonprofit organization GRID Alternatives in administering SASH, concluding that the nonprofit had effectively implemented the program "due to its program strategy, incorporation of education and job training, and its established relationships with the community."

Furthermore, programs need administrators who understand the goals of SB 350 and can fulfill the SB 350 requirement to select well-trained, responsible contractors who can perform high-quality retrofits and reduce efficiency losses due to poor workmanship.[78]

Make Rebate Programs More Convenient to Use

An additional solution to consider is how to make rebate programs easy to use so that they offer speedy reimbursements. McKibben (2013) argues that "every aspect of the rebate process, including application processes, forms, and protocols for determining the rebate amounts for multi-utility measures, should be considered from the

77 GREEN-EEFA Coalition, written comments, August 25, 2016, http://docketpublic.energy.ca.gov/PublicDocuments/16-OIR-02/TN212956_20160825T164946_Caroline_McCormack_Comments_COMMENTS_OF_THE_GREENENERGY_EFFICIE.pdf

78 GRID Alternatives, comments at the SB 350 Low-Income Barriers Study workshop, August 12, 2016.

customers' perspective and made as simple as possible." Rebate programs should strive to avoid reimbursement delays and provide ample time for program partners to prepare for changes while still maintaining reasonable measures for verification (McKibben, 2013).

Integration of Programs and Services

Program design should also incorporate opportunities to integrate programs and services. The literature points to a number of successful examples within California to draw on.

Developing better and more accessible energy assessments, as recommended in the AB 758 Action Plan, could improve the crossover potential of energy programs.[79] Mueller and Ronen (2015) note the success of the California Solar Initiative (CSI), which requires an energy audit before potential customers can become eligible for the program. "After the audit," Mueller and Ronen observe, "CSI participants receive information on options and incentives for energy efficiency measures specific to their building. This process empowers them with the knowledge necessary to make informed decisions on energy efficiency."

Communities for a Better Environment points to Multifamily Affordable Housing Solar Roofs program, authorized by AB 693, as a good example of systemic, integrated energy services targeting community level solutions.[80]

A one-stop shop model can simplify program participation and increase the efficiency of program coordination (McKibben 2013).[81] NRDC recommends the development of regional and statewide concierge services to integrate program offerings and provide technical assistance.[82] This model could be particularly useful for multifamily building owners who need to interface with several programs. Such a solution, StopWaste notes, could help significantly reduce transaction costs for potential program participants.[83] On the other hand, Community Energy Services Corporation contends that a one-stop

79 Energy Commission. 2015. Existing Buildings Energy Efficiency Action Plan. http://docketpublic.energy.ca.gov/PublicDocuments/15-IEPR-05/TN205919_20150828T153953_Existing_Buildings_Energy_Efficiency_Action_Plan.pdf

80 Communities for a Better Environment, comments at the SB 350 Low-Income Barriers Study workshop, August 12, 2016.

81 NRDC points to Massachusetts' LEAN program as an example of a program that successfully coordinates multiple low-income programs through one-stop website. See NRDC, comments at the SB 350 Low-Income Barriers Study workshop, August 12, 2016. See also Markowski, 2014.

82 GREEN-EEFA Coalition, written comments, August 25, 2016, http://docketpublic.energy.ca.gov/PublicDocuments/16-OIR-02/TN212956_20160825T164946_Caroline_McCormack_Comments_COMMENTS_OF_THE_GREENENERGY_EFFICIE.pdf

83 StopWaste, comments at the SB 350 Low-Income Barriers Study workshop, August 12, 2016

shop solution is too low-level. Rather, multiple programs should be coordinated so that services are bundled as a single package.[84]

Barriers to Collaboration and Leveraging Opportunities

Aiming for Comprehensive Savings and Offering a Range of Measures

Mass installation of modest efficiency measures should be pursued wherever possible. But the possibility for deeper, more comprehensive energy efficiency can result in savings from electricity, natural gas, and/or water usage. However, as Henderson (2015) notes, these resources are often supplied by different utilities, so a utility's efficiency program may not target comprehensive energy savings. "There are models that help solve these problems," Henderson observes, "including a cost-effectiveness framework that creates incentives for comprehensive projects by allowing the lead utility to capture the value of savings across all fuels and water, or apportioning the costs and benefits to the appropriate utility."[85] SCE and SoCalGas have demonstrated a successful model for collaboration that could be emulated by other utilities.[86]

NRDC recommends that health and safety improvements should be built into energy retrofit programs.[87]

Habitat for Humanity (2015) suggests retrofitting homes for low-income seniors with energy-efficient "smart" technologies so they can "age in place." Its study suggests that such technological developments "could build on what is already happening in the Weatherization Assistance Program to enable seniors to safely remain in their homes while their medical and safety status is remotely monitored, along with the energy management of their unit."

Coordinating Across Programs and Entities

Collaboration among government, utilities, community organizers, Tribes, non-profits, and the private sector may provide opportunities to leverage various programs and implement those programs in a way to maximize the benefits.

Cluett et al (2016) point to studies that highlight the advantage of "coordinate eligibility requirements between efficiency and bill payment assistance programs to allow for

---

84 Community Energy Services Corporation, comments at the SB 350 Low-Income Barriers Study workshop, August 12, 2016

85 See also CPUC, comments at the SB 350 Low-Income Barriers Study workshop, August 12, 2016

86 LADWP, comments at the SB 350 Low-Income Barriers Study workshop, August 12, 2016

87 GREEN-EEFA Coalition, written comments, August 25, 2016, http://docketpublic.energy.ca.gov/PublicDocuments/16-OIR-02/TN212956_20160825T164946_Caroline_McCormack_Comments_COMMENTS_OF_THE_GREENENERGY_EFFICIE.pdf

more streamlined participation and share customer information to help address the energy needs of the highest-use households." For example, high-usage participants in California Alternative Rates for Energy (CARE) are identified and targeted by utility efficiency programs. These customers must enroll in an energy efficiency program to continue their participation in CARE (Cluett et al, 2016). Mandatory participation may not be appropriate for a rooftop residential program, but the process of identifying low-income customers with high energy requirements may be an effective strategy in targeting rooftop solar participants in programs like SASH and MASH. Harak (2010) suggests that "better coordination between WAP and HUD's Community Development Block Grant ("CDBG") program so that energy efficiency investments can be more easily piggy-backed on work already being done on the home through CDBG." And there is a potential benefit for a weatherization program to combine energy efficiency and solar.[88]

Improved coordination with program partners can benefit the performance of an energy upgrade program. McKibben (2013) recommends that utilities collaborate with local financial intuitions "to design standard finance packages that meet multifamily needs, providing both an additional incentive to participate in the utility program, and an additional marketing channel." And better communication with energy retrofit contractors can improve the performance of energy upgrade programs. Furthermore, performing multiple kinds of services" at the same time reduces the number and severity of disruptions for tenants and the building owner" McKibben notes.

Programs could incorporate performance metric that provide data on the difficulties and success of inter-program coordination.[89]

The low-income solar market "will not develop or scale under the same incentive structures designed for the general market," GRID Alternatives (2016) contends. Innovative methods will be needed to develop a viable and durable low-income solar market. For example, GRID Alternatives points to LIWP funds used in conjunction with SASH as a successful example of leveraging multiple programs to target disadvantaged communities (GRID Alternatives, 2016).

A large number of financial product programs, such as those from HUD and EPA, can be leveraged to provide coordinated funding, although putting together a multi-funded package can be a complex task.[90] Policy makers should not overlook incremental

88 TRC, comments at the SB 350 Low-Income Barriers Study workshop, August 12, 2016.

89 NRDC, comments at the SB 350 Low-Income Barriers Study workshop, August 12, 2016.

90 Yolo Housing, comments at the SB 350 Low-Income Barriers Study workshop, August 12, 2016. This opinion was echoed by other commenters. See, for example, Marin Clean Energy, comments at the SB 350 Low-Income Barriers Study workshop, August 12, 2016.

improvements, since overhauling multiple programs is a lengthy project subject that may be subject to competing political agendas.[91]

Tax Credits

Multiple stakeholders observe that TCAC could greatly encourage efficiency and renewables in affordable housing projects by prioritizing projects that adopt such measures.[92] The reinvigoration of TCAC's previous policies could have very important advantages to meeting the SB 350 and AB 32 goals for transitioning low-income housing to clean energy.

Rate Setting and Regulatory Challenges

CARE Flexibility

Mueller and Ronen (2015) suggest that a portion of funds utilities collect for low-income rate assistance (CARE) be reallocated toward energy reduction programs focused on efficiency and solar for low-income customers.

This option would allow low-income customers to redirect CARE funds from their CARE rate discounts toward purchasing renewable generation from a 3rd party provider (such as a community solar project), selected by the utility through a competitive bidding process. Program participants would move to a standard rate for their rate class, and offset a portion of their monthly bills through their share of the community solar project.[93] IREC points to a model it developed that demonstrates a customer could achieve considerable utility bill savings by redirecting CARE funds to a community solar project.[94] This proposal is currently under consideration in the CPUC's CARE-ESA proceeding.

---

91 Richard Heath & Associates, comments at the SB 350 Low-Income Barriers Study workshop, August 12, 2016.

92 StopWaste, comments at the SB 350 Low-Income Barriers Study workshop, August 12, 2016; Stone Energy, comments at the SB 350 Low-Income Barriers Study workshop, August 12, 2016.

93 This proposal is currently being considered under existing NEM statute. If CPUC determines that this proposal is not allowable, a modification of the statute may be needed. See IREC, written comments to the SB 350 Low-Income Study Workshop, August 25, 2016, http://docketpublic.energy.ca.gov/PublicDocuments/16-OIR-02/TN212949_20160825T143725_IREC's_Comments_on_Barriers_of_LowIncome_and_Disadvantaged_Comm.pdf

94 Under IREC's CleanCARE proposal, a typical CARE customer in the SCE service territory could save 24% (and potentially more in the future) on the utility bill. IREC's model assumes that the community solar project will sell electricity to the utility under a ReMAT agreement, and it does not factor in exit fees such as PCIA. See IREC, 2015, *Proposal for Alternative for Growth in Disadvantaged Communities of the Interstate Renewable Energy Council, Inc.*, http://docs.cpuc.ca.gov/PublishedDocs/Efile/G000/M154/K225/154225576.PDF

Such a solution, though, would require careful vetting to ensure CARE customers choosing this option would realize greater savings than through the standard CARE discount.

Insecure, Inadequate, or Inequitable Program Funding

Multiple stakeholders stress the importance of providing long-term funding for existing programs. NRDC recommends a minimum of four-year budget cycles for affordable multifamily housing programs.[95] Existing mandates should be kept up to date to capture their full potential. For example, the Low Income Oversight Board notes that ESA has unclear statutory authority after 2020.[96]

Programs should be reviewed in light of policy objectives pertaining to low-income customers to ensure that programs targeting low-income customers are adequately and equitably funded. Programs that do not exclusively serve low-income customers could consider ways to expand their services to low-income customers. For example, the Energy Commissions' research funds administered through the Electric Program Investment Charge (EPIC) solicitations, develops some solicitations that allocate funding specifically for demonstration and market facilitation projects located in disadvantaged communities (identified through CalEnviroScreen), or provide preference points to applicants who propose demonstration projects in disadvantaged communities.[97] Furthermore, the Energy Commission is currently scoping the research investment plan for 2018-2020 and has committed to including a dedicated focus on bringing benefits of emerging technologies to disadvantaged communities.

Data Limitations

Better data collection can help shape program design and financial market policy. And the incorporation of non-energy benefits into program evaluation and cost-effectiveness tests can place energy efficiency and renewable upgrades in the proper context, one in which infrastructural, environmental, and societal benefits are part of the political calculus for future energy policy.

Program Data

---

95 GREEN-EEFA Colaition, written comments, August 25, 2016, http://docketpublic.energy.ca.gov/PublicDocuments/16-OIR-02/TN212956_20160825T164946_Caroline_McCormack_Comments_COMMENTS_OF_THE_GREENENERGY_EFFICIE.pdf

96 Low Income Oversight Board, comments at the SB 350 Low-Income Barriers Study workshop, August 12, 2016.

97 The Energy Commission, through EPIC, administers approximately $130 million per year for applied research and development; technology demonstration and deployment; and market facilitation activities to address technology and policy gaps related to the commercialization of next generation clean electricity technologies. The primary guiding principle of the EPIC Program is to provide IOU electricity ratepayer benefits, defined by the CPUC as promoting greater reliability, lower costs, and increased safety.

In 2015, the Energy Commission published California's Existing Buildings Energy Efficiency Action Plan pursuant to AB 758 (Skinner, Chapter 470, Statutes of 2009) and anticipating SB 350 (de León, Chapter 547, Statutes of 2015) and AB 802 (Williams, Chapter 590, Statutes of 2015). The Action Plan placed high emphasis on data-driven decision making, concluding that consistent availability and access to the right kinds of information are foundational for both market activation and monitoring the impacts and determining the effectiveness of local, regional and state initiatives.[98] The Action Plan set several goals for improving metered and whole-building data, establishing streamlined data exchange protocols, and providing easy-to-access data for local governments, industry, and the public.[99] Another key goal from the AB 758 Action Plan is the creation of a statewide database for low-income energy efficiency and weatherization programs, which has been a common recommendation in the literature and stakeholder comments.[100] Ongoing efforts are being made to integrate WAP, LIHEAP, LIWP, and ESA databases in the state. And AB 802 (2015) requires the establishment of a mandatory benchmarking and disclosure program which will generate significant data about the commercial and multifamily building sectors.[101]

---

98 There are a number of needs that the data goals outlined by the AB 758 Action Plan can meet. Property owners need access to data to manage their buildings, understand potential problems, and plan and scope improvements. Multiple-metered buildings, particularly multifamily buildings, present particular challenges. Property owners have difficulty accessing tenant data, and most utilities do not provide whole-building data aggregation services. Therefore, many owners cannot have a clear understanding of the energy consumption in the buildings they own. Geographically specific data are an essential element for policy makers and local governments implementing energy efficiency programs in order to better target programs, develop climate plans, and measure progress. Accurate information also can be very important to the marketplace itself. Market actors can benefit from data on project scopes and costs, building characteristics, and pre-vs.-post energy consumption in order to develop sector- and location-specific outreach and understand market opportunities and risks. And knowledge of one's energy use can be a powerful motivator for making energy efficiency improvements.

99 Energy Commission. 2015. Existing Buildings Energy Efficiency Action Plan. http://docketpublic.energy.ca.gov/PublicDocuments/15-IEPR-05/TN205919_20150828T153953_Existing_Buildings_Energy_Efficiency_Action_Plan.pdf.

100 EPC (2013) points to some examples that have made progress in the arena of multifamily housing: "A number of jurisdictions have passed benchmarking and disclosure ordinances, such as New York City's Local Law 84, requiring buildings to track and/or disclose certain building energy use information. Fannie Mae and the U.S. Environmental Protection Agency (EPA) are working together to expand the existing portfolio manager tool to include a multifamily building rating component. The MacArthur Foundation and Living Cities are developing national standards for the collection of building data, so that the data collected might be more useful and easier to compare.... Bank of America is working with Bright Power to utilize EnergyScoreCards, an online software-as-a-service benchmarking tool specifically geared toward multifamily and other multitenant properties, to track savings in post-retrofit buildings funded through the $55 million Bank of America energy efficiency finance program. Stewards for Affordable Housing is also utilizing the software to track retrofits in many of its buildings. Enterprise Community Partners and many others that received a portion of the $23 million in HUD funds in 2012 for new approaches in older multifamily buildings are similarly including some tracking of retrofit performance in their programs."

101 AB 802 requires utilities to provide energy consumption for covered buildings, including all buildings with five or more residential accounts, to the building owners. Regulatory development for this program is ongoing, with possible adoption targeted for late 2016. The Energy Commission is directed to specify what information shall be delivered to the Commission, and the manner in which the data shall be disclosed. Easy access to this energy use data by building owners and state and local government agencies will be essential to the success of

Stakeholder commentary stresses the need for these types of data initiatives. CSD states that getting the right kind of energy information about homes so that you can look for homes that have the highest energy burden and the right type of housing stock would allow the most impact when doing weatherization and efficiency work.[102] NRDC notes that in order for multi-family property owners to do retrofits and get the financing they need, they have to have access to energy bill data, and that has been a real struggle for owners to get both whole-building and tenant energy bill data.[103] LADWP points to the importance of providing legal specificity so that's it absolutely black and white what data is sharable, with whom under what circumstances.[104] And StopWaste notes that energy use benchmarking data required to be disclosed by AB 802 (2015) presents an opportunity to better target multifamily housing.[105]

Lending Industry Data

Henderson (2014) offers a few suggestions for lenders to refine their property assessments and efficiency potential:

> First, mortgage lenders could incorporate into conventional loan documents borrower permission to obtain utility usage information from applicable utilities….Second, multifamily mortgage lenders could require property owners to report the energy use of the subject property to a benchmarking tool and make the results available to the lender….Third, mortgage lenders could automatically collect information on property efficiency level when such information is available in systems, such as ENERGY STAR status and home energy ratings.

Loan costs might be brought down if the industry had a better understanding of the performance of energy improvement loans. One study suggests that "to fully engage in energy-efficiency financing, markets need better systematic information on the factors that explain defaults, delinquencies, and overall loan performance" (Palmer et al, 2012).[106]

---

the program. Both government and the marketplace will thus be in improved positions to develop targeted initiatives and monitor the actual results over time.

102 CSD, comments at the SB 350 Low-Income Barriers Study workshop, August 12, 2016.

103 NRDC, comments at the SB 350 Low-Income Barriers Study workshop, August 12, 2016.

104 LADWP, comments at the SB 350 Low-Income Barriers Study workshop, August 12, 2016.

105 StopWaste, comments at the SB 350 Low-Income Barriers Study workshop, August 12, 2016.

106 Palmer et al (2012) point to the Fannie Mae energy loan data as an ideal information source for home loan analysis. Furthermore, some research has already been done in this regard, and the results could have positive implications for the financing market. Epperson (2014) notes that "a University of North Carolina study, for

Unrecognized Non-Energy Benefits

The incorporation of non-energy benefits into program evaluation and cost-effectiveness tests can place energy efficiency and renewable upgrades in the proper context, one in which infrastructural, environmental, and social benefits are part of the political calculus for future energy policy. Their inclusion also reflects the objective reality in which actual people make decisions in practice. Non-energy benefits can be critical to framing the narrative of programs that may not be strictly cost effective from an economic standpoint. One study "found that when program administrators include non-energy benefits of energy efficiency along with energy savings, the benefit-cost ratio can improve to up to 1.5 times the initial investment for single-family households and up to 3.5 times for multifamily households" (Kushler et al, 2012). Such a change is crucial, CPUC pointed out at the Barriers Study workshop, because some programs are statutorily required to be cost effective, which suggests statutory changes are needed for the CPUC to pursue a new direction.[107] Indeed, one stakeholder noted that some of the guiding statutes pertaining to energy efficiency programs are decades old and contain provisions that are out-of-date.[108]

As was discussed in Chapter 3, California has made some inroads to this effect. Cluett et al (2016) note that one CPUC test (Total Resource Cost) of ESA programs ranks the performance based on the following criteria:

- "(1) Eliminates combustion-related safety threat;
- (2) Eliminates fire safety threat/improves home security (crime prevention) and building integrity;
- (3) Reduces or eliminates extreme temperatures and temperature variations inside the home/improves customers' ability to manage in-home temperatures;
- (4) Improves air quality, ventilation, and/or air flow."

NRDC, however, suggests that low-income multifamily housing retrofit programs should not be evaluated under Total Resource Cost (TRC) parameters due to the "unique challenges facing the multifamily building sector," and that the costs of combustion safety tests and remediation should not be factored into TRC. In addition, NRDC recommends eliminating or reducing "free ridership" penalties for "owners who seek program assistance to capture additional energy savings on an existing construction

---

example, reviewed over 71,000 homes and uncovered the value of energy efficiency. Loans on ENERGY STAR homes were 32 percent less likely to default than others. And the more efficient the home, the lower the likelihood of default."

107 CPUC, comments at the SB 350 Low-Income Barriers Study workshop, August 12, 2016.

108 Low Income Oversight Board, comments at the SB 350 Low-Income Barriers Study workshop, August 12, 2016.

project," as using only the existing property conditions as the baseline. Finally, NRDC suggests that a fuller accounting pf non-energy benefits could be included.[109]

The Weatherization Assistance Program (WAP) could serve as another model for incorporating non-energy benefits. One study notes that various aspects of WAP "program implementation, such as such as labor requirements, local purchasing requirements, reductions in the use of grid energy, and lower utility bills, etc., suggest that the non-energy benefits of WAP might be useful complementary indicators for expectations surrounding renewable energy assistance programs" (Lampton et al, 20

Potential Solutions for Community Access Barriers

Conducting Targeted Outreach and Education

Framing

The literature provides suggestions for framing energy upgrade programs in a manner that might better resonate with low-income customers.

One study notes that although energy savings is often marketed as the principal benefit of an upgrade, "its efficacy remains largely untested." Furthermore, "many consumers decide to move forward with energy improvements to solve other household or business problems (e.g., comfort, aging or failed equipment)" (Zimring et al, 2013)

Another report points out that "multiple studies have found that people are motivated more by loss-framed messages than by gain-framed messages…Gain-framed messages emphasize the benefits of performing a behavior, and loss-framed messages emphasize the cost of not performing that behavior" (CSE, 2016).

CSE (2016) notes that programs may find more success by encouraging people not to be wasteful "instead of using a sacrifice-oriented message that encourages saving money or energy." However, CSE cautions that this approach may always not work, since an "aversion to waste" may not resonate when asking people to, for example, retire still-functioning appliances.

Farley and Mazur-Stommen (2014) note that evidence does not support the efficacy of pamphlets and signs to promote energy awareness. Rather, they suggest using "behavior programs [that] use insights from social science research to produce better results than traditional campaigns. For example, they may make use of drivers like social norms, whereby individuals are motivated to change based on a perception that their peers are doing the same thing."

---

109 GREEN-EEFA Coalition, written comments, August 25, 2016, http://docketpublic.energy.ca.gov/PublicDocuments/16-OIR-02/TN212956_20160825T164946_Caroline_McCormack_Comments_COMMENTS_OF_THE_GREENENERGY_EFFICIE.pdf

Targeted Outreach

Appropriate marketing is key to meeting the diverse needs and audiences of various disadvantaged communities. IREC (2016) notes that low-to-moderate-income customers may be wary of "novel shared renewables offerings that have not historically been marketed to them, viewing them as potential scams." Therefore, targeting such customers "may require specialized, culturally sensitive marketing, education, and outreach, both as far as the method used (e.g., language, medium, etc.) as well as the substance of the materials."

Farley and Mazur-Stommen (2014) suggest a technique known as *community-based social marketing* (CBSM), which "relies on research to identify barriers to and benefits of desired outcomes, enabling program designers to develop strategies that are relevant and appropriate to target populations." Successful CBSM research, they conclude, should seek to understand the "audience's beliefs, concerns, and values that program designers may have otherwise overlooked."

CSE (2016) cites studies that indicate "characteristics on which ethnic groups may differ that are relevant for framing energy efficiency messages." For example:

> Hispanic Americans may be receptive to messages that emphasize the protection of land, nature, and farmland, among other benefits….While these messages may be effective for Hispanic Americans, one study found messages focused on being close to nature were least likely to resonate with African Americans…Researchers have found that Asian Americans are most responsive to messaging frames that address the collectivist nature of their culture, for example, emphasizing membership within a group, community relations, interdependence, information sharing, and many-to-many forms of communication like forums….In a focus group-based study on how low-income Hispanic Americans and African Americans…stressed the low levels of trust that both groups expressed with respect to their energy utilities. Furthermore…these groups did not trust people outside their peer group for information on energy conservation" (CSE, 2016).

Delivery

Selecting better points of contact with disadvantaged communities can increase the success of a program. CSE (2016) points out "that outreach efforts leveraging community-based organizations (CBOs) and community events can be an effective way to reach minority populations who might have lower levels of trust in energy utilities, large institutions, or the government." Furthermore, Habitat for Humanity (2015) urges programs to reach out to targeted low-income communities "through public relations channels and networks such as community action agencies, churches, and faith-based and community-based organizations." Indeed, the Energy Commission's participation in the series of community meetings organized by local organizations revealed the fruits

of such partnerships between the public and local organizations. Some stakeholders indicated that the Commission such continue such outreach activities (see Appendix B).

Consideration of appropriate forms of media may also yield better results. According to an investigation conducted by Southern California Edison:

> Chinese American participants reported they would normally expect to find information pertaining to energy efficient products and programs in newspapers (55%), radio (24%), and television (14%) (ASW Engineering Management Consultants, Inc. 2006). African Americans reported that they would prefer to learn about energy efficiency program offerings through television, mail, and the Internet (McLain ID Consulting and KVDR Inc. 2010). When program administrators pursued media outlets targeting the Hispanic community as an outreach method, they found that advertisement costs in Hispanic media outlets were two to three times those of Asian media outlets (Kan et al, 2013, cited in CSE 2016).

CPUC comments that the energy retrofit industries need better regulation to prevent predatory sales practices, an issue that is particularly acute for low-income customers.[110] Low-income program requirements could impose such standards through provider eligibility rules, though care must be taken to balance program requirements with increased costs that may limit participation.

110 CPUC, comments at the SB 350 Low-Income Barriers Study workshop, August 12, 2016.

CHAPTER 5: Barriers to Contracting Opportunities for Local Small Businesses in Disadvantaged Communities

Background

The California legislature has determined that a key to realizing the policy goals of SB 350 is to better understand the contracting challenges faced by small businesses in disadvantaged communities. The statute states: "The Commission, with input from relevant state agencies and the public, shall conduct and complete a study on…barriers to contracting opportunities for local small businesses in disadvantaged communities."[111] This chapter addresses this mandate by identifying barriers faced by small businesses in disadvantaged communities, as well as potential solutions that government agencies, the private sector, and other stakeholders can undertake to address the barriers.

Additionally, this chapter summarizes material discovered through the literature review, input provided at the Barriers Study workshop, and expert opinions and reading material from stakeholders (listed in Table 5).

Table 5: List of organizations surveyed for input on barriers to contracting opportunities for local small businesses in disadvantaged communities

Organization	Location
California Energy Commission (CEC)	Sacramento
California Public Utility Commission (CPUC)	San Francisco
Community Energy Services Corporation (CESC)	Berkeley
Department of Consumer and Business Affairs (DCBA)	Los Angeles County
Department of General Services (DGS)	Sacramento
Energy Conservation Options (ECO)	East Oakland
Governor's Office of Business and Economic	Los Angeles

111 California Legislative Information website, *SB-350 Clean Energy and Pollution Reduction Act of 2015* https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201520160SB350

Development (GO-Biz)	
The Greenlining Institute (representing the Asian Pacific Environmental Network [APEN], Brightline Defense Project, Center for Sustainable Energy, Coalition for Clean Air, Energy Solidarity Cooperative, Jobs to Move America, Rising Sun Energy Center, and Strategic Concepts in Organizing & Policy Education [SCOPE LA], as well as several small diverse businesses)	(several locations)
High-Speed Rail Authority (HSR)	Sacramento
San Diego Contracting Opportunities Center (SDCOC), Southwestern College	San Diego

The literature review and stakeholder input suggest a number of barriers to small-business contracting in disadvantaged communities. Some of these barriers may be faced by small businesses beyond disadvantaged communities as well. Barriers may exist during all phases of the contracting process, including: researching contracting opportunities, the bidding phase, and contract implementation.

Also, some barriers may be more common in state contracting than in private contracting, or vice versa. Furthermore, Varshney and Tootelian (2009)[112] note that the small businesses that bid for state contracts must be certified. This means that small businesses that are not certified may face challenges that are not captured in their research. Where appropriate, some of these distinctions are made in the barrier description text below. The identified barriers, in order of most frequently mentioned to least, are:

- Lack of access to information about contracting opportunities
    - Information about existing bids
    - Information about funding and funding criteria
    - Data and information *on* small businesses in disadvantaged communities
    - Insufficient focused outreach
- Technical assistance and workforce needs
    - Solicitation process

112 Varshney, Sanjay B. and Dennis H. Tootelian. 2009, *The Impact of the Small Business and Disabled Veteran Business Enterprise.*

    - Specialization issues
    - Workforce recruitment and retention
- Financial obstacles
    - Cost structure
    - Self-financing
    - Insufficient private funding available
- Other concerns

Barriers

Lack of Access to Information about Contracting Opportunities

Information about Existing Bids

According to Varshney and Tootelian (2009), one main reason participants in their research did not bid for state contracts was that they "did not know of bid opportunities (28.0%)."[113]

The environmental equity organizations that hosted clean energy and workforce policy experts to discuss SB 350 barriers at their own workshop on Wednesday, July 20, 2016 add that current outreach efforts to small businesses for clean energy contracting and sub-contracting opportunities in low-income and disadvantaged communities are "insufficient and often exclusionary." They further add, "Although incentives for diverse-owned businesses currently exist, the incentive levels are inconsistent, poorly communicated, and insufficient." The same coalition also acknowledges that "due to their size, limited resources, and small staffs, small businesses often cannot participate in convenings or networking events designed to connect them with prime contractors."[114]

Additional responses obtained by Varshney and Tootelian include that "36.5% of the respondents believe they are not very or not at all knowledgeable about how to identify contracts, 41.2% feel this way about how to submit bids, and 44.5% of the respondents feel this way about how bids are awarded."[115]

---

113 Varshney, Sanjay B. and Dennis H. Tootelian. 2009, *The Impact of the Small Business and Disabled Veteran Business Enterprise*.

114 Documented by the same coalition in *SB 350 Jobs & Economic Opportunities – Comments & Recommendations* and docketed on 26 August, 2016 (docketpublic.energy.ca.gov/PublicDocuments/16-OIR-02/TN212959_20160825T173803_Sekita_Grant_Comments_350_Recommendations_for_Jobs_Workforce_Tr.pdf)

115 Varshney, Sanjay B. and Dennis H. Tootelian. 2009, *The Impact of the Small Business and Disabled Veteran Business Enterprise*.

The Varshney and Tootelian study is dated, which may partly explain these responses. State outreach efforts in this area have been improved since the study's publication (for example, DGS conducted 183 outreach events in this fiscal year alone). Nonetheless, it is possible that because of lack of coordination on targeted outreach efforts,[116] the information may not reach small businesses in many disadvantaged communities.

Information about Funding and Funding Criteria

Stakeholders have shared that "specific knowledge of available funds and funding criteria" is a barrier to clean energy contracting "at the state and local levels."[117]

Data and Information on Small Businesses in Disadvantaged Communities

Currently, state agencies are restricted in their ability to target small businesses in disadvantaged communities and are not required to obtain data from small businesses in disadvantaged communities that could help identify their unique needs and circumstances. DGS staff has shared that it is working on potentially collecting optional data from small businesses in order to better understand their needs.[118]

The High-Speed Rail Authority (HSR) is one state entity that does target small businesses in disadvantaged communities for assistance and tracks contracting dollars that goes to them. This is driven by an aggressive goal of having 30 percent of their contracting go to small business (exceeding the state's requirement for 25 percent)[119], and a 10-percent Disadvantaged Business Enterprises (DBE) participation goal.[120] HSR has committed to eliminating barriers and increasing small business participation and, as a result, created a Business Advisory Council (Council) in 2012. The Council is representative of

---

116 According to one state small-business advocate.

117 APEN and Greenlining. 2016. *SB 350 Jobs & Economic Opportunities – Comments & Recommendations*, docketpublic.energy.ca.gov/PublicDocuments/16-OIR-02/TN212959_20160825T173803_Sekita_Grant_Comments_350_Recommendations_for_Jobs_Workforce_Tr.pdf

118 Conversation with DGS staff, August 19, 2016.

119 See Appendix D

120 HSR staff have shared that, according to their *Small and Disadvantaged Business Enterprise Policy*, "As a condition of federal financial assistance, […] the [High-Speed Rail] Authority will […] ensure Small and Disadvantaged Businesses have an equitable opportunity to participate in contracts funded in part or in whole with federal financial assistance." Furthermore, "The [High-Speed Rail] Authority strives to meet an overall 30 percent SB participation goal, representative of firms that reflect the diversity of California. The 30 percent goal is inclusive of a 10 percent DBE goal and a 3 percent DVBE goal on federally assisted contracts." because they receive federal funding, they are required to track and assist disadvantaged businesses. The language that Proposition 209 added to the California Constitution allows this. See http://hsr.ca.gov/docs/programs/small_business/Small%20and%20Disadvantaged%20Business%20Enterprise%20Policy.pdf and http://www.leginfo.ca.gov/.const/.article_1

California construction and professional services business trade associations and provides input to HSR in its interactions with and support of small businesses.[121]

Insufficient Focused Outreach

The latest DGS annual report indicates that DGS "encourages state departments to conduct focused outreach consistent with SB 1045 (2001). Departments are encouraged to incorporate focused outreach into their general outreach as part of their public contracting and commitment to diversity."[122] However, one small-business advocate indicated that his agency does not have the resources to conduct more outreach on its own. Along the same lines, DGS indicates that some agencies do not have dedicated small-business advocates; therefore, their bandwidth to step out of the office for agency-driven outreach efforts is limited.[123]

Technical Assistance and Workforce Needs

Solicitation Process

A number of surveyed stakeholders cited technical complexity or volume of (paper)work associated with the solicitation process as an obstacle some small businesses face. The chief executive officer (CEO) of ECO, for instance, said she could not justify committing so many resources on every bid on slim chances of securing a contract.[124] And the environmental organizations commented that "Many small and diverse-owned businesses might not understand the technical language of grant applications or may not speak or read English fluently."[125]

Specialization Issues

In its annual Report, DGS "recognizes the challenges departments encounter due to the lack of certified SB/DVBE businesses in highly specialized fields."[126] Paraphrasing CEC small-business advocate staff, if there are any small engineering firms in East Oakland,

---

121 The HSR Business Advisory Council, http://hsr.ca.gov/Programs/Small_Business/business_advisory_council.html

122 California Department of General Services, *Consolidated Annual Report, Fiscal Year 2014–2015, on Small Business (SB) and Disabled Veteran Business Enterprise (DVBE) Participation.*

123 Conversation with DGS staff, August 19, 2016.

124 Dahlia Moodie, Energy Conservation Options, "SB 350 Barriers Study Workshop Public Comments," August 12, 2016.

125 APEN and Greenlining. 2016. *SB 350 Jobs & Economic Opportunities – Comments & Recommendations*, docketpublic.energy.ca.gov/PublicDocuments/16-OIR-02/TN212959_20160825T173803_Sekita_Grant_Comments_350_Recommendations_for_Jobs_Workforce_Tr.pdf

126 California Department of General Services, *Consolidated Annual Report, Fiscal Year 2014–2015, on Small Business (SB) and Disabled Veteran Business Enterprise (DVBE) Participation.*

they are not aware. From their perspective, DGS and other state agencies do not work together on enough efforts to identify specialized small businesses for the type of work contracted at his agency.

Workforce Recruitment and Retention

The environmental equity coalition states that "California's transition into a clean energy economy in accordance with…SB 350 necessitates active participation of all Californians, which includes workforce from disadvantaged and low-income communities.… Workforce will undeniably play a huge role in the implementation of SB 350."[127]

And it already is, according to Jones et al. (2016): "Due to its aggressive climate policies and the size of its economy, California, by far, supports the most clean energy jobs of any state in the nation. […] We outline how the Renewables Portfolio Standard (RPS) has produced a significant number of good quality jobs with family-supporting wages, health and retirement benefits, and career training opportunities across the state of California. The major beneficiaries of the growth in renewable energy generation were workers in very high unemployment, low-income counties, such as Imperial and Kern Counties. The concentration of renewable energy construction in these areas further amplifies the benefits of renewable energy jobs."[128]

However, the picture is not all positive, according to several stakeholders. For example, energy upgrades reflect broader trends in the construction industry, in particular the construction slowdown during the winter months. This can result in some energy upgrade jobs being temporary or seasonal, and even permanent jobs may face reduced hours during slow periods in the industry. The pressure to find other work is especially acute for workers from low-income households. Consequently, even for programs that provide entry-level workforce development training, small firms can have high turnover rates.[129]

Also, program instability issues, due to changes in funding and reduced production, have resulted in PG&E losing 41% of the 2,000 ESA workers it hired in local communities.[130] The CEO of ECO shares that this start-and-stop behavior of state

---

127 APEN and Greenlining. 2016. *SB 350 Jobs & Economic Opportunities – Comments & Recommendations*, docketpublic.energy.ca.gov/PublicDocuments/16-OIR-02/TN212959_20160825T173803_Sekita_Grant_Comments_350_Recommendations_for_Jobs_Workforce_Tr.pdf

128 Jones, Betony, Peter Philips, and Carol Zabin. 2016. *The Link Between Good Jobs and a Low-Carbon Future: Evidence from California's Renewables Portfolio Standard, 2002-2015*. Donald Vial Center of Employment in the Green Economy, Center for Labor Research and Education, University of California, Berkeley.

129 Janine Medina, Proteus, Inc., "SB 350 Barriers Study Workshop Public Comments," August 12, 2016; Melvin Parham, Rising Sun Energy Center, "SB 350 Barriers Study Workshop Public Comments," August 12, 2016.

130 Cynthia Bruno, Richard Heath & Associates, "SB 350 Barriers Study Workshop Public Comments," August 12, 2016.

programs that provide stimulus on an inconsistent basis hurts those small businesses that greatly depend on them, thus making it harder for a business owner to retain her workforce.

The CEO of ECO shares another very specific concern—the ability to hire trainees in disadvantaged communities at an affordable rate:

> As we grow we have some constraints around being able to hire local people and get them onto public works classified jobs, because they are no longer eligible as electrical trainee card carriers to participate at a trainee level and must be paid at the level of a journeyman.… There used to be a job class called *fixtures and maintenance* or something like that…which allowed individuals coming from community colleges and green training programs could get what's called an electrical trainee card to actually be on public jobs.… So that is going to create…a short term problem but it's going to create even a long term problem as well as an impact to the community college system because a lot of those [trainees] come from Laney College and other local community colleges.[131]

Another stakeholder tells us that just training and hiring workers is not enough. Workers from low-income households may not have reliable transportation or childcare, which could interfere with their ability to consistently show up to work and may prompt the employer to terminate employment.[132]

Also, some small businesses, in particular in disadvantaged communities, feel a tension between providing a service as cost-effective as possible, in order to benefit its customers, and doing right by its employees: "the more that we pay a workforce, the less cost effective the service that they provide becomes."[133]

Financial Obstacles

Cost Structure

In the experience of some of the stakeholders (ECO, SDCOC), small businesses can face higher costs than some larger firms. In the experience of SDCOC, for instance, a manufacturer may decide to sell equipment to a larger company at a lower price if it has a long-standing relationship with the larger company, or if the larger company is buying

131 Dahlia Moodie, ECO, "SB 350 Barriers Study Workshop Public Comments," August 12, 2016.

132 Martin Bond, Community Energy Services Corporation, "SB 350 Barriers Study Workshop Public Comments," August 12, 2016.

133 Martin Bond, Community Energy Services Corporation, "SB 350 Barriers Study Workshop Public Comments," August 12, 2016.

a larger quantity in support of more than one contract.[134] In the experience of the CEO of ECO, small businesses tend to buy retail.[135]

Additionally, the CEO of ECO finds that she spends more time and resources training the new workforce, all of which she believes raises her costs more than an equivalent small business in a different community. She attributes this to high turnover rates and scarcity of specialized workers in her community.[136]

Self-Financing

The environmental equity organizations surveyed share that among the "many requirements for state contracting, […] [w]hen contracting for a construction project, for example, a business has to both, demonstrate its financial ability to complete the project, as well as show a performance bond in case a prime or sub-contractor fails to meet deadlines. Both of these requirements are very expensive and consequently exclude many small businesses."[137]

Insufficient private funding available

In regards to finding financial assistance for small businesses in disadvantaged communities, the environmental equity organizations added:

> There is a lack of interest in providing private financing in disadvantaged and low-income communities. To address this problem, entities such as CalCEF and DBL Investors provide examples of how investing in small businesses and underserved communities can be a profitable strategy. California can help to increase private capital investment by using public dollars and policies to encourage clean energy investments in target communities. Of the existing programs directing money to small businesses, many may lack sufficient funding and administrative capacity. Currently, the state and the federal government only offer (a) contracts in small bites, or (b) bundled projects for cost savings from economies of scale. However, these larger "bundled" projects do not generally lower project cost, and furthermore, make it harder for small

134 Conversation with Rachel Fischer, SDCOC. on August 19, 2016.

135 Conversation with Dahlia Moodie, ECO, August 19, 2016.

136 Conversation with Dahlia Moodie, ECO, August 19, 2016.

137 APEN and Greenlining. 2016. *SB 350 Jobs & Economic Opportunities – Comments & Recommendations*, docketpublic.energy.ca.gov/PublicDocuments/16-OIR-02/TN212959_20160825T173803_Sekita_Grant_Comments_350_Recommendations_for_Jobs_Workforce_Tr.pdf

> businesses to submit a bid and compete against larger, more resourced companies.[138]

CESC sheds light on one potential reason behind the lack of interest on the part of financial institutions:

> We work a lot with very small businesses, so our average project size for the businesses […] might have a net cost of $500 to maybe $2,500. So in that situation there really isn't a financing mechanism that offers such low dollars. It's not worth it for a bank or a credit union to offer a $5,000 loan for a year. […] There are many […] third parties, private industries who are trying to get into financing these small commercial projects. But again, they're usually starting around a $10,000 customer cost payment, and we really work with much smaller businesses than that.[139]

The CEO of ECO further shared at the Barriers Study workshop:

> Getting the small business to have the capacity to take on either debt or qualify for loans […] is very tough to do. […] [Also,] they may have a good credit score and maybe there's a program, a utility program that if they've had a late payment, then that might disqualify them, too.[140]

Other Concerns

"Bid success seems to be a function of the number of applications made," Varshney and Tootelian found.[141] While they wonder "the direction of the cause-and-effect relationship" (that is, whether the more companies bid, the more likely they will be successful; or whether the more successful companies are, the more likely they are to bid and win more frequently," a feedback loop is apparent, and some stakeholders corroborate it. Therefore, it does seem plausible to think that the more companies bid, the more likely they will be successful; AND the more successful companies are, the more likely they are to bid and win more frequently.

In fact, Varshney and Tootelian (2009) found that "success rates clearly are higher among respondents who have bid for more State contracts. For example, 56.9% of the

---

138 APEN and Greenlining. 2016. *SB 350 Jobs & Economic Opportunities – Comments & Recommendations*, docketpublic.energy.ca.gov/PublicDocuments/16-OIR-02/TN212959_20160825T173803_Sekita_Grant_Comments_350_Recommendations_for_Jobs_Workforce_Tr.pdf

139 Martin Bond, Community Energy Services Corporation, "SB 350 Barriers Study Workshop Public Comments," August 12, 2016.

140 Dahlia Moodie, ECO, "SB 350 Barriers Study Workshop Public Comments," August 12, 2016.

141 Varshney, Sanjay B. and Dennis H. Tootelian. 2009, *The Impact of the Small Business and Disabled Veteran Business Enterprise*.

respondents who have bid two to five times have been successful at least once, and 85.4% of the respondents who bid for at least six contracts have been successful at least once. This suggests that there may be a learning curve effect and SBs and DVBEs should be encouraged to continue bidding for State contracts rather than be discouraged if they do not receive an award the first time."[142] This could present a barrier for small business as they may not have the resources to submit bids on multiple contracts.

Another area of concern raised by stakeholders (DGS and the participating environmental equity organizations) is the need of tighter controls around meeting the small-business contracting target. DGS staff cited the example of a primary contractor signing a contract with the state showing 25 percent of the contract has been awarded to small businesses. Then, in the course of performing the contract, new work change orders may arrive that may increase the total contract amount. At that point, the amount previously subcontracted to small businesses is less than 25 percent. However, some contractors do not adjust the amount subcontracted to small businesses to correct the gap and maintain compliance with the 25 percent requirement.[143]

Another concern shared by DGS and the participating environmental equity organizations is that a contractor may list small businesses as part of its bid, only to replace them later by its own firm or other firms of its preference.[144]

Potential Solutions and Opportunities

Through the literature review and stakeholder engagement process, a number of solutions and opportunities were suggested that could be further explored. Some of them may represent a challenge to current policy or capabilities of the state agencies themselves. Therefore, not all of the below have to be implemented by the state government; the government may just need to broker or kick-start some of them.

Follow-up Data Collection and Analysis

As stated by various stakeholders, including DGS, more data are required to be able to understand the specific needs of small businesses in disadvantaged communities. Therefore, two ideas were offered for consideration: (1) a statewide in-depth follow-up

142 Varshney, Sanjay B. and Dennis H. Tootelian. 2009, *The Impact of the Small Business and Disabled Veteran Business Enterprise.*

143 Conversation with DGS staff, August 19, 2016.

144 Conversation with DGS staff, August 19, 2016 and text from APEN and Greenlining. 2016. *SB 350 Jobs & Economic Opportunities – Comments & Recommendations*, docketpublic.energy.ca.gov/PublicDocuments/16-OIR-02/TN212959_20160825T173803_Sekita_Grant_Comments_350_Recommendations_for_Jobs_Workforce_Tr.pdf ("primary contractors may list a diverse-owned business in its application in order to meet a procurement requirement and win a contract, only to later cancel the contract with the diverse-owned business and use a different business already in its network. Building in an effective compliance strategy from the beginning can help mitigate against such fraud.")

study; (2) an ongoing effort to collect, analyze and share these data at the relevant state agencies and departments.

An Overarching Small-Business Supply Chain Strategy

Greenlining and its peer organizations commented that "The clean energy supply chain must reflect the diversity of California's economy and population. There are billions of dollars in contract opportunities for businesses that can provide ancillary support for clean energy investments – from paper clips to legal services."[145] Also, Varshney and Tootelian tell us that substantial economic benefits are already enabled with around 25% of state contracting going to small businesses every year.[146] Therefore, there is an opportunity to help more small businesses that support various supply chains and in turn bring greater economic benefit to the state.

The public sector would not be the first to wonder how to nurture a strong supply base for the benefit of all stakeholders. For example, the global auto industry has long followed the example set by Toyota and Honda in the late twentieth century. A number of books, papers and articles were written on *lean management* principles at the turn of the century, which have reached well beyond the auto industry. For our purpose here, Liker and Choi summarize it well: "The advice on that score is quite consistent: Experts agree that American corporations, like their Japanese rivals, should build […] networks of vendors that continuously learn, improve, and prosper along with their parent companies. The issue isn't whether companies should turn their arms-length relationships with suppliers into close partnerships, but how."[147]

A number of supplier management tools and tactics have been developed and utilized over time. Liker and Choi share a summary of their findings based on their research of Toyota and Honda.[148] They found that the process towards developing strong ties with their suppliers follows six distinct stages:

1. Commit to joint success with and develop an understanding of your suppliers' business and operation – the objective here is to build trust to be allowed *inside* and then be able to help them *inside out*.

---

145 APEN and Greenlining. 2016. *SB 350 Jobs & Economic Opportunities – Comments & Recommendations*, docketpublic.energy.ca.gov/PublicDocuments/16-OIR-02/TN212959_20160825T173803_Sekita_Grant_Comments_350_Recommendations_for_Jobs_Workforce_Tr.pdf

146 Varshney, Sanjay B. and Dennis H. Tootelian. 2009, *The Impact of the Small Business and Disabled Veteran Business Enterprise*.

147 Liker, Jeffrey and Thomas Y. Choi. 2004, December issue. *Building Deep Supplier Relationships*. Harvard Business Review.

148 Liker, Jeffrey and Thomas Y. Choi. 2004, December issue. *Building Deep Supplier Relationships*. Harvard Business Review.

2. Use a combination of competition and collaboration to form a supplier network and raise the bar for everyone, while being able to spread best practices.
3. Measure and track progress, provide continual feedback, and jointly solve problems.
4. Prepare long-term development plans—a roadmap that shows suppliers the steps towards improving their technical capabilities.
5. Develop the habit of constant information sharing.
6. Become partners in the habit of *continuous improvement*.

Any of these stages can be a tool for delivering better suppliers, but together, as a system, they are likely to develop a successful supplier network. The state could consider ways to use contracting opportunities as a pipeline to continually introduce and develop small businesses— that could also benefit industry. Or, industry could develop small businesses in the course of doing business with them, which would then benefit all communities and the state as a whole.

Also, Greenlining and its peer organizations suggest the following:

> The state or private businesses can require that a minimum amount is spent on contracts with diverse-owned business. This promotes more transparency, accountability, and targeted outreach. The state can also offer stronger incentives and preference points for contracting with diverse-owned businesses that operate in disadvantaged communities and low-income communities. This also helps to promote a more inclusive clean energy economy. The CPUC has had great success through its GO 156 supplier diversity program and should be looked to as a model for this work.

Partnerships with Community-Based Organizations to Provide Information and Train Local Workforce

During the community outreach phase of this study, a number of residents and Community-Based Organizations (CBOs) expressed that, (1) because CBOs have built community trust, and (2) because CBOs are dedicated to developing the skills necessary to ensure economic progress within their communities, CBOs make ideal partners in sharing program information with the local residents, as well as in training the local workforce.[149] CBOs believe that when the local workforce is involved in the installation and maintenance of technologies (such as rooftop solar or energy-efficient appliances), they are more likely to take good care of the installed systems.

The environmental equity organizations add: “The state and private groups can improve outreach by partnering with local community-based organizations and nonprofits such

149 Expressed by different residents at the community meetings that the Energy Commission participated in Los Angeles, Fresno, Oakland and Riverside (August 2016).

as chambers, economic development agencies, and other organizations supporting small business interests."

Alternative Funding Strategies and Tracking Metrics

In addition to contracts, the state could use another financial tool at its disposal to support small businesses in disadvantaged communities: grants. However, grants tend to come with their own set of challenges. For example, grants are not tracked with the specificity of contracts. Grantees may *sub-grant* or subcontract to other entities which can make tracking these money flows cumbersome—but not impossible.[150] Therefore, it was suggested that the state may want to consider policies and procedures that will (1) include better tracking of grants to small businesses and, at some point, (2) an actual target—just as is the case with contract spending today.

To this end, it could be valuable to use and track metrics to help ensure that efforts to create more small business opportunities are effective, particularly for small businesses in disadvantaged and low-income communities in the clean energy industry. Existing programs and policies that have demonstrated success, such as CPUC's General Order (GO) 156, may be leveraged. The CPUC issued GO 156 requiring utilities to establish goals for the purchase of services, fuels, and goods as a percentage of total procurement from diverse owned businesses.

The utilities are then required to annually report performance on their diverse procurement mandate and identify plans for future enhancement. The Greenlining Institute uses a supplier diversity report card that tracks various metrics of success for increasing diversity under the CPUC's GO 156 program. That report provides examples for metrics and reporting strategies.

Through the stakeholder process, participating environmental equity organizations proposed a range of other ideas for further consideration, including:

- Target small businesses for green investment opportunities. [There is an opportunity to target] small businesses in disadvantaged and low-income communities…for clean energy technology use. Churches, schools, law firms, accounting firms, community centers, restaurants, small businesses, and other community-serving organizations are promising spaces to roll out clean energy and clean transportation technologies.… In addition, the CEC should also seek out small businesses and community buildings for clean energy demonstration and deployment projects through EPIC and Alternative and Renewable Fuel and Vehicle Technology Program funding.[151]

150 Conversation with Energy Commission staff, July 26, 2016.

151 APEN and Greenlining. 2016. *SB 350 Jobs & Economic Opportunities – Comments & Recommendations*, docketpublic.energy.ca.gov/PublicDocuments/16-OIR-02/TN212959_20160825T173803_Sekita_Grant_Comments_350_Recommendations_for_Jobs_Workforce_Tr.pdf

- Provide targeted, consistent, and sufficient incentives to small businesses. There should be clearly defined, consistent, streamlined, and accessible sources of funding for small businesses in disadvantaged and low-income communities, particularly diverse-owned businesses.… Entities such as CalCEF and DBL Investors provide examples of how investing in small businesses and underserved communities can be a profitable strategy. California can help to increase private capital investment by using public dollars and policies to encourage clean energy investments in target communities. To help reach a diverse set of communities, the key is to have programs that target and address community needs and priorities (e.g. job growth, deferred maintenance, safety, mobility options) with funding at sufficient levels that are not fragmented.
- Direct research, development, and deployment (RD&D) opportunities to small and diverse-owned businesses. California is at the cutting edge of clean energy RD&D and the CEC is leading the way through its Electric Program Investment Charge (EPIC). The CEC should work closely with community-based groups to build regional networks of small business hubs and incubators that can promote access to clean energy opportunities and foster innovation, particularly in disadvantaged and low-income communities. CarbonBLU and GO Biz Innovation Hubs provide great models and resources for this type of initiative. Finally, the state should conduct outreach to diverse and underrepresented graduate students about research and development opportunities as well as entrepreneurship opportunities.
- Support diversity throughout the procurement pipeline…. The state or private businesses can require that a minimum amount is spent on contracts with diverse-owned business. This promotes more transparency, accountability, and targeted outreach. The state can also offer stronger incentives and preference points for contracting with diverse-owned businesses that operate in disadvantaged communities and low-income communities…. The CPUC has had great success through its GO 156 supplier diversity program and should be looked to as a model for this work.

Greater Coordination Among State Agencies and Departments

The literature and organizations surveyed suggest that relevant agencies and departments, including CEC, CPUC, DGS, CARB, GO-Biz, DGS, and others, could work more closely together to:

1. Better educate small businesses about contracting with the state.

2. Perform targeted strategic marketing and outreach to identify specialized firms—in particular in disadvantaged communities.
3. Share best practices to ensure small businesses have high-quality experiences with all agencies and departments with which they do business.
4. Provide clearly defined, consistent, streamlined, and accessible sources of funding for small businesses in disadvantaged and low-income communities, particularly diverse-owned businesses
5. Look for opportunities to leverage private capital and state resources

Special Focus on Increasing Access to Information and Contracting Opportunities for Small Businesses in Disadvantaged Communities

A combination of any of the above potential solutions could be designed to strengthen small businesses in disadvantaged communities altogether; or, if funds are extremely limited, some of these solutions could be piloted with a subset of the small businesses in disadvantaged communities in a particular field.

Expert panelists at the Technical Workshop, for instance, explained that for each solar installation job, up to three back-office jobs are created.[152] In other words, the ripple effect of systematically strengthening even a small number of small-business jobs in a disadvantaged community can be far-reaching.

With respect to improving access to information, outreach and education efforts could be refined and better targeted. Greenlining and peers suggested the following for consideration:

- *Improve transparency of data to support clean energy outreach and accountability*. Increasing access to clean energy business opportunities will require greater transparency of those opportunities in earlier stages (e.g. during the development of investment plans). This information should be accessible and targeted to small and diverse-owned businesses in disadvantaged and low-income communities. Furthermore, there should be more transparency around how much state clean energy funding is going to small businesses in disadvantaged and low-income communities, with a particular focus on businesses with less than 20 employees."[153]
- *Remove policy barriers to targeting contracting opportunities with small and diverse-owned businesses.* There are many requirements for state contracting, some of which can be overly burdensome for small businesses….The state should therefore pursue a policy fix or a financing mechanism that can help alleviate some of this burden that currently disproportionately affects small

152 Dahlia Moodie, ECO and Allan Rago, Energy Efficiency Council. "SB 350 Barriers Study Workshop Public Comments," August 12, 2016.

businesses….Reversing Proposition 209 would help the state more effectively target women- and minority-owned businesses that have historically been left out of clean energy business opportunities.

- *Increase and improve outreach to small and diverse-owned businesses.* In addition to building partnerships [with CBO's], effective outreach strategies should include the following: (1) Translate target outreach and education into key languages; (2) Partner with local community organizations; (3) Work with ethnic media; (4) Hire from within the community; (5) Present contracting and business opportunities that are clear and accessible with next steps, a follow-up contact (e.g. case manager), and financing opportunities; (6) Understand and address specific community needs in communication.
- *Develop targeted and equitable solicitations.* Solicitations or requests for proposals/information should give applicants with experience working in disadvantaged communities additional credit or points in an application process for that work. Solicitations and requests for proposals/information should also require that applicants partner and subcontract with diverse-owned businesses and community-based organizations that work in disadvantaged and low-income communities. Additionally, there should be targeted hiring requirements to support clean energy job access within disadvantaged and low-income communities. To support some of these efforts, there is an employment social enterprise reporting requirement that exists under California's Target Area Contract Preference Act (TACPA). It is unclear if this tool is actually used. At a minimum, there is an opportunity to use the TACPA to encourage more transparency and reporting on targeted procurement.

Support Clean Energy Job Placement & Workforce Development

As California increases access to clean energy technologies in disadvantaged and low-income areas, it is important to also promote well-paying, family-sustaining clean energy job opportunities for residents in these communities. To help facilitate this, Energy agencies could look for opportunities to collaborate with state labor agencies such as the California Labor & Workforce Development Agency, the California Workforce Development Board, and the Employment Development Department on targeted workforce training and job placement initiatives to create strategies that drive clean energy job opportunities in low-income and disadvantaged communities.

As part of this collaboration, a roadmap with recommendations on how California can improve clean energy workforce and job placement policies within disadvantaged and

low-income communities may be helpful. Such a roadmap would promote solutions that improve and scale successful workforce, education, and training programs in the clean energy industry and effectively connect participants to clean energy jobs with competitive wages, job security, and career opportunities. Furthermore, recommendations should be actionable, increase job placement rates for disadvantaged and low-income community members, and build and promote job pipelines that create opportunities for higher paying and more sustainable jobs in the clean energy industry.

Glossary

The following definitions are provided to clarify the terms used in this study.

Affordable housing: Affordable housing can be market-rate housing with low enough rents to serve low-income customers, as well as subsidized and public housing.

Disadvantaged community: CalEPA has designated disadvantaged communities as those that scored at or above the 75th percentile using the *California Communities Environmental Health Screening Tool* (CalEnviroScreen) method for ranking communities that are afflicted by environmental and socioeconomic issues.

Energy burden: The share or percentage of annual household income used to pay annual energy bills. The formula for energy burden is as follows: (Annual Energy Bill)/(Annual Income) * 100 percent = Energy Burden. For example, if a household's gross annual energy bill is $1,000 and its gross annual income is $10,000, the energy burden is 10 percent. There is no widely accepted threshold for what constitutes a "high" energy burden. Some studies reviewed for this document indicated a range of 6 percent to 11 percent of a household's annual gross income, while others characterized a "high" energy burden as anything greater than the median energy burden of the city in which the household is located.

Energy efficiency: Generally, energy efficiency means using less energy to perform the same function. For example, appliances and machines are energy-efficient when they use less electricity, water, or gas to accomplish the same task (Energy Upgrade California®). The California Public Utilities Commission's (CPUC) *Energy Efficiency Policy Manual* (July 2013) defines energy efficiency as activities or programs that stimulate customers to reduce customer energy use by making investments in more efficient equipment or controls that reduce energy use while maintaining a comparable level of service as perceived by the customer.

Energy equity: The quality of being fair or just in the availability and distribution of energy programs. Pertaining to this study, energy equity means that low-income Californians benefit from the state's efforts to increase energy efficiency and renewable energy resources.

Environmental Justice: The NAACP (2013) defines environmental justice as "the pursuit of prioritizing the voices and the needs of and/or low-income communities that are routinely targeted to host facilities that have negative environmental and public health impacts."

Housing unit: A house, an apartment, a mobile home or trailer, a group of rooms, or a single room occupied as separate living quarters, or if vacant, intended for occupancy as separate living quarters. *Separate living quarters* are those in which the occupants live separately from any other individuals in the building and that have direct access from

outside the building or through a common hall. For vacant units, the criteria of separateness and direct access are applied to the intended occupants whenever possible. (U.S. Census, 2016)

Incentive: Financial instruments to encourage investment in energy efficiency improvements and renewable energy technologies. Incentives can lower upfront costs of technologies and complement other energy policies, mandates, standards, and codes. Incentives can be in the form of rebates, grants, loans, direct income tax deductions, tax exemptions, or reduced sales or use taxes.

Low-income household: A *low-income household* can be defined in several ways. It can be an absolute number based on federal poverty guidelines (for example, a low-income household is one that falls at or below 200 percent of the federal poverty guidelines, which in 2016 was $48,600 for a family of four) (Roberts et al. 2012-2013 and Families USA, 2016). It can be defined in comparison to the standard of living where the household is located; for example, low-income families are those whose incomes do not exceed 80 percent of the median family income for the area, very low-income families are those who do not exceed 50 percent (U.S. Department of Housing and Urban Development [HUD], 2016), and extremely low incomes are those that are 30 percent or less of area median income (CBPP, 2015).

Local small businesses: An independently owned and operated company that is limited in size and in revenue depending on the industry. California Government Code Section 14837 defines "small business" as "an independently owned and operated business that is not dominant in its field of operation, the principal office of which is located in California, the officers of which are domiciled in California, and which, together with affiliates, has 100 or fewer employees, and average annual gross receipts of ten million dollars ($10,000,000) or less over the previous three years, or is a manufacturer, as defined in subdivision (c), with 100 or fewer employees."

Multifamily housing: For this report, "multifamily" refers to buildings with five or more housing units. The multifamily market is composed of several housing types. Buildings are commonly characterized by size, whether they are owned or rented, and whether rents are market-rate or subsidized. The housing industry draws a distinction between small buildings with two to four units and larger buildings with five or more units. "Multifamily" is commonly defined in the mortgage markets as buildings of five or more units. This definition follows the categories contained in the U.S. Census' American Housing Survey and the U.S. Department of Energy's Residential Energy Consumption Survey, our nation's main sources of housing energy statistics." (McKibben, 2013). The U.S. Census defines multifamily units as "residential buildings that contain more than one housing unit with units built one on top of another and those built side-by-side which do not have a ground-to-roof wall and/or common facilities (attic, basement, heating plant, plumbing) (U.S. Census, 2016).

Net Metering (NEM): A tariff billing mechanism that allows participating customers receive a bill credit for excess generation (typically solar) that is exported to the electric grid during times when it is not serving onsite load. Under current NEM 2.0 rules, customers receive a credit equal to the same retail rate that the customer would have paid the utility for the electricity.

Non-energy benefits: Any positive consequences resulting from making energy efficiency improvements or installing renewable energy systems outside of saving or producing energy. Non-energy benefits include, but aren't limited to environmental benefits, such as the reduction of carbon emissions or other detrimental pollutants, economic benefits, increased comfort, reduced energy insecurity, or improved health.

Poverty level (also poverty threshold): Poverty thresholds are developed by the Census Bureau as a measure of income inequality. The U.S. Department of Health and Human Services (HHS) releases poverty guidelines as a simplified version of the thresholds for administrative purposes. Income eligibility for the federal Low Income Home Energy Assistance Program is set at 150 percent of the poverty guidelines, while "low-income" for California's Energy Savings Assistance Program is defined as at or below 200 percent of the federal poverty threshold. Here are the 2016 HHS poverty guidelines for the 48 contiguous states and the District of Columbia.

Table 1: HHS Poverty Guidelines for 2016 for the 48 Contiguous States and the District of Columbia

Persons in Family/Household	Poverty Guideline	Persons in Family/Household	Poverty Guideline
1	$11,880	5	$28,440
2	$16,020	6	$32,580
3	$20,160	7	$36,730
4	$24,300	8	$40,890
For families/households with more than 8 persons, add $4,160 for each additional person.			

Source: *Federal Register: Annual Update of the HHS Poverty Guidelines*, accessed August 16, 2017, https://www.federalregister.gov/articles/2016/01/25/2016-01450/annual-update-of-the-hhs-poverty-guidelines#t-1.

Renewable resources: In California, "renewable energy" is defined as a power source that does not derive power from the combustion of fossil fuels, nuclear energy, or operation of a hydropower facility greater than 30 megawatts (add citation). Renewable resources used to generate electricity that are eligible for the state's Renewables Portfolio Standard include biodiesel, biomass, biomethane, fuel cells that use a renewable fuel, geothermal, small hydroelectric, ocean energy (thermal, wave, and tidal), solar thermal electric, solar photovoltaic, wind, and (to a limited extent) municipal solid waste (Energy Commission, 2015).

Split incentive: A circumstance in which the flow of investments and benefits are not properly rationed among the parties to a transaction, impairing investment decisions. In the context of this study, a split incentive generally applies to a landlord and tenant and describes a situation in which the incentives and benefits for a low-income energy program are not received by the same party because the tenant (who is also responsible for paying the utility bill) rents the home from an owner responsible for investing in the property. In effect, the property owner fails to benefit from the energy retrofit, while the low-income resident fails to receive the financial incentive of the program.

Virtual Net Metering: A tariff arrangement that enables a multi-meter property owner to allocate a solar system's energy credits to other tenants.

Weatherization: The practice of protecting a building and the interior from the elements (particularly from sunlight, precipitation, and wind) and of modifying a building to reduce energy consumption and optimize energy efficiency.

List of Acronyms and Abbreviations

CARE – California Alternate Rates for Energy

CBO – community based organization

CBSM – community based social marketing

CDFI – Community Development Finance Institutions

CDGB – Community Development Block Grant

CPUC – California Public Utilities Commission

CSD – Community Services and Development

CSI – California Solar Initiative

DAC – disadvantaged community

EPA – Environmental Protection Agency

EPC – Energy Performance Contracting

ESA – Energy Savings Assistance Program

ESCO – energy service company

FERA – Family Electric Rate Assistance Program

FHA – Federal Housing Administration

GTSRP – Green Tariff Shared Renewables Program

HHS – Health and Human Services

HUD – Housing and Urban Development

HVAC – heating, ventilation, and air-conditioning

IOU – investor owned utility

ITC – Investment Tax Credit

LIHEAP – Low Income Home Energy Assistance Program

LIHTC – Low-Income Housing Tax Credit

LIWP – California Low-Income Weatherization Program

MASH – Multifamily Affordable Housing Program

MEER – Multifamily Energy Efficiency Rebate

MW – megawatt

NEB – non-energy benefit

NEM – net energy metering

NEM – Net Energy Metering Tariff

NMTC – New Market Tax Credit

NSHP – New Solar Homes Partnership

PACE – Property Assessed Clean Energy Financing

PAYS – Pay As You Save

PG&E – Pacific Gas and Electric Company

PPA – power purchase agreement

PV – photovoltaic

RIOPP – Ratepayer Integrated On-Bill Payment Program

SASH – Single-Family Affordable Housing Program

SB – Senate Bill

SCE – Southern California Edison Company

SDG&E – San Diego Gas and Electric Company

SEIA – Solar Energy Industries Association

SEP – supplemental environmental project

SoCal Gas – Southern California Gas Company

U.S. DOE – U.S. Department of Energy

WAP – Weatherization Assistance Program

Appendix A: Low-Income Market Characteristics

This appendix summarizes housing characteristics, energy profiles, and demographics of low-income and disadvantaged communities identified in the literature review.

Housing

According to a 2013 evaluation of California's Energy Savings Assistance Program, there are about 3.719 million low-income households in California (those whose incomes are at or below 200 percent of the Federal Poverty Guidelines), representing roughly 30 percent of all California households (West et al, 2013).

Characteristics of low- and moderate-income housing are different from the residential sector as a whole (Cluett et al, 2016). Low-income households typically pay proportionally more for energy than the average household. Energy Efficiency for All (2016) estimates the portion of income spent by low-income families on energy bills is 15 percent, compared to 2 percent for high-income families. A 2016 study of 48 of the largest U.S. cities found that in urban areas, the median energy burden for low-income households was 7.2 percent, more than twice the median burden across all cities in the study (3.5 percent) and three times higher than higher-income households (2.3 percent). Low-income households had the highest median energy burden, followed by African-American households (5.4 percent), low-income households living in multifamily buildings (5.0 percent), Latino households (4.1 percent), and renting households (4.0 percent). The study also found that more than one-third of the excess energy burden experienced by low-income households was caused by inefficient housing, and that bringing these homes up to the median efficiency level would lower the overall energy burden from 7.2 percent to 5.9 percent (Drehobl and Ross, 2016).

Energy costs for federally subsidized affordable housing are higher than for private homes by almost 40 percent, which "means that higher energy costs are passed down to property owners and low-income tenants." (Arnold, 2013b)

Regional Characteristics

California's low-income households live primarily in urban areas: 93 percent urban versus 7 percent rural (Evergreen Economics, 2013). Nationally, rural communities have a higher rate of poverty than other communities, with nearly 18 percent of rural families falling below the federal poverty guidelines compared to 14.5 percent in other areas of the country (USDA, 2014). In California, the San Joaquin Valley has the highest poverty rate at 19 percent, followed by Northern California at 16 percent. Regions with the lowest poverty rates are the San Francisco Bay Area at 9 percent and the Central Southern California region at 10 percent (HCD 2012).

Between 1980 and 2013, housing in California's coastal urban counties (with populations greater than 500,000) grew by only 34 percent, while over the same period rents paid by low-income households in these counties grew nearly three times faster than in the fastest growing urban counties. As a result, the typical low-income household in California's coastal urban counties spends about 54 percent of its income on housing compared to about 43 percent in fast-growing counties (Taylor, 2016).

Three of the five cities in the United States that have been identified as having the lowest median energy burdens are located in California: San Francisco (1.4 percent), San Jose (1.8 percent), and San Diego (2.3 percent) (Drehobl and Ross, 2016). This may be a reflection of California's aggressive energy efficiency efforts. Low-income households in California, however, like those in the rest of the nation, still have energy burdens higher than those of the average household. In Los Angeles, Riverside, San Diego, and Sacramento, the median energy burden for a low-income household was more than 1.5 times higher than for the median household and was more than double in San Francisco and San Jose (Table 6). The median energy burden for a low-income multifamily household was also significantly higher than each city's median household energy burden.

Table 6: Energy Burdens in California Cities

	Median Household	Median Low-Income Household	Median Low-Income Multifamily Household
Riverside	3.54	5.74	4.22
Sacramento	2.93	5.29	3.60
Los Angeles	2.75	4.60	3.48
San Diego	2.30	3.90	2.66
San Francisco	1.41	2.82	1.89
San Jose	1.78	3.82	2.28

Source: Data from Drehobl and Ross, 2016

While housing markets in California are rebounding after the Great Recession, the rebound is happening at different paces in different areas. For instance, coastal regions are almost fully recovered, but inland regions still struggle (HCD, 2014).

High Percentage of Renters

At the time of the 2010 Census, there were about 5.5 million renter households in California representing about 44 percent of all households in the state (HCD, 2012). McKibben (2013) stated that "up to half of all new households created between 2012 and 2022 are expected to be renters." The National Low Income Housing Coalition finds that one out of every four renter households in America is an extremely low-income household, and three out of four extremely low-income renters spend more than 50 percent of their income on housing costs, with little left over to meet other basic needs (Arnold et al, 2014).

According to California's Legislative Analyst, California has about 3.3 million low-income households that are renters, including 2.3 million very-low-income households. Around 1.7 million low-income renter households in California spend more than half of their income on housing, which represents about 14 percent of all California households compared to 8 percent in the rest of the country (Taylor, 2016). Low-income single-family households are relatively evenly divided between renters and owners, while the majority of multifamily households are renters (West et al, 2013). Only about a third of low-income homes are owned compared to more than half of all homes.

Table 7: Home Ownership by Population (2011)

	Percent of California Population	Percent of California Low-Income Population
Owned with mortgage or loan	41%	20%
Owned free and clear	14%	13%
Rented	44%	64%
Occupied without payment of rent	2%	3%

Source: Evergreen Economics, 2013b, Table 10.

Table 8: Regional Rental Rates in California (2012)

	Renters	Owners
Greater Los Angeles Area	46%	54%
San Francisco Bay Area	44%	56%
San Joaquin Valley	42%	58%
San Diego County	46%	54%
Central Coast	45%	55%
Northern California	38%	62%
Sacramento	39%	61%
Central Southern California	29%	77%

Source: Data from HCD 2012.

As rents rise and vacancy rates go down, low-income households are the most affected by a tight rental market. Eleven out of the 20 least affordable rental markets in the United States are in California: San Francisco, San Jose, Santa Ana, Oakland, Oxnard, Napa, Santa Barbara, Los Angeles, San Diego, and Santa Rosa (CHP, 2015).

In the multifamily building sector, rental apartment buildings that are owned by a single entity represent the largest segment of the sector, which also includes condominiums and cooperative apartment buildings. Recruiting a multifamily building into an energy efficiency program can be affected significantly by whether units are owned or rented (McKibben, 2013). In addition, there has been less focus on energy efficiency spending in

multifamily rental housing, and "on average, multifamily rental homes have fewer energy savings measures than any other type of housing" (Pivo, 2011).

Nationally, 15 percent of rental units have their electric utilities included in the cost of the rent, with 27 percent including water. Twenty-eight percent of units served by natural gas included the cost in their rents, compared to 73 percent of units served by fuel oil (McKibben 2013).

Affordable Housing

According to McKibben (2013), the three categories of rental buildings – market rate, subsidized, and public housing – have different motivations when it comes to energy efficiency. Market-rate housing represents the largest share of rental buildings. Subsidized housing includes nearly 5 million low-income households that participated in federal rental housing subsidy programs administered by the U.S. Department of Housing and Urban Development (HUD), and 2 million units that received subsidies through the Low-Income Housing Tax Credit program administered by the Internal Revenue Service. For public housing, there are around 1.2 million units in the United States, the majority of which were built before 1970.

In California, only about one-fourth (roughly 800,000) of low-income households live in subsidized affordable housing or receive housing vouchers, with another 700,000 households on waiting lists (Taylor, 2016). More than 492,000 low-income households in California receive federal rental assistance, with at least 73 percent having extremely low incomes (defined as 30 percent or less of area median income) (CBPP, 2015).

Single- and Multifamily Housing

The 2013 American Housing Survey states that multifamily housing (defined as having five or more units) accounts for 16 percent of all housing units nationally and nearly 19 million households (U.S. Census Bureau, 2013). A later study by the Natural Resources Defense Council stated that multifamily housing represents 26.1 percent of all housing and 17 million households and estimated that half of very low-income renters live in multifamily buildings (McCormick, 2015).

An evaluation of California's Energy Savings Assistance program identified the distribution of home types in California and for the state's low income population. A smaller percentage of low-income homes are single-family than in the total population, with a higher percentage of multifamily homes.

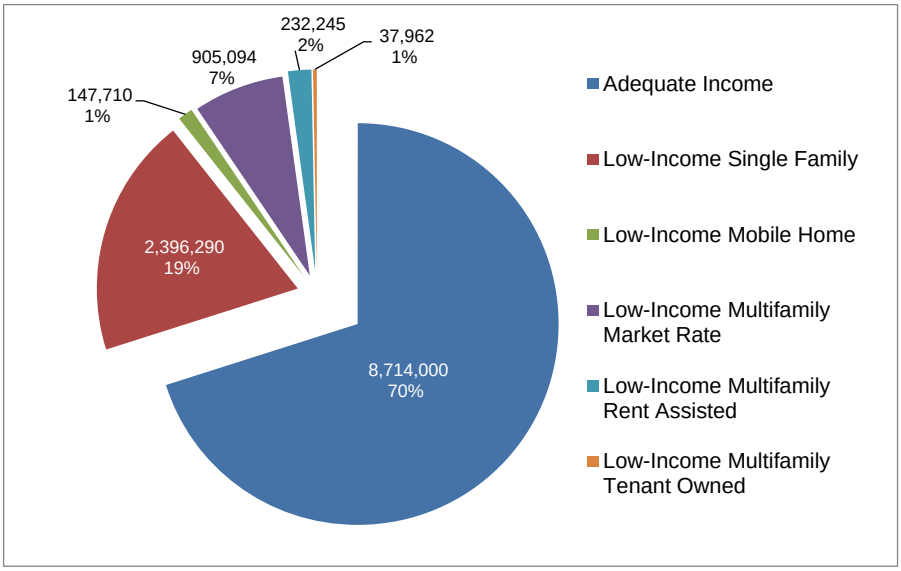
Table 9. Housing Type by Population (2011)

Housing Type	Percent of California Population	Percent of California Low-Income Population
Single-Family	66%	51%
Multifamily	31%	43%
Mobile Home	4%	6%

Source: Evergreen Economics, 2013b, Table 9.

Figures 1 and 2 show California low-income households by housing type (West et al, 2013). Of the 30 percent of households in California characterized as low-income, 19 percent of households are single-family, 10 percent are multifamily, and 1 percent are mobile homes.

Figure 1: Estimated Number of California Households, Including Low-Income Multifamily

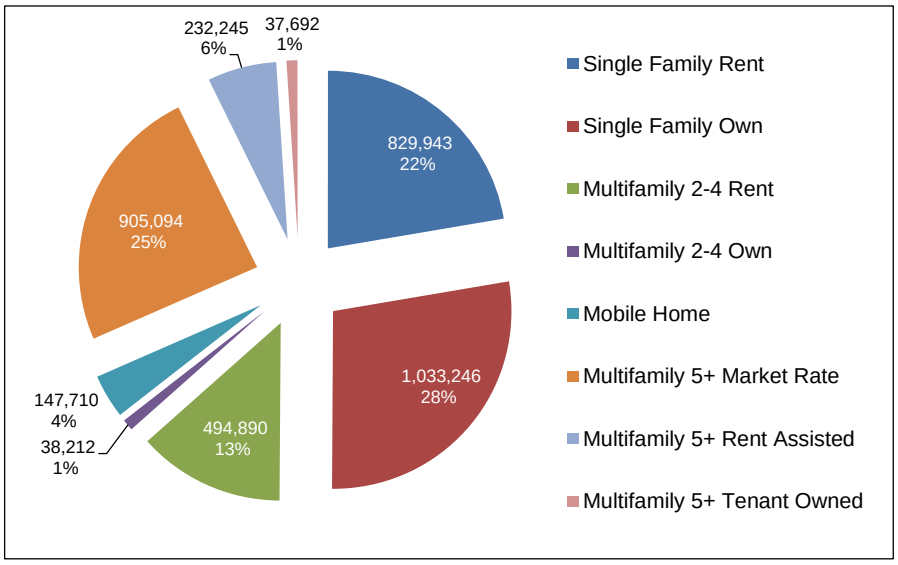


Source: West et al, 2013, Figure 3.

Building Age

Low-income families frequently live in older, less-efficient homes, meaning they require more energy for heating and cooling than newer and more efficient buildings (Drehobl and Ross, 2016). Henderson (2015) stated that "about two-thirds of multifamily buildings of five or more units were built since 1970" and noted that "older buildings are likely to have uninsulated walls, single-pane windows, extensive air filtration issues, and fewer efficiency features, all of which can lead to less energy efficiency." The median age of all rental buildings in the United States is 38 years, with 9.8 million rental apartments in multifamily buildings built before 1980 and an additional 4.3 million built between 1980 and 2000 (McKibben, 2013).

Figure 2: Estimated Number of Low-Income Households by Housing Type



Source: West et al, 2013, Figure 4

A 2013 study by Evergreen Economics found that in California, there is little difference between the average age of low-income homes (42 years) and the average age of all homes (40 years). However, there are differences among specific low-income household segments: an average of 42 years for single-family owned homes, 46 years for rented single-family homes, and 38 years for multifamily homes (Evergreen Economics, 2013b).

Fuel and Equipment Types

According to McKibben (2013), most units in multifamily buildings in the United States use electricity for heat (47 percent or 8.9 million units), while 38 percent (7.2 million units) heat with natural gas. Around 31 percent of units in multifamily buildings are heated with central, multiunit systems, and more than half of apartments have central air conditioning. This conclusion is consistent with Cluett et al (2016), which found that low-income households are more likely than all households to use electric space heating (37 percent versus 29 percent), with 4 percent of low-income owner-occupied households using portable electric heaters as the primary heating equipment compared to zero non-low-income households. Harak (2010) breaks down heating fuels in public housing by decade of construction and by census division, with electricity being the predominant heating fuel in most vintages of home construction.

In California, most heating equipment uses natural gas, and low-income homes are more likely to use wall or space heaters when compared to all California homes.

Table 10: Heating Equipment and Fuel Type by Population Segment (2011)

Equipment	Percent of California Population	Percent of California Low-Income Population
Electric portable heaters	2%	2%
Electric resistance/baseboard	2%	3%
Other electric	7%	6%
Natural gas hot air furnace	61%	47%
Natural gas space heaters/wall units	14%	27%
Other gas	8%	5%
Propane	4%	2%
Wood or coal	1%	4%
No heating equipment	2%	4%

Source: Evergreen Economics 2013b, Table 26.

Low-income households are also more likely to own older and less-efficient appliances: 33 percent of low-income households have refrigerators older than 10 years, compared to 26 percent of non-low-income households, and low-income households have fewer ENERGY STAR® refrigerators than the general population (Cluett et al, 2016). This echoes Harak (2010), which notes that 15 percent of public housing units in the United States have ENERGY STAR refrigerators, with the western United States having nearly double that amount at 29 percent. In assisted housing, 24 percent of units have ENERGY STAR refrigerators compared to 40 percent in the western region.

Table 11: Refrigerator Characteristics by Population Segment (2011)

	Percent of California Population	Percent of California Low-Income Population
Number of refrigerators		
One	70%	77%
Two or three	29%	22%
Age		
<6 years	24%	28%
6-10 years	37%	42%
11-15 years	24%	18%
16+ years	16%	13%
Average age	9.8%	8.8%

Source: Evergreen Economics 2013b, Table 31.

Nationally, low-income households are more likely to have electric water heaters (48 percent versus 38 percent for all households), which have higher costs and greater

energy expenditures. Furthermore, only 24 percent of low-income households have programmable thermostats compared to 47 percent of non-low-income households (Cluett et al, 2016).

Table 12: Water Heating Equipment Type and Age by Population Segment (2011)

	Percent of California Population	Percent of California Low-Income Population
Water Heating Fuel		
Electricity	6%	8%
Natural Gas	84%	81%
Propane	4%	3%
Solar	1%	1%
Unknown	5%	8%
Age of Equipment		
1-5 years	35%	33%
6-10 years	48%	45%
11-15 years	7%	9%
16-20 years	5%	8%
>20 years	4%	5%
Average age	7.8	8.2

Source: Evergreen Economics 2013b, Table 28.

In California, low-income homes "are less likely to have clothes washers, dryers, and dishwashers than the total population" (Evergreen Economics, 2013b).

Table 13: Home Appliance Types by Population Segment (2011)

	Percent of California Population	Percent of California Low-Income Population
Dishwasher	74%	50%
No Dishwasher	26%	50%
Clothes Washer	81%	68%
No Clothes Washer	19%	32%
Clothes Dryer	79%	66%
Electric	28%	24%
Gas	49%	40%
Propane	2%	2%
No Clothes Dryer	21%	35%

Source: Evergreen Economics 2013b, Table 32.

Energy Usage

Nationally, low-income households spend less on energy overall ($1,690 annually) than non-low-income households ($2,134) (U.S. EIA, 2013b). These numbers are lower in the

western United States. According to the U.S. Energy Information Administration, in the West Region (which encompasses 13 western states, including California), low-income households spent an average of $1,256 each year on energy bills, compared to $1,666 for the average non-low-income household (U.S. EIA, 2013b). Low-income homes are on average smaller than other homes – 1,480 square feet compared to 2,462 square feet for the average non-low-income home in the United States (Granade et al, 2009) and 1,311 square feet compared to 1,643 square feet in the average California home (Evergreen Economics, 2013b). This contributes to lower per-house consumption (Granade et al, 2009). Low-income households may also have fewer energy-consuming appliances and other devices (Cluett et al, 2016).

However, low-income households tend to spend more per square foot on utilities, an average of $1.23/square foot for low-income households compared to $0.98 for non-low-income households (nationally) and $0.99/square foot compared to $0.92/square foot (West Region). Higher spending per square foot could be related to higher energy use because of building condition, lack of resident control over central heating and cooling systems, common area usage, greater resident density, household and appliance efficiency, unit size, and metering arrangements. (Henderson, 2015; Drehobl and Ross, 2016). Also, the majority of multifamily rentals are low-income families, and renters tend to use more energy on average than owner-occupied homes because it is difficult for them to make energy efficiency investments (Drehobl and Ross, 2016). Henderson (2014) suggests that the total cost of housing for many affordable-housing occupants may be inflated by paying for the cost of wasted energy used in the building.

Moreover, low-income households spend a greater share of their income on energy bills. One study concludes that while an average household spends "5 percent of its income on energy bills, the average low-income household spends about 15 percent, and some households on fixed incomes spend as much as 35 percent" (Granade et al., 2009).

Demographics

Employment and Income

Nationally, the average hourly wage across all occupations is $23.23/hour, while in California it is $26.57 (BLS, 2015). For low-wage workers (those earning 150 percent or less than the federal minimum wage, or $7.73/hour), only 50 percent work full-time and year-round, compared to 70 percent of other workers. In addition, more low-wage employees work in small firms with fewer than 10 employees (Acs and Nichols, 2007).

Thirteen percent of California's population has incomes below the federal poverty level (FPL), with another 19 percent between 100 and 199 percent of the FPL (HCD, 2012). According to research by Evergreen Economics (2013b), the average household income for all California homes is $80,684, while the average income of homes that are at or below 200 percent of the federal poverty level is $20,621. The average income for low-income homes in 2011 was about the same as in 2004, while the average household

income for the state as a whole shows a marked increase from the 2004 level of $69,596.

Table 14: Average California Household Income by Housing Type and Language (2011)

Housing Type	Average Annual Income ($)
Single-family own	23,656
Single-family rent	23,257
Multifamily	17,860
Mobile homes	18,872
Language	
English only	16,883
Primary language Spanish	25,735
Primary language other	19,320
Linguistically isolated	19,904

Source: Evergreen Economics 2013b, Figure 10.

In California, 48 percent of children in low-income families have at least one parent who is employed year-round and full-time, compared to 87 percent of children in non-low-income families. Thirty two percent of children in low-income families have at least one parent who is employed either part of the year, or part time, compared to 11 percent of children in above-low-income families, with the remaining 20 percent not having an employed parent, compared to 2 percent in above low-income families (National Center for Children in Poverty [NCCP], 2016).

Table 15: Employment Status of Head of Household by Population Segment (2011)

	Percent of California Population	Percent of California Low-Income Population
Employed	63%	43%
Unemployed	6%	11%
Not in labor force (includes retired population)	30%	46%

Source: Evergreen Economics 2013b, Table 19.

Table 16: Employment Status of Head of Household by Housing Type and Language (2011)

	Employed	Unemployed	Not in Labor Force (Including Retired Population)
Housing Type			
Single-family own	37%	9%	54%
Single-family rent	50%	13%	37%
Multifamily	45%	12%	33%
Mobile homes	33%	10%	57%
Language			
English only	58%	11%	31%
Primarily Spanish	44%	14%	43%
Primarily other	38%	9%	53%
Linguistically isolated	46%	8%	46%

Source: Evergreen Economics 2013b, Figure 11.

Language(s) Spoken

California has a rich and diverse population with more than 260 languages spoken. According to the U.S. Census Bureau, in 2009-2013 43.7 percent of California's residents spoke a language other than English at home. These languages are generally grouped into the following categories: 28 percent Spanish and Spanish Creole; 4.4 percent Other Indo-European languages; 9.6 percent Asian and Pacific Island languages; and 0.9 percent Other.

An analysis by Research Into Action found that "first-generation immigrants are more prevalent in Asian American communities in California than in Hispanic American communities, with a majority (58 percent) of Asian Americans in the state born outside the U.S. relative to just over one-third (37 percent) of Hispanic Americans. Large majorities of both Asian Americans (66 percent) and Hispanic Americans (68 percent) speak a language other than English in their homes. Notably, about half of both Asian and Hispanic Americans report they speak English 'well' or 'very well' (52 percent and 50 percent respectively)." (CSE, 2016).

Fifty-four percent of low-income households in California speak a language other than English, compared to 42 percent of the general population (Evergreen Economics, 2013b). The primary language spoken by non-English-only low-income households is Spanish (38 percent of all low-income households), with 9 percent of households speaking Asian and 7 percent "other."

Table 17: Language Spoken in Household by Housing Type (2011)

	English Only	Spanish	Asian	Other
Housing Type				
Single-family own	51%	34%	9%	6%
Single-family rent	42%	46%	8%	4%
Multifamily	43%	38%	11%	9%
Mobile homes	59%	35%	3%	3%

Source: Evergreen Economics 2013b, Figure 4.

Low-income residents with limited English proficiency can face many barriers, including difficulty finding adequate or affordable housing. Research also indicates that these individuals may be more willing to accept sub-standard housing conditions in the private rental market and less likely to complain about housing conditions (HCD, 2012). Linguistically isolated households – defined by the U.S. Census Bureau as those in which no one older than 14 years of age speaks English well – can be limited in their ability to communicate, which can interfere with accessing employment, transportation, medical and social services; voting; and schooling (Siegel et al, 2001). An estimated 20 percent of low-income households are linguistically isolated, compared to 10 percent of the general population (Evergreen Economics, 2013).

Table 18 provides a regional breakdown of all linguistically isolated households in California. Of these households, 63 percent spoke only Spanish; 26 percent spoke only an Asian or Pacific Islander language; and 9 percent spoke only an Indo-European language. About 30 percent of all households that speak an Asian or Pacific Islander language at home and 27 percent of all households that speak Spanish are linguistically isolated.

Table 18: California Households by Language Spoken at Home

	Total Households	Households by Language Spoken				
		English	Spanish	Other Indo-European	Asian and Pacific Island	Other
Greater Los Angeles Area	46.7%	52.7%	31.0%	5.6%	9.5%	1.1%
San Francisco Bay Area	20.7%	61.4%	14.6%	7.7%	15.2%	1.1%
Sacramento	6.7%	74.0%	12.3%	6.1%	7.0%	0.7%
San Joaquin Valley	9.5%	59.4%	31.6%	3.7%	4.5%	0.8%
San Diego County/MSA	8.6%	65.3%	21.5%	4.4%	7.7%	1.1%

Central Coast	3.8%	67.8%	24.0%	4.2%	3.6%	0.5%
Northern California	3.3%	86.5%	8.9%	2.7%	1.5%	0.4%
Central Southern California	0.6%	90.6%	5.8%	2.3%	0.7%	0.5%

Source: HCD 2012, Table 2-17.

Evergreen Economics found that the number of linguistically isolated households in California's low-income population is double that of the general population (20 percent versus 10 percent).

Table 19: Linguistic Isolation by Housing Type and Language (2011)

	Percent of California Low-Income Population
Housing Type	
Single-family own	13%
Single-family rent	19%
Multifamily	25%
Mobile homes	17%
Language	
Primarily Spanish	34%
Primarily other	44%

Source: Evergreen Economics 2013b, Figure 5.

Race/Ethnicity

Sixty-four percent of low-income heads of household in California identify themselves as nonwhite, compared to 49 percent of the general population (Evergreen Economics, 2013). The 64 percent consists of 42 percent Hispanic, 10 percent Asian, 9 percent African American, and 3 percent Other.

Table 20: Race/Ethnicity of Householder by Housing Type and Language (2011)

	White (non-Hispanic)	African American	Asian American	Hispanic American	Other
Housing Type					
Single-family own	45%	5%	1%	37%	3%
Single-family rent	28%	9%	9%	52%	3%
Multifamily	31%	12%	12%	42%	3%
Mobile homes	54%	2%	3%	39%	2%
Language					
English only	64%	17%	2%	13%	3%
Primarily Spanish	4%	<1%	<1%	95%	<1%
Primarily other	33%	3%	58%	<1%	6%
Linguistically	10%	1%	24%	64%	1%

isolated					

Source: Evergreen Economics 2013b, Figure 6.

A literature review by the Center for Sustainable Energy (CSE) examined housing, energy use, decision-making, and messaging among key ethnic groups in California. The review focused on three groups within California – Hispanics, Asian Americans, and African Americans. The review acknowledges that these broad categories do not accurately represent the actual diversity of countries and cultures. Furthermore, it doesn't represent the extent to which individuals continue to identify with their native culture as opposed to being fully assimilated into the majority culture, which can influence the type of outreach and messaging needed.

CSE's review states that after White (non-Hispanic), Hispanic Americans make up the largest portion of California's population at 38 percent followed by Asian Americans (15 percent) and African Americans (7 percent). On average, Asian Americans have the highest incomes among the three groups. Hispanic Americans have slightly higher average incomes than African-Americans but are closer to the poverty level, which may be due to larger family size. Asian-Americans are most likely to own their homes, with the literature suggesting that "mortgage lending requirements of large down payments and high credit scores have limited the ability of African Americans and Hispanic Americans to buy homes." African Americans are more likely to live in multifamily buildings, while Hispanic Americans are more likely to live in manufactured homes. In terms of structural features, "both African and Hispanic Americans in California are more likely to live in homes that have sub-par structural features (such as lack of toilets, plumbing, or electrical fittings, water leaks, or lack of heating), as non-Hispanic whites." The primary home heating fuel types among the three groups are consistent with statewide averages, but Hispanic Americans are more likely to live without a primary heating system. Hispanic-American households use the least energy among the three groups, while Hispanic-American and Asian-American households both use less energy than the typical California household. African-American households use less delivered fuels than the average household but are otherwise consistent with statewide averages for energy use (Center for Sustainable Energy, 2016).

Education

Only 14 percent of heads of low-income households have a bachelor's degree or higher, compared to one-third of the general population (Evergreen Economics, 2013b).

The CSA literature review found that among the three groups examined in that review, Asian Americans are more likely to have postsecondary degrees than both Hispanic Americans and African Americans, as well as the California population in general. Hispanic Americans are more likely than the general population to have less than a high school diploma, but this could be a reflection of the relative youth of the Hispanic population.

Table 21: Education of Head of Household by Population Segment (2011)

	Percent of California Population	Percent of California Low-Income Population
Bachelor's degree or higher	34%	14%
Some college	32%	31%
High school graduate	18%	24%
Less than high school graduate	15%	31%

Source: Evergreen Economics 2013b, Table 20.

Table 22: Education of Head of Household by Housing Type and Language (2011)

	Bachelor's degree or more	Some college	High school graduate	Less than high school graduate
Housing Type				
Single-family own	18%	23%	32%	27%
Single-family rent	9%	25%	30%	36%
Multifamily	15%	25%	28%	32%
Mobile homes	6%	24%	35%	35%
Language				
English only	17%	43%	27%	14%
Primarily Spanish	5%	18%	22%	55%
Primarily other	28%	28%	20%	24%
Linguistically isolated	10%	12%	20%	58%

Source: Evergreen Economics 2013b, Figure 12.

The Elderly and Persons With Disabilities

In the 2010 Census, 13 percent of Californians 5 years or older reported having a disability, defined as a long-lasting physical, mental, or emotional condition that makes it difficult for a person to do activities such as walking, climbing stairs, dressing, bathing, learning, or remembering. The condition can also affect the ability to go outside the home alone or work at a job or business (HCD, 2012). The most prevalent disabilities identified in California were physical limitations (41 percent), followed by mental (26 percent), sensory (19 percent), and self-care (14 percent). Areas of the state with the highest proportion of disabled persons were the San Joaquin Valley at 16 percent and Sacramento with 15 percent. Both the Greater Los Angeles Area and San Diego County had the lowest proportion of disabled persons at 12 percent.

More low-income homes have disabled members, while the proportion of elderly household members in low-income homes is similar to the general population.

Table 23: Elderly or Disabled Household Member by Population Segment (2011)

	Percent of California Population	Percent of California Low-Income Population
Elderly household member	25%	26%
Disabled household member	22%	31%

Source: Evergreen Economics 2013b, Table 20.

Table 24: Elderly or Disabled Household Member by Housing Type and Language (2011)

	Elderly	Disabled
Housing Type		
Single-family own	43%	34%
Single-family rent	13%	28%
Multifamily	20%	30%
Mobile homes	22%	41%
Language		
English only	31%	37%
Primarily Spanish	16%	25%
Primarily other	37%	31%
Linguistically isolated	30%	28%

Source: Evergreen Economics 2013b, Figure 9.

Health Status Indicators

The California Environmental Protection Agency (CalEPA) identifies disadvantaged communities as those that score at or above the 75th percentile using the *California Communities Environmental Health Screening Tool* (CalEnviroScreen) method for ranking communities burdened by environmental and socioeconomic issues (CalEPA 2014). Indicators that affect the CalEnviroScreen score are grouped by pollution burden and population characteristics (Office of Environmental Health Hazard Assessment [OEHHA], 2014). The overall CalEnviroScreen score is calculated by multiplying the scores from the Pollution Burden and Population Characteristics groups of indicators, which each has a maximum score of 10. The highest possible CalEnviroScreen Score is 100; the higher the score, the higher the pollution burden and the population sensitivity. Geographic areas are placed in order from highest score to lowest and a percentile for the overall score is calculated from those values. Locations with the highest scores include the areas of Los Angeles, Sacramento, San Francisco, and San Diego; the San Joaquin Valley, and the Coachella and Imperial regions (OEHHA, 2014).

Table 25: CalEnviroScreen Indicators

Pollution Burden: Exposure and Environmental Effect Indicators	Population Characteristics: Sensitive Population and Socioeconomic Factor Indicators
• Air Quality: ozone and PM2.5 • Diesel particulate matter • Drinking water contaminants • Pesticide use • Toxic releases from facilities • Traffic density • Cleanup sites • Groundwater threats • Hazardous waste generators and facilities • Impaired water bodies • Solid waste sites and facilities	• Age: Children and elderly • Asthma • Low-birth-weight infants • Educational attainment • Linguistic isolation • Poverty • Unemployment

Source: OEHHA, 2014

Analysis of the CalEnviroScreen scores for Californians of different races and ethnicities shows that, while all racial and ethnic groups are represented in communities with both the highest and lowest scores, 19.2 percent of the Hispanic/Latino population and 13.6 percent of the African-American population live in one of the 10 most impacted areas, compared to fewer than 3 percent of the white population (OEHHA, 2014b).

Another tool to identify health disadvantaged communities is the *California Health Disadvantage Index* developed in 2016 for the Public Health Alliance of Southern California to summarize cumulative health disadvantage at the census tract level (Bhatia and Maizlish, 2016). Race and ethnicity are not explicitly incorporated in the HDI, although Bhatia and Maizlish acknowledge that racial and ethnic characteristics are "important social determinants of health." Despite this and other limitations, the authors state that "there is broad consensus in the public health community that there is sufficient information to make causal links and take action."

HDI integrates 27 economic, social, and environmental indicators in California to help target and prioritize public and private investments to economically, socially, and health disadvantaged communities. The indicators are assigned to "domains," which are assigned different weights.

Table 26: California Health Disadvantage Index Indicators

Economic, Social, and Environmental Indicators	

• Educational Opportunity
  o Residents eligible for, but not enrolled in, preschool and high school
• Environmental Hazards
  o Pedestrian Injuries
	• Economic Resources
	  o Poverty
	  o Crowding
	  o High Housing Cost
	  o Unemployment Rate
	  o No Auto Access

o PM 2.5 Concentration o Traffic Density • Health Outcomes o Population with a Disability o Asthma ER Visits o Low Birth Weight o Years of Life Lost • Complete Neighborhoods o Park Access o Supermarket Access o Retail Density o Transit Service	o Median Income o Uninsured o No Kitchen • Social Resources o High School Educational Attainment o Linguistic Isolation o Renter Occupied o Voting o Single Parent Households o

Source: Bhatia and Maizlish, 2016

Table 27: Domain Mean Disadvantage Scores by California Region (2010)

Region	Education	Environ-ment	Health	Neighbor-hood	Economic	Social
Bay Area	0.22	0.28	0.22	0.19	0.33	0.21
Inland Valley	0.43	0.49	0.35	0.55	0.50	0.37
Los Angeles	0.47	0.31	0.52	0.25	0.29	0.61
Other	0.29	0.32	0.09	0.45	0.41	0.22
Sacramento Area	0.26	0.32	0.16	0.28	0.51	0.21
San Diego	0.29	0.33	0.30	0.31	0.27	0.29
San Joaquin Valley	0.49	0.47	0.46	0.43	0.66	0.52
0 = least disadvantaged; 1 = most disadvantaged						

Source: Bhatia and Maizlish, 2016, Table 6

Appendix B: Community Meetings and Public Workshops

Public Engagement Summary

Broad-based public engagement is essential to understanding the barriers to accessing renewables and energy efficiency and weatherization investments for low income customers as well as the barriers to small business contracting opportunities in disadvantaged communities. This study's primary objective for public engagement was to gather input from low income customers, including those in disadvantaged communities, from Northern California, the Central Valley, Southern California, and the Imperial Valley as well as those in rural, urban, and tribal communities. The public engagement strategy also focused on including input from community organizations, energy program administrators, industry representatives, and relevant state agencies. This broad-based level of engagement provided a comprehensive approach in understanding barriers and identifying solutions and opportunities.

Multi-Layered Approach

A combination of many different types of events and efforts were executed to facilitate public engagement including:

- Public Workshops
- Community Stakeholder Meetings
- Community Stakeholder Workshops and Roundtable Discussions
- EJAC Community Meeting
- Barriers Study website
- Media press release and articles

Community Stakeholder Meetings

The Energy Commission held a series of seven community meetings to engage directly with community members of low income and disadvantaged communities and better understand the barriers and opportunities for access to renewable energy, energy efficiency, and weatherization perceived at the community level. For these meetings the Energy Commission sought a broad range of communities throughout the state, reflective of California's diversity. As a result, meetings were held in Northern California, the Central Valley, Southern California, and the Imperial Valley, as well as rural, urban, and tribal communities.

The information gathered at these meetings was compared to the results of staff's literature review as well as comments received at the technical workshop and then used to support or augment the proposed solutions and recommendations included in this report. While individual communities and members raised unique issues, there were a number of themes that intersected many, if not all, of the discussions.

Major themes identified

Greater Need for Community Education and Outreach

Members across all seven community meetings expressed a need for better education and outreach. Several participants noted that they and others in their communities have a strong interest in being knowledgeable about renewable energy and energy efficiency programs and opportunities, however; they reported that they often receive conflicting and/or inconsistent information from both utilities and technology providers. For example, several participants across most of the community meetings have expressed that they had an initial belief that their electricity bills would drop to near zero cost if they installed solar, only to have heard of cases where, not only was this not true but that some participants' electricity bills had increased. This has resulted in a hesitation to enroll in offered programs and in some cases a general distrust of these companies. To help address this, residents recommended a need for improved customer service and suggested developing partnerships to channel information from trusted sources such as community organizations. Several residents also noted that a lot of the community information they and their neighbors receive come from churches or their children schools.

Upfront Costs are Prohibitive

Unsurprisingly, a number of residents identified that the upfront costs of implementing energy efficiency technologies or procuring renewable energy such as solar was a significant barrier. They stated that they as well as many of their friends and neighbors qualify as low-income and that these technologies are simply not within budget. Suggested recommendations to address this included additional financial assistance opportunities, particularly in there is going to be a requirement or even strong "nudging" to adopt these technologies, as well as a requirement to include solar on new

development within disadvantaged communities. However, a number of residents across all community meetings stated that rooftop solar may not be the best renewable in all cases. For instance, a few expressed familiarity with solutions such as community solar as a way to deliver decentralized energy, as well as with mobile solar and thin-film solar for the weak-rooftop and high-cost issues. Also, participants at the community meeting in Ukiah expressed the limitations of solar technology in the woods, where many of their local reservations reside (i.e., they are surrounded by very tall trees that block direct sunlight during most of the day).

Need to Improve Program Awareness, Eligibility, and Requirements

To kick-off the community meetings attendees were asked what energy efficiency programs they are aware of and whether or not they participate in them. While a handful of participants at each meeting indicated they participate in a variety of different programs, community members generally felt strong that efforts needed to be made to increase the awareness of programs and that often program eligibility and requirements can be confusing. For example, a common misunderstanding identified was that if you participate in one program, you would then be ineligible to participate in others. Also, a number of participants noted that they live in apartments and mobile homes which made them ineligible to participate in some of the programs offered in their areas. Suggestions included setting up a central website through which all educational, program, and financial assistance information could be shared; simplifying program requirements and application processes; broadening eligibility to accommodate varying types of housing; and considering multi-year average income, not just the last month's or year's.

Shared Understanding of Benefits

When asked what the benefits of efficiency and weatherization programs to the household and community all groups identified economic, health, and environmental, albeit not always ranked in the same order. A few participants who expressed greater understanding of these issues, however, view all three benefits as equally important because they are intertwined: what pollutes the environment can eventually erode their health, which in turn can hurt their finances.

List of Workshops, Community Meetings, and Roundtable Discussions

- *June 3, 2016, Sacramento*—The California Energy Commission held a workshop to seek public input on the proposed scope and schedule of the Senate Bill 350 (SB350) study on barriers to access for low-income customers disadvantaged communities to renewables, energy efficiency and weatherization investments. The workshop was attended by 57 participants representing governmental agencies, local governments, private industry, state government, independently owned utilities, as well as environmental advocacy, funding, and community

organizations. Energy Commission staff provided a brief overview of the proposed scope of the SB 350 Barriers Report, the proposed plan for workshops and release of the draft report for stakeholder comment. There was also a panel discussion on effective stakeholder participation and agency coordination with representatives from the California Community Services Department, the Greenlining Institute, Asian Pacific Environmental Network, Center for Sustainability and the California Air Resources Board.

- *June 20, 2016, Berkeley*—The Center for Sustainable Energy and the Greenlining Institute co-hosted a roundtable discussion with energy experts from a wide array of organizations. The discussion focused on potential solutions for overcoming barriers to adoption of energy efficiency and renewable energy among low-income consumers and disadvantaged communities. To better understand these barriers and the barriers to distributed resources, energy experts participated in several small group discussions to identify challenges and solutions. To assist the Energy Commission with its Barriers Study, the workshop offered the following recommendations for each topic area listed below:
- *August 3, 2016, East Los Angeles*—Communities for a Better Environment hosted a community stakeholder meeting with low-income community members to discuss barriers and solutions to renewable energy and energy efficiency. This meeting was conducted completely in Spanish with English translation available. The meeting was attended by 23 residents. Community members stated they live in their own homes as well as in rented homes.
- *August 5, 2016, Fresno*—The Leadership Counsel hosted a community stakeholder meeting with low-income community members to discuss barriers and solutions to renewable energy and energy efficiency. This meeting was conducted in English with Spanish translation available. The meeting was attended by 34 participants. Community members stated they live in their own homes (including mobile homes) as well as in rented homes.
- *August 12, 2016, Sacramento*—Public workshop hosted by the Energy Commission with guest speakers from government agencies, environmental justice groups, utilities, and industry partners
- *August 18, 2016, Riverside/San Bernardino*—The Center for Community Action and Environmental Justice (CCAEJ) hosted a community stakeholder meeting with low-income community members to discuss barriers and solutions to renewable energy and energy efficiency. This meeting was conducted in English with Spanish translation available. The meeting was attended by 10 residents. Community members stated they live in their own homes (including trailer homes) as well as in rented homes.
- *August 19, 2016, Oakland*—The Asian Pacific Environmental Network (APEN) hosted a community stakeholder meeting with low-income community members

to discuss barriers and solutions to renewable energy and energy efficiency. This meeting was conducted in English with translation available in three different Asian languages (Mandarin, Laotian, and Mien). The meeting was attended by 11 residents. Community members stated they live in their own homes as well as in rented homes.

- *August 22, 2016, Truckee/South Lake Tahoe/Sierra Mountain Region*—The Sierra Business Council and Sierra CAMP hosted a community stakeholder meeting with community members to discuss barriers and solutions to renewable energy and energy efficiency. This meeting was attended by 19 participants (including one who joined via WebEx) and was conducted in English. The majority of community members stated they were homeowners living in a single family home and a few noted that they were renters living in multifamily housing that included apartment buildings and shared single family homes.
- *August 24, 2016, Ukiah*—The Northern Circle Indian Housing Authority hosted a community stakeholder meeting with representatives of a few local tribal nations and representatives of a number of local community-based organizations to discuss barriers and solutions to renewable energy and energy efficiency. That is, unlike previous community meetings, this community meeting was not attended by independent residents. There were 19 participants. In addition to these local representatives and Energy Commission staff, staff from the Air Resources Board, the California Coalition for Rural Housing, the Department of Housing & Community Development, and the Strategic Growth Council attended. This meeting was conducted in English. Community representatives stated that members of their communities live in their own homes, as well as in rented homes, including trailer homes
- *August 31, 2016, Los Angeles*—The Strategic Concepts in Organizing and Policy and Education (SCOPE) and RePower LA hosted a community stakeholder meeting with low-income community members, as well as representatives of a few local community-based organizations to discuss barriers and solutions to renewable energy and energy efficiency. This meeting was conducted in English with Spanish translation. This meeting was attended by 42 participants. Community members stated they live in their own homes, as well as in rented homes.
- *September 13, 2016, Sacramento*—

Summary of Responses and Comments from Community Meetings

1. Do you currently participate in an energy efficiency or weatherization program to help you save on your yearly energy cost? If yes, which programs? If not, do you know about any programs in your area?

Community	Response
East Los Angeles	• CARE, ESAP, VELA, Maravilla Foundation programs, VELAS Handy Worker Program, EAF. • A few comments reflected that there is no consistency on the approach by these programs. Some folks feel threatened, scared, or confused by receiving what seems to be mixed information about what is offered, what is going to cost them upfront versus in the long run, and then they (over)hear neighbors or acquaintances talk about their bad experiences with utilities or even scammers.
Fresno	• CARE, PG&E Weatherization, LIHEAP, Proteus, Salvation Army, Catholic Charities.
Riverside/San Bernardino	• Only CARE was mentioned. • A woman, who seemed to be the head of her household, said that she only pays $30 now thanks to CARE; she used to pay $50—but she does not have A/C, so maybe that is why it is low. • Another individual said that most of San Bernardino residents are low-income, so they cannot afford to have or use A/C. • One individual said that she shares an apartment with a friend. When they asked their utility for help to get an A/C unit, they were told that assistance was only available for people who already had A/C.
Oakland	• Most people were not aware of specific programs or how to apply. • For those who have, PG&E (lighting replacement program; microwave; water saving efficiency) and CARE. • One individual mentioned that “we cannot apply, even if we qualify, because all utilities are on the owner's name.”
Truckee/South	• Energy Savings Assistance Program, the Residential Energy

Lake Tahoe/Sierra Mountain Region	Audit Program, the CARE program, LYHEAP (a county program) and PACE (a third party funding operation). • These programs were meant to address the weatherization issues faced in the community based on homes with old construction, little to no weatherization measures, and an increase in population.
Ukiah	• LIHEAP (but very few qualify, because it is meant to be for very low-income families), only 4~5 out of 37 families are eligible for low income funding opportunity for weatherization. Even seniors who are working are not eligible.
Los Angeles	• More than half of the participants said that they do not participate. • Those who participate, do so in Energy Upgrade CA and LADWP programs (HEIP, as well as rebate and tune-up programs). • Those who do not participate cite as reasons not to: they rent; they live in a multi-unit building; they do not like the features of energy-efficient or water-saving appliances (e.g., light is not the same, little water); or they do not qualify (e.g., they do not meet the minimum energy spend limit, or they do not have the right paperwork); some residents say that they often throw away the flyers that come with the bill, so they do not even get to learn about what programs may be available).

2. What are the benefits of efficiency and weatherization programs to your household (e.g. health, economic, and environmental benefits)? How would you rank the benefits?

Community	**Response**
East Los Angeles	• For most attendees: health, environment, household economy. • One individual said the environment must come first, as it influences people's health.
Fresno	• For most attendees: health, economic, environmental.
Riverside/San Bernardino	• For most attendees: health, economic, environmental.
Oakland	• For most attendees: health, economic, environmental. • For others, saving money is most important.
Truckee/South Lake	• Community members identified financial savings, comfort,

Tahoe/Sierra Mountain Region	climate change.
Ukiah	N/A
Los Angeles	• For most attendees: health, economic, environmental. • Some added "comfort" at the end. • A few individuals stated that "it's a false perception that they're separate," meaning that, what may harm the environment can harm their health as well, which in turn can hurt them financially. • One resident raised the issue that low-income people of color are often more affected in those three areas (health, economy, their nearby environment).

3. Do you know anyone who has solar panels on their homes? If so, who?

Community	**Response**
East Los Angeles	• Five individuals said they had seen solar panels, but not in their neighborhood. • One individual suggested we could not find a single solar panel in their community.
Fresno	• N/A
Riverside/San Bernardino	• No one has seen one in their neighborhood. They figure that many of their homes are old, so their roofs will not support the panels; plus, many of the residents are renters, so they will not qualify. • Also, one resident expressed that it may be inefficient to install solar in low-income communities: given that their energy intake is so low and that sunlight is so abundant in the area, he wonders whether the excess energy generated by solar will go to waste. • Folks want to be better educated about the benefits, as solar is seen by some only as a luxury right now. • "What's the benefit for us? Is it that we will have a zero bill? • Another participant expressed the need to take into account the cost of maintaining new technology—she cites the numerous, expensive repairs she has had to have done on her

	hybrid car. • Only 6 people expressed an interest in having solar, even if it were affordable. One explained that her reason for not being interested is that she was told once by (a utility?) that her bill would go up with solar. • Upon a follow-up question, "Is there solar around?" one participant said that some schools in neighboring communities have installed solar, but not San Bernardino schools themselves. And he sees this as an impossible feat: "It's been a battle with the school district just to get new air filters, so we could not even dream of having solar."
Oakland	• Only three people stated knowing someone who has solar. • Many people in the community share houses with other families, so they cannot afford to install solar; even those who own a home are low-income (several relatives live together).
Truckee/South Lake Tahoe/Sierra Mountain Region	• N/A
Ukiah	• Solar in this community is not considered to be very effective; many homes are surrounded by very tall (80~125 ft) trees. A number of families have applied for weatherization programs without much success. • The community has been working with Grid Alternatives: 34 solar installations so far, although mainly for residential, single-family housing – it used to be free, but it seems that now it is $4k per install
Los Angeles	• Several individuals said they have seen solar panels in their neighborhood and elsewhere. For instance, on their kids' school, at a building where they previously lived, on their way to Las Vegas (i.e., solar power plants). Some people think that having solar panels is "cool," but that it is also a status symbol. • Folks talked about mixed trust about the costs and the benefits – one resident knows a colleague who got solar panels a while ago, it seems to have cost a lot, and then the bill seemed to be higher than before. • Other residents talked about their rooftops not being capable of supporting solar panels.

4. Are there any recommendations you can suggest to increase accessibility and participation in renewables, energy efficiency or weatherization programs?

Community	Response

East Los Angeles	• If they are going to be "required" to go solar, they would like more financial assistance.
	  o They reminded us that many of their rooftops would need fixing first before solar can be installed.
	• The Commission/the government should monitor those who sell/install solar, as well as ensure clear information is disseminated about what is being offered and under what conditions.
	  o Better still, to channel all information through their Community Based-Organization (CBO), which they trust—representatives from the CBO suggested they would like to get trained by the government or the manufacturers, so they could train the local workforce in turn
	  o Quality of installation is also important. One person said, "many people are afraid of installing solar, because some folks complain that the roof leaks, even though the company says they seal them well."
	• "Why not broad installation?"
	  o [NOTE: This could be read as, "why does the government not cover the cost of widespread installation," but it could also be read as, "why not community solar?"]
	• Quality of customer service at utilities and other companies providing these programs needs to improve as well. Because folks do not want to get ripped off, they ask a lot of questions, but service representatives seem unable or unwilling to provide detailed information.
	  o They say that the city itself does not "come to tell us what's going on," so they would like better communication from their local government as well.
	• A few individuals appreciated the Commission reaching out and coming out to listen to them, to see how they live.

	○ One individual asked that the government focus on the specific type of help their towns need: Bell, Bell Gardens, Cudahy, Huntington Park, Maywood, South Gate, Walnut Park. • They also asked the Commission to come back every so often an update them on progress, as well on any new help the State can provide. • "How about 'mobile solar,'" one participant said. He shared that utilities do not want to install solar on old rooftops and be responsible for roof damages. • New low-income buildings should have solar.
Fresno	• More information, education and outreach are needed, and in several languages. ○ Including that, if people are already benefiting from one or more programs, that does not disqualify them from other programs. ○ The state should launch a massive public awareness campaign. • Simplify requirements for all programs—and avoid asking for SSN (use ITIN if needed). ○ And need-based qualification should not look at the landlord's income. • Ensure benefits are created for both, landlords and tenants. • Quality of customer service (CS) at utilities and other companies providing these programs needs to improve as well. They need to have better information and attitude. ○ Flexible hours for CS representatives, to accommodate various customers' working shifts. • Do not reduce current programs. ○ Some folks seem to have heard that PG&E will reduce its funding for its low-income program, because the upcoming Time-of-Use rates will not provide enough funds. ○ What formal, legal recourse does the community have to force IOU's to provide the programs?

	• More options for people who live in mobile homes.
	• Build trust with the community. Work through the Community Based-Organization.
	  o They are afraid of scammers
	  o Work with churches and schools as well to help educate the community—people already attend these meetings, so why not take advantage of that?
	• No/low-cost financing: pay for it with the program savings
	  o Also, make sure that renter's insurance costs do not increase—with solar installed, some insurance companies want a higher premium/collateral.
	• Perform a state-wide assessment of low-income families (both, those currently participating in Energy Efficiency/Renewable Energy programs and those that are not), in order to understand their needs better and thus determine optimal deployment
	  o That is, not one home/one community at a time; determine proper conditions for rooftop vs community vs central solar

Riverside/San Bernardino	• Better information is required, and from a trusted source:
	  o "That's why we're discouraged, because we hear all kinds of information—we have old homes, we're renters, we don't often qualify, we feel left out."
	  o "We're open; we do want you to use our Community Based-Organization (CBO), because we trust them to give us good info.
	  o Another resident said that "the utility is in the best position to send information about solar (via mail), because I cannot trust anyone who reaches out by phone."
	  o "Disseminate info through schools: you get parents' attention [that way]"
	  o "This information [we are providing you] is going to the legislature, but we don't trust that they will act on it -- not the CEC's fault."
	• "Solar should be more accessible to everyone; I've seen them

	on houses and with so much sunlight in CA, we're wasting that free resource." o "There should be no new development without solar -- it should already be a mandate that all new housing should have access to renewable energy (mainly solar) and energy efficiency. Most people recognize that solar is the best way to get renewable energy, but it also brings an environmental benefit." o "The burden shouldn't be on individual customers." Utilities or the government should figure out what is the optimal distribution of solar → rooftop vs community vs central solar? • Quality of customer service at utilities and other companies providing these programs needs to improve as well. o "We get harassed, we start asking questions and they don't answer." o o They say that the city itself does not "come to tell us what's going on," so they would like better communication from their local government as well. • A few individuals appreciated the Commission reaching out and coming out to listen to them, to see how they live. o One individual asked that the government focus on the specific type of help their towns need: Bell, Bell Gardens, Cudahy, Huntington Park, Maywood, South Gate, Walnut Park. • They also asked the Commission to come back every so often an update them on progress, as well on any new help the State can provide. • "How about 'mobile solar,'" one participant said. He shared that utilities do not want to install solar on old rooftops and be responsible for roof damages. • New low-income buildings should have solar.
Oakland	• Better communication/education in general. In particular, it is essential to deal with the language barrier in a community with so much diversity

	○ Must-include languages: Cantonese & Mandarin, Laotian, Mien, Thai, Vietnamese, Spanish. ○ Translate and spread the information: what agencies, what programs, what services—people do not know about many programs ▪ One resident had to go through the county to get help with his bill ▪ Another said that in some families, the parents, who cannot read English, do not get to read the information; their children, who understand English, do not read the bill. ○ No need to print out millions of flyers in different languages—just post the info in multiple languages on a website. ○ Launch a public campaign: upload videos to the web, send maquettes to schools and community centers ▪ Use Facebook. ○ Ask schools, pastors to help communicate information about the programs—but the government needs to do more outreach. ▪ They hear of programs (e.g., swap appliances), but do not know where to get more information. ○ Install solar on, say, community centers, so folks can see and learn from the example. • Address the split incentive ○ Renters cannot apply sometimes because they do not easily qualify. ○ Landlords have little/no incentive to install, for they do not (seem to) benefit; both should benefit, landlords and tenants. ○ Address the combined family incomes issue. • "All new buildings should be required to have solar; older buildings, find ways to retrofit or have some other access to solar." (e.g., *mobile solar*, or central/community solar?)

	○ Encourage the use of natural light instead of light bulbs. (New building designs could address this) • Address the issue of not being able to apply for new upgrades if the house has been weatherized is a big issue ○ One person was told that they could not get any updates until 10 years later. It seems that we could lower that to every 5 years. • "Make sure [utilities] dispense the program funds." • "Our bill is small, so how can solar really help?"
Truckee/South Lake Tahoe/Sierra Mountain Region	• Incentives for homeowners ○ Including clause to bring benefits of the incentive to renters e.g. rent decrease in fixed rent area (fixed rent based on energy upgrade to avoid increasing rent with increased property value) • Incentives that apply to homes off the grid (propane users) • Reclassification of the term Disadvantaged Community • Financing mechanisms that apply to the discrepancies between living costs and average wages in the area ○ Low income subsidies to fund community solar instead of the CARE program ○ Use current electricity rates in conjunction with living costs and wages to gauge incentive requirements • Performance contracting to ensure there is quality work being done • Utilization of the following technologies in the region: ○ geothermal heat pumps for building and school heating ○ Passive solar (buildings facing a warmer direction in order to garner heat and light) ○ Small scale bioenergy grouping incentives • Customizing building and tree cutting requirements ○ The modification of the Governor's tree waste program could assist with this

	• Reducing the load of paperwork needed to attain approval for weatherization programs • Increased community awareness and education • Public transit in rural areas o EV charging stations • Require a percentage of utilities to offer incentives to their low income customers • Population requirements should take into account seasonal visitors and tourists • Expansion of the existing Liberty Utility Program to offer incentives for building renovations not just low income customers • Modification of the Pointer-Cologne Act to remove the clause requiring the pumping of heated wastewater out of the Tahoe Basin

Ukiah	• Establish a CEC liaison with tribes
	  o "be aware that some tribes don't have the bandwidth to keep up with meetings, etc., but also it seems that the state has not made a real effort to reach out over the years"
	• Minimize eligibility requirements – so many things seem to disqualify them
	  o "Work with the working people" – income guidelines are so low, that the working poor cannot meet them and thus can't get help
	  ▪ "Be aware that income fluctuates" – one person may seem to be above the poverty line this year, but look at the average over several years
	  o Many are tenants, so they do not qualify
	  o often, some families do qualify "to apply", but there is no actual funding (i.e., was the intent just to be able to claim that they qualify to apply?)
	  o raise the income eligibility requirements
	• Adopt the right solution for each community's situation:
	  o community solar allows to pick ideal location for maximum energy collection
	  ▪ consolidate production in ideal locations
	  ▪ this also avoids the issue of different tribes fighting for the same funds
	  o use thin-film solar for weaker roofs
	  o provide assistance to bring homes to code, at least so they can benefit from weatherization, solar
	• Use tax incentives for energy efficiency improvements

	• improve education/awareness
	  o improve information on solar billing options
	  ▪ more options on their bill, so they can figure out what type of payment works for them
	  o centralized location (website?) from a trusted source w/ info on progs, requirements
	  ▪ Provide links and information for tribal websites: folks are not too proactive about going to CA.gov websites, make sure tribal websites are hosting our information - "Indian Desk"
	  o general awareness/outreach/education

Los Angeles	• Improve accessibility
	  o Make solar accessible and marketed to renters – e.g., community solar
	  o Eligibility -- what constitutes a low-income/disadvantaged community? Some folks in need are left out
	  o Programs for EE and Weatherization should be op-out instead of opt-in and mandatory EE compliance requirements.
	  ▪ Mandatory targets and reporting
	  o Utility funded Solar programs for low income
	  o One-stop shop
	  o Make sure funding is equitably distributed
	• Improve outreach and education
	  o Partner with CBO's to do the outreach – when you have trusted organizations involved, it is easier for folks to trust – and give them more funding for outreach and education efforts
	  o Make information on current Solar, weatherization, and Energy efficiency programs available in different languages and distribute through sources that can be trusted
	  o show equipment in low-income communities, so folks can see the technology
	  ▪ e.g., if people see solar panels on their community building, they will be interested; and they should be able to get more information to learn about the topic (e.g., a yard sign that shows where to go for more info)
	  ▪ Build solar and energy-efficient demonstration homes in disadvantaged communities, especially in those whose residents have never seen solar
	  o more training programs in RE/EE industry -- especially for fossil-fuel industry folks to transition
	  ▪ use community colleges, high schools
	  o Is there a "Do-It-Yourself" solar program? Could there be a toolkit for a self-install, low-cost solar (e.g., thin-

	film solar)? o incorporate solar panels in Lego game ▪ "kids are capable to learn the technology faster" ▪ "you can make your own battery charger!" ▪ "EE toolkit" o "talk to people in terms they understand" o "teach children, so they can do the outreach to their parents" o Improve program representatives' customer service o Use "Earth Day" as an excuse to introduce interactive activities in communities o Use social media to promote programs and spread information o Show the benefits: perform a study before and after – assess the health, economy, and environment of a neighborhood now, then after installation of RE/EE and monitor every year and compare the results ▪ "Make IOU's champion this, so they can further spread the idea – instead of making excuses" ▪ "Hold IOU's accountable" o Develop a healthy contest to challenge communities • Stop subsidizing the oil industry and channel those subsidies to benefit communities o or, match each $1 of subsidy to the oil industry with $1 to communities • Make use of inexpensive energy-saving and weatherization solutions: o E.g., roof gardens ("Green roofs") o Plant more trees on streets (to provide more shade) • Link spread of technology with developing new job opportunities

Other comments:

Community	**Comment**
East Los Angeles	• Most attendees said they do not qualify for renewable energy programs, because they do not hit the minimum energy spend limit. Their argument is that using an air conditioner raises their bill much above what they can afford to pay—therefore, they do not seem to use as much energy as they would if they wanted to live more comfortably. They wonder then whether shifting to solar would allow them to lower their bill to close to zero—but it seems that their utility company would like them to spend more. • Some expressed feeling offended by the fact that they are trying to conserve as much of their money, yet they are being

	nudged to adopt a new technology that is out of their budget. • Commissioner McAllister commented that perhaps it is not that IOU's do not want to offer, but that it may just not be economically feasible for them to offer solar at much lower rates. • One individual said that people also do not want to apply for programs because they have heard it is free, but that they do not believe that—they believe they will get cheated. • A few individuals appreciated the Commission reaching out and coming out to listen to them, to see how they live.
Fresno	
Riverside/San Bernardino	• People asked for the CEC website url.
Oakland	
Truckee/South Lake Tahoe/Sierra Mountain Region	• Lack of incentives for renewable energy • Lack of qualification for renters and no incentives given to the homeowner to create energy efficiency measures • Multifamily and residential housing conflict between renters and home owners • Strict building restrictions which increase the cost of bringing existing buildings up to safe living standards • 40% of the region is not part of the electric grid system thus are ineligible for energy saving or weatherization opportunities • Strict regulations for tree cutting in order to utilize solar power • Lack of funding opportunities for renewable energy and weatherization projects
Ukiah	• "Can we decentralize energy? Tribes have self-determination, so they should be able to make their own decisions." RE/EE should be more of a community topic, not individualized. • Roofs are not strong enough for solar, so even if a family qualifies for solar, they still do not have enough money to make it happen • "'With all due respect,' this is the result of decades of neglect"

	• The community had just had a Grid Alternatives meeting the previous day – great barrier to membership is that the first year they would get a low rate, but then after the 1st year, PG&E would add back charges – so people got scared off solar

SB 350 Barriers study webpage

A dedicated SB350 Barriers study was launched in February and provided an overview of the planning approach and process. The webpage provided information about public workshops, listserv sign-up, a public comment portal and docket where all documents and comments received were made available for public review.

References

Acs, Gregory and Austin Nichols. 2007. *Low Income Workers and Their Employers, Characteristics and Challenges.* http://www.urban.org/sites/default/files/alfresco/publication-pdfs/411532-Low-Income-Workers-and-Their-Employers.PDF.

ACF (Administration for Children and Families). Website accessed July 20, 2016. *About* LIHEAP. http://www.acf.hhs.gov/programs/ocs/programs/liheap/about.

Andrews, Nancy O. and Dan Rinzler. 2014. "Financing Energy Efficiency in Low-Income Multifamily Rental Housing: A Progress Update From the Low-Income Investment Fund." *Community Development Investment Review.* Vol. 10, Issue 1.

Arnold, Eric K. 2013a. *Greening the Hood: Is Clean Energy Reaching Poor Communities?* http://newamericamedia.org/2013/11/greening-the-hood-is-clean-energy-reaching-poor-communities.php.

——2013b. *'A Terrible Irony' – Affordable Housing, Unaffordable Energy.* http://newamericamedia.org/2013/11/budget-cuts-derail-efforts-to-green-affordable-housing.php.

Arnold, Althea, S. Crowley, E. Bravve, S. Brundage, and C. Biddlecombe. 2014. *Out of Reach 2014.* (http://nlihc.org/sites/default/files/oor/2014OOR.pdf)

Behles, Deborah N. 2013. *From Dirty to Green: Increasing Energy Efficiency and Renewable Energy in Environmental Justice Communities.*

Berelson, Serj. 2014. *Myths of Low-Income Energy Efficiency Programs: Implications for Outreach.*

Bhatia, Rajiv and Neil Maizlish. 2016. *Methodology for a California Health Disadvantage Index, Version 1.1.*

Bird, Stephen and Diana Hernandez. 2012. *Policy Options for the Split Incentive: Increasing Energy Efficiency for Low-Income Renters.*

BLS (Bureau of Labor Statistics. 2015. *May 2015 National Occupational Employment and Wage Estimates*, http://www.bls.gov/oes/current/oes_nat.htm,

Bodaken, Michael and Todd Nedwick. 2014. "Utilities and Community Developers Partner to Improve the Energy Efficiency of Affordable Rental Housing Nationwide." *Community Development Investment Review.* Vol. 10, Issue 1.

Bovarnick, Ben and Darryl Banks. 2014.*State Policies to Increase Low-Income Communities' Access to Solar Power.*

BPC (Bipartisan Policy Center). 2013. *Housing America's Future: New Directions for National Policy.*

CalEPA (California Environmental Protection Agency). 2014. *Designation of Disadvantaged Communities Pursuant to Senate Bill 535.* CBPP (Center on Budget and Policy Priorities). 2015. *California Fact Sheet: Federal Rental Assistance.* http://www.cbpp.org/sites/default/files/atoms/files/4-13-11hous-CA.pdf.

CDFI Coalition. http://www.cdfi.org/wp-content/uploads/2015/03/California.pdf. (accessed May 19, 2016).

California Climate Investment Map, Accessed August 18, 2016, http://www.climateinvestmentmap.ca.gov/.

California Energy Commission. 2015. *Existing Buildings Energy Efficiency Action Plan.* http://docketpublic.energy.ca.gov/PublicDocuments/15-IEPR-05/TN205919_20150828T153953_Existing_Buildings_Energy_Efficiency_Action_Plan.pdf

—— 2015. *Renewables Portfolio Standard Eligibility Guidebook.* http://www.energy.ca.gov/renewables/documents/.

——2016. *New Solar Homes Partnership Market Report.* http://www.gosolarcalifornia.ca.gov/about/nshp.php.

CEEP (Center for Energy and Environmental Policy, University of Delaware). 2010. *Policies for Achieving Energy Justice in Society: Best Practices for Applying Solar Energy Technologies to Low-Income Housing.*

CHP (Center for Housing Policy). 2015. *Paycheck to Paycheck 2015.* http://www.housingpolicy.org/assets/Most_Least_Expensive_Rental_1Q2015.pdf.

CHPC (California Housing Partnership Corporation). 2016. http://chpc.net/wp-content/uploads/2016/02/IOU_EEMatrix2015_FINAL.pdf.

Clean Energy Collective. 2014. *The Barriers of Rooftop Solar.* http://www.solarfeeds.com/barriers-rooftop-solar/.

Mullendore, et al. 2016. *Closing the California Clean Energy Divide: Reducing Electric Bills in Affordable Multifamily Rental Housing with Solar+Storage.* Clean Energy Group, California Housing Partnership, and Center for Sustainable Energy.

Cluett, Rachel, J. Amann, and S. Ou. 2016. *Building Better Energy Efficiency Programs for Low-Income Households.* ACEEE.

CPUC (California Public Utilities Commission). 2015. *Interim Decision Adopting Bridge Funding from January 1, 2016, to June 30, 2016, for the Large Investor-Owned Utilities' Energy Savings Assistance and California Alternate Rates for Energy Programs.*

——2016a. *CPUC Energy Savings Assistance Program,* presentation by Energy Division Staff, July 25, 2016.

——2016b. *Decision Funding Authorizations and Related Measures for Continuation of the New Solar Homes Partnership Program.*

——2016c. *California Solar Initiative-Thermal Program Handbook.*

CSD (California Department of Community Services and Development). 2016a. *Request for Information 2016-RFI-45, Single Family Energy Efficiency and Solar PV Services.*

——2016b. *Weatherization Assistance Program (WAP).* http://www.csd.ca.gov/Services/ResidentialEnergyEfficiencyServices.aspx, accessed June 29, 2016.

——2016c. *Solar Programs.* http://www.csd.ca.gov/Services/LowIncomeWeatherizationProgram.aspx, accessed June 29, 2016.

——2016d. *Find Services in Your Area.* http://www.csd.ca.gov/Services/FindServicesinYourArea.aspx, accessed June 29, 2016.

——2016e. *California Low Income Weatherization Program for Large Multifamily Projects.* https://camultifamilyenergyefficiency.org/, accessed June 29, 2016.

——2016f. *California Low Income Weatherization Program for Large Multifamily Projects, Resources and FAQ.* https://camultifamilyenergyefficiency.org/resources-and-faq/, accessed June 29, 2016

——2016g. *Solar for All California.* http://www.csd.ca.gov/Services/HelpPayingUtilityBills/SolarForAllCalifornia.aspx, accessed June 29, 2016.

CSD (California Department of Community Services and Development) and PG&E. 2014. *CSD/PG&E Weatherization Programs Geographic Coordination Pilot-Final Draft*. Prepared by RHA.

CSE (Center for Sustainable Energy). 2016. *Literature Review: Housing, Energy Use, Decision-Making and Messaging among Key Ethnic Groups in California.* Prepared for the California Energy Commission under Grant #EPC-14-037.

DRA (Division of Ratepayer Advocates). 2011. *Status of Energy Utility Service Disconnections in California.*

Dean, Jesse, C. Smith-Drier, G. Mekonnen, W. Hawthorne. 2011. *Integrating Photovoltaic Systems into Low-Income Housing Developments: A Case Study on the Creation of a New Residential Financing Model and Low-Income Resident Job Training Program.* U.S. Department of Energy, Energy Efficiency & Renewable Energy

Deutsche Bank. 2012. *Recognizing the Benefits of Energy Efficiency in Multifamily Underwriting*. Prepared by Steven Winter Associates and HR&A Advisors, Inc.

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.*

Energy Efficiency for All. Accessed July 20, 2016. *Making Multifamily Homes Healthy and Affordable through Energy Efficiency*. http://energyefficiencyforall.org/resources/making-multifamily-homes-healthy-and-affordable-through-energy-efficiency-0.

EPC (Energy Programs Consortium). 2013. *Multifamily Energy Efficiency: Reported Barriers and Emerging Practices*. http://aceee.org/files/pdf/resource/epc_%20multifamily_housing_13.pdf.

Epperson, Stacey and Doug Ryan. 2014. *Manufactured Homes Help Both, Save the Planet and Save Money for Low-Income Owners*. Community Development Investment Review. Vol. 10, Issue 1.

Ernst, Kendall. 2015. *Giving Low-Income Families Access to Clean Energy and Efficiency*. RMI (Rocky Mountain Institute).

Evergreen Economics. 2013a. *Needs Assessment for the Energy Savings Assistance and the California Alternate Rates for Energy Programs, Volume 1: Summary Report*.

——2013b. *Needs Assessment for the Energy Savings Assistance and the California Alternate Rates for Energy Programs, Volume 2: Detailed Findings*.

——2013c. *Needs Assessment for the ESA and CARE Programs: Study Results*. Workshop Presentation.

Families USA. 2016. Federal Poverty Guidelines. http://familiesusa.org/product/federal-poverty-guidelines.

Farley, Kate and Susan Mazur-Stommen. 2014. *Saving Energy with Neighborly Behavior: Energy Efficiency for Multifamily Renters and Homebuyers*.

Federal Register: Annual Update of the HHS Poverty Guidelines, accessed August 16, 2017, https://www.federalregister.gov/articles/2016/01/25/2016-01450/annual-update-of-the-hhs-poverty-guidelines#t-1.

Frank, Marti and Seth Nowak. (Forthcoming). *Mining Participant Demographics to Yield New Opportunities from Old Measures.*

Garcia, Anna Maria. 2016. *Program Year 2016 Grantee Allocations*. Washington, DC: US Department of Energy. http://www.waptac.org/data/files/Website_docs/Government/Guidance/2016/WPN-16-2-Grantee-Allocations.pdf.

Granade, Hannah Choi, J. Creyts, A. Derkach, P. Farese, S. Nyquist, and K. Ostrowski. 2009. *Unlocking Energy Efficiency in the U.S. Economy*.

GRID Alternatives, Center for Social Inclusion, and Vote Solar. 2016. *Low-Income Solar Policy Guide*.

Habitat for Humanity. 2015. *Shelter Report 2015, Less Is More: Transforming Low-Income Communities Through Energy Efficiency.*

Harak, Charlie. 2010 *Up the Chimney: How HUD's Inaction Costs Taxpayers Millions and Drives up Utility Bills for Low-Income Families*. National Consumer Law Center.

HCD (California Department of Housing and Community Development). 2012. *Analysis of Impediments to Fair Housing.* http://www.hcd.ca.gov/housing-policy-development/housing-resource-center/reports/fed/ai_web.html.

——2014. *Highlights of the State of Housing in California.* http://www.hcd.ca.gov/housing-policy-development/statewide-housing-plan/web_hcd_stateofhousing_april2014.pdf.

Henderson, Philip. 2014. *Lenders' Property Standards and Energy Efficiency: The Vital Link for Affordable Housing*. Community Development Investment Review. Vol. 10, Issue 1.

——2015. *Program Design Guide: Energy Efficiency Programs in Multifamily Affordable Housing.* http://www.energyefficiencyforall.org/sites/default/files/Full%20Program%20Design%20Guide.pdf.

HHS (US Department of Health and Human Services). 2015a. *Low Income Home Energy Assistance Program Report to Congress for Fiscal Year 2010.* http://www.acf.hhs.gov/programs/ocs/resource/liheap-report-to-congress-2010.

——2015b. "Low Income Home Energy Assistance Program." http://neada.org/wp-content/uploads/2015/03/LIHEAPstateallocationsFY16Pres.pdf.

Hochschild, David. "PACE: Protect Homeowners and the Environment." *San Diego Union-Tribute*. June 23, 2016. Accessed August 8, 2016. http://www.sandiegouniontribune.com/news/2016/jun/23/pace-environment-homeowners/.

HUD (U.S. Department of Housing and Urban Development), Office of Policy Development and Research. 2016. *FY 2016 HUD Income Limits Briefing Material*. https://www.huduser.gov/portal/datasets/il/il16/IncomeLimitsBriefingMaterial-FY16.pdf.

——2008. *Green Rehabilitation of Multi-family Rental Property, A Resource Guide.* https://www.hudexchange.info/resource/246/green-rehabilitation-of-multifamily-rental-property-a-resource-guide/.

Hynek, Don, M. Levy, and B. Smith. 2012. *"Follow the Money": Overcoming the Split Incentive for Effective Energy Efficiency Program Design in Multi-family Buildings.* 2012 ACEEE Summer Study on Energy Efficiency in Buildings.

Institute for Market Transformation. 2012, *Energy Transparency in the Multifamily Housing Sector: Assessing Energy Benchmarking and Disclosure Policies.*

IREC (Interstate Renewable Energy Council). 2016. *Shared Renewable Energy for Low- to Moderate-Income Consumers: Policy Guidelines and Model Provisions.* http://energy.gov/sites/prod/files/2016/04/f30/IREC-LMI-Guidelines-Model-Provisions_FINAL.pdf.

——2015, *Proposal for Alternative for Growth in Disadvantaged Communities of the Interstate Renewable Energy Council, Inc.*, http://docs.cpuc.ca.gov/PublishedDocs/Efile/G000/M154/K225/154225576.PDF

Jospé, Christophe, C. Probst, M.E. Burstein, T. Deng, E. Helson, C. Mayer, K. Palacios, I. Valdebenito, K. Verriest, and B. Youn. 2014. *Ensuring New York Solar Programs Reach Low-Income Residents.*

Kronk, Elizabeth Ann. "Alternative Energy Development in Indian Country: Lighting the Way for the Seventh Generation." *Idaho Law Review*, Vol.46, 449 2009-2010.

Kushler, M., S. Nowak, and P. Witte. 2012. *A National Survey of State Policies and Practices for Evaluation of Ratepayer Funded Energy Efficiency Programs.* Washington, DC: ACEEE. aceee.org/ research-report/u122. Cited in Drehobl and Ross, 2016.

LABCI (Los Angeles Business Council Institute). 2011. *Making a Market: Multifamily Rooftop Solar and Social Equity in Los Angeles.*

LIHEAP Program and Funding, Congressional Research Office, July 2013, accessed August 17, 2016, http://neada.org/wp-content/uploads/2013/08/CRSLIHEAPProgramRL318651.pdf

Lampton, Cara, A. Smart, V. Veerabhadrappa, C. Robinson, and F. Guo. 2010. *Policies for Achieving Energy Justice in Society: Best Practices for Applying Solar Energy Technologies to Low-Income Housing.*

Maizlish Neil, D. Tran, D.M. Bustamante-Zamora. 2014. *Healthy Communities Data and Indicators Project: How-To Manual and Illustrative Guide.* https://www.cdph.ca.gov/programs/Documents/HCI_How-To_Manual10-2014highres.pdf

Markowski, Jack, A. Evens, M. Schwartz. 2014. *Financing Energy Efficiency Retrofits of Affordable Multifamily Buildings.* Community Development Investment Review. Vol. 10, Issue 1.

McConnell, Erica. 2016. "Expanding Solar Access for Disadvantaged Communities." Blog post. http://www.renewableenergyworld.com/ugc/blogs/2016/02/expanding_solar_acce.html.

McCormick, Katharine. 2015. *Bridging the Clean Energy Divide: Affordable Clean Energy Solutions for Today and Tomorrow.* Natural Resources Defense Council.

McKibben, Anne. 2013. *Engaging as Partners in Energy Efficiency: A Primer for Utilities on the Energy Efficiency Needs of Multifamily Buildings and their Owners.*

Miller, Ansje and Cody Sisco. 2002. Ten Actions of Climate Justice Policies 4 (Second Nat'l People of Color Envtl. Leadership Summit—Summit II, Resource Paper Series. http://www.ejrc.cau.edu/summit2/SummIIClimateJustice%20.pdf (discussing ten principles for climate change policies). Cited in Behles, 2013.

Mosenthal, P., and M. Socks. 2015. *The Potential for Energy Savings in Affordable Multifamily Housing.* Hinesburg, VT: Optimal Energy. www.energyefficiencyforall.org/sites/default/files/EEFA%20Potential%20Study%20EXECSUM.pdf. Cited in Drehobl and Ross, 2016.

Mueller, James and Amit Ronen. 2015. *Bridging the Solar Income Gap.* GW Solar Institute.

Mullendore, Seth, R.G. Sanders, L. Milford, H. Misas, and A. Mensah. 2015. *Resilience for Free: How Solar+Storage Could Protect Multifamily Affordable Housing from Power Outages at Little or No Net Cost.*

NAACP (National Association for the Advancement of Colored People). 2013. *Just Energy Policies: Reducing Pollution and Creating Jobs.*

Navigant. 2015a. *California Solar Initiative – Biennial Evaluation Studies for the Single-Family Solar Homes (SASH) and Multifamily Affordable Solar Housing (MASH) Low-Income Programs, Market and Program Administrator Assessment, Program Years 2011-2013.* http://www.cpuc.ca.gov/general.aspx?id=3043.

——2015b. *California Solar Initiative – Biennial Evaluation Studies for the Single-Family Solar Homes (SASH) and Multifamily Affordable Solar Housing (MASH) Low-Income Programs, Impact and Cost-Benefit Analysis, Program Years 2011-2013.* http://www.cpuc.ca.gov/general.aspx?id=3043

NCCP (National Center for Children in Poverty). 2016. *California Demographics of Low-Income Children.* http://www.nccp.org/profiles/CA_profile_6.html.

Nichols, George L. and Stanley L. Greschner. 2013. *Successful Solar Incentive Programs Grow Solar Penetration Within Low-Income Communities.* http://communitypowernetwork.com/node/9486.

NREL (National Renewable Energy Laboratory. 2011. *Integrating Photovoltaic Systems into Low-Income Housing Developments: A Case Study on the Creation of a New Residential Financing Model and Low-Income Resident Job Training Program.*

OEHHA (Office of Environmental Health Hazard Investment). 2014. *California Communities Environmental Health Screening Tool, Version 2.0 (CalEnviroScreen 2.0).* http://oehha.ca.gov/calenviroscreen/report/calenviroscreen-version-20.

Ottinger, Richard L. and John Bowie. 2015. *Innovative Financing for Renewable Energy.*

Palmer, Karen, M. Walls, and T. Gerarden. 2012. *Borrowing to Save Energy, An Assessment of Energy-Efficiency Financing Programs.*

PG&E, SCE, SDG&E, SoCal Gas. 2016. Monthly Reports to the CPUC on Low-Income Assistance Programs.

Philbrick, Deborah, R. Scheu, and A. Evens. 2014. *Preserving Affordable Multifamily Housing through Energy Efficiency: Non-Energy Benefits of Energy Efficiency Building Improvements.*

Pivo, Gary. 2011. *Energy Efficiency and its Relationship to Household Income in Multifamily Rental Housing.* (Washington, DC: Fannie Mae, 2011). Cited in Bodaken and Nedwick, 2014.

RMI (Rocky Mountain Institute). 2016. *Empowering and Improving the Lives of Low-Income Households and Communities in a Clean Energy Future* (brochure). http://www.rmi.org/Content/Files/eLab_Leap_2pager.pdf.

Roberts, Brandon, D. Povich, and M. Mather. 2012-2013. *Low-Income Working Families: The Growing Economic Gap.*

Sanders, Robert G. and Lewis Milford. 2014. *Clean Energy for Resilient Communities: Expanding Solar Generation in Baltimore's Low-Income Neighborhoods.*

Schweitzer, Sophia V. 2016. *Can Low-Income Housing Be Energy Efficient and Affordable?* http://ensia.com/features/can-low-income-housing-be-energy-efficient-and-affordable

Siegel, Paul, E. Martin, and R. Bruno. 2001. *Language Use and Linguistic Isolation: Historical Data and Methodological Issues.*

Skumatz Economic Research Associates, Inc. 2010. "Non-energy Benefits Analysis for Xcel Energy's Low-income Energy Efficiency Programs," May 27, 2010, Docket No. 13A-0686EG, Exhibit TW-8. Cited in McCormick, 2015.

Taylor, Mac. 2016. *Perspectives on Helping Low-Income Californians Afford Housing.*

The White House. 2015. *Fact Sheet: Administration Announces New Initiative to Increase Solar Access for All Americans*, White House Press Release.

https://www.whitehouse.gov/the-press-office/2015/07/07/fact-sheet-administration-announces-new-initiative-increase-solar-access.

The White House. 2015. *Programs and Activities to Support Renewable Energy and Energy Efficiency in Low- and Moderate-Income Communities.* https://www.whitehouse.gov/sites/default/files/low-income_and_energy_efficiency_programs.pdf.

US Census Bureau, 2014. *American Fact Finder: Selected Housing Characteristics*, accessed August 2, 2016, http://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=ACS_14_5YR_DP04&src=pt.

US DOE (US Department of Energy). 2016a. *Community Renewable Energy Shared Solar FAQ,* accessed April 26, 2016, http://apps3.eere.energy.gov/greenpower/community_development/community_solar_faq.html.

——2016b. *Weatherization Assistance Program*, accessed June 29, 2016, http://energy.gov/eere/wipo/weatherization-assistance-program.

US Census Bureau. 2013. *American Housing Survey*. http://www.census.gov/programs-surveys/ahs.html.

——2015. *Geographical Mobility: 2014 to 2015*, accessed August 4, 2016, http://www.census.gov/data/tables/2015/demo/geographic-mobility/cps-2015.html.

——2016. *Census Glossary.* https://www.census.gov/glossary.

USDA (U.S. Department of Agriculture). 2014. *Rural Poverty & Well-being.* www.ers.usda.gov/topics/rural-economypopulation/ rural-poverty-well-being/poverty-overview.aspx.

US EIA (Energy Information Administration). 2009. *Residential Energy Consumption Survey*, http://www.eia.gov/consumption/residential/data/2009/index.cfm?view=consumption.

——2013a. *Residential Energy Consumption Survey (RECS): 2009 RECS Survey Data.* Washington, DC: EIA. www.eia.gov/consumption/residential/data/2009/.

——2013b. “Heating and Cooling No Longer Majority of US Home Energy Use.” www.eia.gov/todayinenergy/detail.cfm?id=10271&src=%E2%80%B9%20Consumption%20%20%20%20%20%20Residential%20Energy%20Consumption%20Survey%20(RECS)-b1.

US EPA (United States Environmental Protection Agency), “Why We Need a Cleaner, More Efficient Power Sector,” June 2014, www2.epa. gov/sites/production/files/2014-05/documents/20140602fs-benefits. pdf. EPA, “By the Numbers: Cutting Carbon Pollution from Power Plants,” June 2014,

http://www2.epa.gov/sites/production/files/2014-06/documents/20140602fs-important-numbers-clean-power-plan.pdf. Cited in McCormick, 2015.

Varshney, Sanjay B. and Dennis H. Tootelian. 2009, *The Impact of the Small Business and Disabled Veteran Business Enterprise*.

West, Anne, E. Rambo, A. Ellsworth, T. Duncan, D. Moran, and J. Van Clock. 2013. *ESA Program Multifamily Segment Study, Volume 1: Report*. http://www.energydataweb.com/cpucFiles/pdaDocs/1000/ESA%20MF%20Segment%20Study%20-%20Volume%201%20Final%20Report%2012-04-13.pdf.

Whited, M., T. Woolf, and J. Daniel. 2016. *Caught in a Fix: The Problem With Fixed Charges for Electricity*. Synapse Energy Economics for Consumers Union.

Zetterberg, Johanna and Brian Ng. 2013. *Using Financing to Scale Up Energy Efficiency: Work Plan Recommendations for the SEE Action Financing Solutions Working Group*. Prepared for the SEE Action Financing Solutions Working Group by Lawrence Berkeley National Laboratory and Harcourt, Brown, and Carey.

Zimring, Mark, M.G. Borgeson, I. Hoffman, C. Goldman, E. Stuart, A. Todd, and M. Billingsley. 2011. *Delivering Energy Efficiency to Middle Income Single Family Households.*

Zimring, Mark, M. Borgeson, A. Todd, and C. Goldman. 2013. *Getting the Biggest Bang for the Buck, Exploring the Rationales and Design Options for Energy Efficiency Financing Programs.*