DOCKETED

Docket Number:	16-OIR-02
Project Title:	SB 350 Barriers Report
TN #:	214830
Document Title:	SB 350 Low-Income Barriers Study, Part A - Commission Final Report
Description:	Commission Final Report for the SB 350 Low-Income Barriers Study, Part A: Overcoming Barriers to Energy Efficiency and Renewables for Low-Income Customers and Small Business Contracting Opportunities in Disadvantaged Communities. This report was adopted by the Energy Commission at the December 14, 2016 Business Meeting.
Filer:	Michael Sokol
Organization:	California Energy Commission
Submitter Role:	Commission Staff
Submission Date:	12/15/2016 6:46:56 PM
Docketed Date:	12/16/2016

California Energy Commission

COMMISSION FINAL REPORT

Low-Income Barriers Study, Part A: Overcoming Barriers to Energy Efficiency and Renewables for Low-Income Customers and Small Business Contracting Opportunities in Disadvantaged Communities

California Energy Commission

Edmund G. Brown Jr., Governor

December 2016 | CEC-300-2016-009-CMF

California Energy Commission

Robert B. Weisenmiller, Ph.D.
Chair

Commissioners
Karen Douglas, J.D.
Andrew McAllister, Ph.D.
David Hochschild
Janea A. Scott

Jordan Scavo
Suzanne Korosec
Esteban Guerrero
Bill Pennington
Pamela Doughman
Primary Authors

Christopher Wymer
Research Librarian

Alana Mathews
Project Manager

Michael J. Sokol
Program Manager

Executive Director
Robert P. Oglesby

ACKNOWLEDGEMENTS

Energy Commission staff would like to thank the following organizations, including but not limited to the individuals identified, for their invaluable assistance with this report:

Asian Pacific Environmental Network
Parin Shah
Amee Raval
Sydney Fang
Jing Jing He

BayREN
Gerald Lahr

BlueGreen Alliance
Ross Nakasone

Brightline Defense Project
Eddie Ahn

California Alternative Energy and Advanced Transportation Financing Authority
Deana Carrillo
Bettina Redway

California Air Resources Board
Ashley Dunn
Richard Corey

California Association of Realtors
Jennifer Svec

California Department of Community Services and Development
Chuck Belk
Linné Stout
Jason Wimbley

California Department of General Services
Tanya Little

California Energy Commission
Kevin Barker
Emilio Camacho
Rhetta DeMesa
Bryan Early
Jennifer Nelson
Ken Rider
Matt Coldwell
Eunice Murimi
Galen Lemei
Erik Jensen
Lorraine Gonzalez

California Environmental Justice Alliance
Strela Cervas

California Housing Partnership Corporation
Stephanie Wang
Caroline McCormack

California Independent System Operator
Thomas Doughty

California Municipal Utilities Association
Justin Wynne

California Public Utilities Commission
Melicia Charles
Jeanne Clinton
Hazlyn Fortune
Lola Odunlami
Shannon O'Rourke

California Solar Energy Industries Association
Bernadette Del Chiaro

California Workforce Development Board
Tim Rainey
Sarah White
Robin Purdy

Center for Community Action and Environmental Justice
Graciela Larios
Michele Hasson
Ericka Flores

Center for Sustainable Energy
Stephanie Wang

Clean Energy Works
Holmes Hummel

CleanPath Ventures
Matt Cheney

Community Energy Services Corporation
Martin Bond

Communities for a Better Environment
Shana Lazerow
Dilia Ortega
Darryl Molina Sarmiento

El Dorado County Water Agency
Ken Payne

Energy Conservation Options
Dahlia Moodie

Energy Efficiency Council
Allan Rago
Anna Solorio

Enervee
Anne Niederberger

Environmental Defense Fund
Jayant Kairam

Everyday Energy
Scott Sarem

Governor's Office of Business and Economic Development
Jesse Torres

GREEN-Energy Efficiency for All
Stephanie Wang

Greenlining Institute
Sekita Grant
Stephanie Chen
Alvaro Sanchez

GRID Alternatives
Stan Greschner

Humboldt County
Philip Young

Individuals
Alex McDonald
Rick Brown

International Brotherhood of Electrical Workers
Johnny Simpson

Interstate Renewable Energy Council
Erica McConnell

Johns Mansville
Bruce Ray

Leadership Counsel for Justice and Accountability
Phoebe Seaton
Veronica Garibay
Grecia Elenes

Los Angeles Department of Water and Power
David Jacot

Low Income Oversight Board
Robert Castaneda

Marin Clean Energy
Elizabeth Kelly

Natural Resources Agency
Saúl Gomez

Natural Resources Defense Council
Maria Stamas

Nest Labs
Rick Counihan

Northern Circle Indian Housing Authority
Darlene Tooley

Pacific Gas & Electric
Mary O'Drain

Proteus Inc.
Janine Medina

Renew Financial
Colin Bishopp

Richard Heath and Associates
Cynthia Bruno

Rising Sun Energy Center
Melvin Parham

Sacramento Municipal Utility District
Timothy Tutt

Sierra Climate Adaptation and Mitigation Partnership
Diana Madison

Sierra Business Council/Sierra CAMP
Diana Madson

Sierra Club
Eddie Moreno

The Shift Model
Marti Frank

SolarCity
Damon Franz

SoCalGas
Regina Lugani

Southern California Edison
Catherine Hackney

Stone Energy Associates
Nehemiah Stone

StopWaste
Heather Larson

Strategic Concepts in Organizing and Policy and Education/RePower LA
Laura Muraida
Manisha Vaze

Strategic Growth Council
Allison Joe
Monica Palmiera

Sustainable Energy Solutions
Bernie Kotlier

TRC Energy Services
Sophia Hartkopf

UC Berkeley Labor Center
Carol Zabin

UC San Diego Strategic Energy Initiatives
Byron Washom

Vote Solar
Susannah Churchill

Yolo County Housing
Lisa Baker

ABSTRACT

This study, mandated by Senate Bill 350, explores the barriers to and opportunities for expanding low-income customers' access to energy efficiency, weatherization, and renewable energy investments. It also examines barriers and opportunities related to contracting with small businesses located in disadvantaged communities. This study provides recommendations intended to have a transformative effect on access to clean energy investments for low-income customers and local small businesses in disadvantaged communities.

Keywords: Energy efficiency, weatherization, photovoltaic, solar, renewables, low-income, small business, SB 350

Please use the following citation for this report:

Scavo, Jordan, Suzanne Korosec, Esteban Guerrero, Bill Pennington, and Pamela Doughman. 2016. *Low-Income Barriers Study, Part A: Overcoming Barriers to Energy Efficiency and Renewables for Low-income customers and Small Business Contracting Opportunities in Disadvantaged Communities.* California Energy Commission. Publication Number: CEC-300-2016-009-CMF.

TABLE OF CONTENTS

Page

LIST OF FIGURES

Page

LIST OF TABLES

Page

EXECUTIVE SUMMARY

"California has made bold commitments to sustain our environment, help the neediest and build for our future," Governor Edmund G. Brown Jr. stated at his inaugural address on January 5, 2015. The Governor and Legislature's recent actions are driving a complete transformation in the way Californians produce and use energy. In keeping with this vision, Senate Bill 350 (De León, Chapter 547, Statutes of 2015) set ambitious goals for developing renewable energy and advancing energy efficiency. SB 350 also takes steps to ensure California's clean energy transformation includes a strong focus on equity to ensure benefits are realized by all Californians, especially those in the most vulnerable communities. Investment within the low-income sector not only helps the neediest achieve the energy bill savings that other Californians enjoy, but such investments also result in substantially larger multipliers for economic development. And developing local workforce participation in clean energy programs is integral to enabling the full range of benefits for low-income customers.

At the September 13, 2016 workshop on the SB 350 Low-income Barriers Study, Chair Robert Weisenmiller posed the challenge: "How do we make sure all Californians have access to essential energy services, particularly clean and affordable ones, including energy efficiency and renewables…. We're trying to really broaden the participation, and it's going to require a rethink."

Governor Brown signed the Clean Energy and Pollution Reduction Act of 2015 (SB 350) on October 7, 2015. SB 350 establishes new energy efficiency and renewable electricity targets to support California's climate goal of reducing greenhouse gas emissions to 40 percent below 1990 levels by 2030. In addition, SB 350 directs the Energy Commission to study:

- 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 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 to contracting opportunities for local small businesses in disadvantaged communities.
- Barriers for low-income customers to zero-emission and near-zero-emission transportation options, including those in disadvantaged communities, as well as recommendations on how to increase access to zero-emission and near-zero-emission transportation options to low-income customers, including those in disadvantaged communities (addressed in Part B of this study, to be completed by the Air Resources Board).

Three informational pillars informed Part A of this study: the literature review, grassroots outreach through community meetings, and technical public workshops. First, the Energy Commission performed a literature review of more than 100 available studies on the topic areas identified in the statute. Second, Energy Commissioners and staff participated in a series of meetings across California led by community-based organizations. Seven community meetings were held in locations selected to reflect the regional and demographic diversity on the state (in chronological order: East Los Angeles, Fresno, Riverside, Oakland, Truckee/South Lake Tahoe/Sierra Mountain region, Ukiah, and Los Angeles). In total, 158 members of the public participated in these meetings. (See Appendix B.) These meetings provided an opportunity for community members to speak about experiences with renewable energy, energy efficiency, and weatherization programs, including roundtable discussions with representatives of program delivery partners. And third, the Energy Commission hosted public technical workshops for public agencies, utilities, industrial representatives, and environmental justice advocates to share their expertise.

Some barriers are structural, inherent to the conditions of poverty in California. These barriers may be mitigated but are difficult to eradicate. Other barriers stem from policy and program decisions, and these may be overcome through new policy development or program refinement. Many challenges overlap, compounding one another. Several existing programs have mechanisms for targeting low-income residents or goals for increasing disadvantaged communities' access to energy efficiency or renewable energy. However, rural and tribal communities unserved by a utility have been difficult to reach through traditional utility programs.

Structural Barriers Limiting Access to Clean Energy for Low-Income Customers

Structural barriers limiting access to clean energy for low-income customers include:

- Low home ownership rates
- Complex needs, ownership, and financial arrangements for low-income multifamily housing
- Insufficient access to capital
- Building age
- Remote or underserved communities

Most low-income Californians are renters. Ensuring low-income renters and property owners participate and benefit from energy upgrades poses a unique barrier commonly referred to as *split incentives*. The issue is particularly acute among the low-income multifamily housing sector, as low-income Californians are 39 percent more likely to live in multifamily housing than the general population. The split incentive has long vexed program administrators seeking to increase access to energy upgrade options for low-income residents.

Low-income multifamily housing faces unique barriers, such as diverse building characteristics and needs, complex ownership and financial arrangements, and limited budgets with restricted opportunities to take on additional debt.

Low-income customers who own their homes do not face split incentives, but they face other challenges gaining access to energy efficiency and renewable energy opportunities. Because they have limited disposable funds, they may be more risk-averse and less capable of participating in programs with high upfront payments or copayments for energy efficiency or renewable equipment. At the same time, poor credit or lack of collateral may restrict access to financing options.

Older buildings are more likely to have structural or design issues that make energy efficiency and renewable energy retrofits unviable, particularly for people in disadvantaged communities, who are more likely to live in such housing.

Remote or underserved low-income communities, including tribal communities, may pay a high proportion of their income for home heating and cooling. Customers in these jurisdictions may have limited access to utility-based energy efficiency and renewable energy programs.

Policy and Program Barriers Limiting Access to Clean Energy for Low-income Customers

There are also several policy and program barriers limiting low-income customers' access to energy efficiency and renewable energy, including challenges related to:

- Market delivery. Effective market delivery can be hampered by differing definitions of low-income or disadvantaged communities, insufficient or poorly calibrated outreach and delivery, high transaction costs imposed on low-income residents with limited time and resources, and slow rebate disbursals. For multifamily building owners, a lack of information about whole-building energy usage and energy upgrade potential and lack of program coordination across multiple services can contribute to limited participation.
- Program integration. Barriers to program integration, collaboration, and leveraging limit opportunities to streamline services and lock complementary funding sources into silos. Rate-setting and regulatory challenges can create uncertainty *and* new possibilities. Insecure, inadequate, or inequitable program funding can limit the transformative effect of low-income programs.
- Data limitations. Data limitations impede innovative and adaptive approaches to reaching low-income residents and stymie collaborative efforts.
- Unrecognized non-energy benefits. Non-energy benefits are often not considered in cost-effectiveness tests, which devalues some of the most important factors that motivate investment in clean energy upgrades, such as family health and safety, comfort, and tenant retention.

Local Small Business Challenges and Opportunities in Disadvantaged Communities

This report also describes challenges and opportunities for local small businesses in disadvantaged communities, including contracting opportunities with state government. Available statistical information indicates thousands of small businesses are in zip codes with disadvantaged communities. Barriers to expanding small business contracting opportunities in disadvantaged communities include:

- Lack of access to information on small businesses in disadvantaged communities, including success stories, funding opportunities, incentives for local hiring and training, the amount of funding awarded to small businesses in disadvantaged communities and funding criteria, and insufficient targeted outreach.
- Technical assistance and workforce development needs. Technical assistance is needed to help local small businesses in disadvantaged communities meet certification and solicitation requirements and address workforce recruitment and retention issues.
- Financial obstacles. Local small businesses in disadvantaged communities face financial obstacles related to business cost structure, self-financing requirements, and insufficient access to private funding.
- Keeping the Playing Field Level. There is a need for greater access to mentorship, networking, and subcontracting opportunities to help small businesses build a record of success with government contracting, as well as tight controls to ensure compliance with existing subcontracting requirements.

Principal Recommendations

In keeping with the mandate created by SB 350, the Energy Commission offers several recommendations. Special attention has been given to crafting recommendations that offer scalable, sustainable solutions; address low-income customers' inability to access traditional financing mechanisms available to most Californians; and help maximize public investments. Many of these recommendations are designed to address multiple barriers. These recommendations should be implemented with recognition of existing and in-development efforts to address low-income barriers, and lessons learned from prior and existing efforts should be incorporated as appropriate. Some of these recommendations may warrant further analysis and stakeholder discussion as policy makers consider them for implementation.

This report identifies the following five principal recommendations to promote a coherent vision for low-income clean energy programs, explore innovative solutions to expanding access, and ensure that economic benefits of public investments are realized by low-income customers and disadvantaged communities.

1. The State should establish a task force to facilitate coordination of all state agencies administering energy, water, resilience, housing, and low-emission transportation infrastructure programs for low-income customers and disadvantaged communities. To reach more customers, the task force should seek to align program eligibility requirements and reduce redundancies and administrative overhead. This effort should encourage collaboration, standardization, streamlining, integration, and cofunding opportunities with related federal, state, and local agencies, including actions to:
    a. Expand existing direct-install energy programs to include upgrades for water-efficient appliances for customers in low-income and disadvantaged communities.
    b. Initiate pilot programs that address entire neighborhoods in disadvantaged communities, rather than building-by-building. Future expansions could include neighborhoods outside disadvantaged communities but that include a significant proportion of low-income households.
    c. Ensure that energy retrofit programs facilitate access to available funds from programs that address non-energy work, such as asbestos, lead, and mold removal and structural maintenance so that work can be conducted in conjunction with energy upgrade projects. Explore the potential for energy upgrade programs to coordinate with local housing rehabilitation efforts in low-income and disadvantaged communities.
    d. Develop a comprehensive action plan on improving opportunities for energy efficiency, renewable energy, demand response, energy storage, and electric vehicle infrastructure for multifamily housing, with attention to pilot programs for multifamily rental properties in low-income and disadvantaged communities.
    e. Engage with the federal government to explore program development opportunities, share best practices, and leverage research and cofunding potential for all energy, water, and housing programs.
    f. Ensure all state programs identify and prioritize best practices in other states with high-functioning programs that serve low-income and disadvantaged communities.
    g. Leverage local government planning initiatives to enhance low-income clean energy deployment programs.
    h. Establish common definitions of non-energy benefits, develop standards to measure them, and attempt to determine consistent values for use in all energy programs.

i. Establish an expert advisory committee to align future low-income program modifications with the latest market trends and industry best practices. This committee should be comprised of representatives from clean energy finance, information technology experts, building property owners, and other marketplace actors with expertise needed to design and implement effective financial, housing, and related energy service programs for low-income customers and disadvantaged communities.

j. Use program data resulting from recommendation #5 to inform actions taken by the task force.

2. The State should act to enable the economic advantages of community solar to be readily accessible to low-income and disadvantaged populations across California (for investor-owned utilities [IOUs], publicly owned utilities [POUs], and other load-serving entities). Where feasible, community solar installations should be deployed in the low-income and disadvantaged communities they serve, with priority given to locations that maximize benefits to the distribution system.

    a. The Legislature could authorize exemptions and incentives for low-income IOU customers so that the cost of community solar does not exceed the cost of onsite solar. These subsidies could be time-limited and declining.

    b. The governing boards of POUs should consider developing community solar offerings for low-income customers within their territories.

3. The Energy Commission, California Public Utilities Commission (CPUC), and California Department of Community Services and Development (CSD) should partner with the California Labor and Workforce Agency, the Workforce Investment Boards, community colleges, and other agencies, as well as consult with employers, the UC Berkeley Labor Center and the relevant trade unions and community-based organizations, to strategize and track progress of workforce, community, and clean energy goals. This strategy should consider the following:

    a. The Legislature should establish a green workforce fund to allow state-administered clean energy and transportation programs to include a local workforce development component for low-income and disadvantaged communities. This workforce development should be provided through direct hiring and training, through community-based organizations that have demonstrated to have hired and trained locally, or with organizations that run pre-apprentice or apprenticeship programs.

    b. Energy service companies that demonstrate a commitment to hiring employees in low-income and disadvantaged communities should receive preference points, similar to incentives offered through the Target Area

Contract Preference Act (TACPA), when competing for state or utility contracts. A set of contractor and workforce standards and other interventions should be included in the program requirements for clean energy incentive programs.

c. Expand the use of community workforce agreements for clean energy contracting in disadvantaged communities.

d. IOUs should coordinate their workforce education and training programs with California's main training and education institutions, with a focus on disadvantaged communities.

4. The State should continue developing a series of energy upgrade financing pilot programs to evaluate a variety of models to improve access and participation of low-income customers, including those in disadvantaged communities. The pilot programs would include the cost of health and safety measures required to accomplish energy efficiency upgrades. Possible pilots include:

    a. The CPUC should consider developing a tariffed on-bill pilot for investments in energy efficiency that targets low-income customers regardless of credit score or renter status, and that do not pass on a debt obligation to the customer. Utilities could use the program to make energy upgrade investments and recover the cost through the bill, so long as the recovery charge is less than the estimated savings. The Energy Commission should encourage and provide technical assistance to POUs and other load-serving entities seeking to implement a tariffed on-bill pilot.

    b. The Legislature could authorize development of a pilot program to provide low-income customers the option to use their California Alternative Rates for Energy (CARE) subsidy or other subsidies to purchase shares in a community solar offering. Flexible CARE alternatives should be guaranteed to reduce energy bills by at least as much as the CARE discount. This model could be extended to enable CARE customers to redirect their CARE subsidy to energy efficiency upgrades.

    c. The State Treasurer's Office, in coordination with other state entities, could offer a credit enhancement pilot program to encourage financing for energy improvements for market-rate, low-income multifamily housing and commercial, community, and industrial buildings in disadvantaged communities. Options could include establishing a financial warehouse line of credit or subordinated capital.

    d. The State Treasurer's Office could establish a pilot program to evaluate the potential for social impact bonds to increase investment in energy upgrades for low-income customers.

5. The Legislature should require collaboration among all program delivery agencies to establish common metrics and collect and use data systematically across programs to increase the performance of these programs in low-income and disadvantaged communities, including requirements to:

    a. Develop standardized energy equity indicators as metrics to ensure low-income customers are being served. Use these metrics to set a statewide baseline, advance energy savings, and track performance.

    b. Target program services to increase coverage and improve equity.

    c. Develop a common database for use by program delivery agencies and other community partners.

    d. Use market intelligence to achieve data-driven program design and target best intervention strategies that serve low-income needs.

    e. Ensure that low-income persons have product selection options and information necessary to avoid driving up their plug-load energy use, recognizing that low-cost appliance and consumer products are commonly less energy-efficient than other appliances and products.

    f. Ensure that program participation includes a condition for permission to access participant, project, and pre-/post-consumption data by the State to enhance service delivery, evaluation, and planning. Where viable, such data should be made public.

    g. Establish standardized metrics to track employment and job quality impacts of clean energy programs.

Additional Recommendations

This report recommends seven additional strategies to address the barriers identified in this study and complement the principal recommendations provided above.

6. The Legislature should expand opportunities for low-income and disadvantaged communities to use photovoltaic and solar thermal technologies by:

    a. Instructing the IOUs to implement programs, such as the Multifamily Affordable Housing Solar Roofs Program, to achieve an equitable penetration rate among low-income customers.

    b. Directing the governing boards of POUs to consider developing or expanding pilot programs that provide solar for low-income customers and disadvantaged communities.

    c. Emphasizing special attention to tribal communities and communities not served by utilities.

7. The California Tax Credit Allocation Committee (TCAC) should consider enhancing the priority of affordable housing tax credits for housing rehabilitation projects to include onsite energy efficiency and renewable energy upgrades. In addition, with funding provided by State policymakers, California Alternative Energy and Advanced Transportation Financing Authority (CAEATFA) should consider providing financial assistance, such as credit enhancements, to support energy efficiency and renewable energy improvements to coincide with TCAC tax credit events at rehabilitation.

8. The State, in consultation with Energy Commission, CPUC, ARB, CSD, and other related state and local agencies, should establish a pilot program for multiple regional one-stop shops to provide technical assistance, targeted outreach, and funding services to enable owners and tenants of low-income housing across California to implement energy efficiency, clean energy, zero-emission and near-zero emission transportation infrastructure, and water-efficient upgrades in their buildings. This pilot program should also support a range of local service delivery providers, coordinate with local government energy programs, and leverage existing Web portals, such as Energy Upgrade California®, with information provided in a variety of languages and in a format relevant to local low-income communities. Regional pilot programs should build on the best models for comprehensive one-stop models both in California and other states.

9. The State, in coordination with local authorities and consumer protection agencies, should investigate the need for heightened consumer protection to help prosecute companies that use misleading information or engage in predatory practices to take advantage of low-income customers and small businesses in disadvantaged communities seeking access to clean energy benefits.

10. The Legislature should direct funding for all state programs to collaborate with trusted and qualified community-based organizations in community-centric delivery of clean energy programs, in coordination with local governments, to:

    a. Communicate program information to customers and obtain ongoing feedback from customers.

    b. Communicate contract information to local small businesses in disadvantaged communities.

    c. Develop local workforce to expand access to entry-level and high-quality jobs in the clean energy economy.

11. The Energy Commission and CPUC should direct research, development, demonstration, and market facilitation programs to include targeted benefits for low-income customers and disadvantaged communities.

a. The Energy Commission's Electric Program Investment Charge (EPIC) Program should target a minimum of 25 percent of technology demonstration and deployment funding for sites located in disadvantaged communities.

b. Energy Commission research development and deployment programs should conduct forums to share best practices and case studies on current projects located in disadvantaged communities.

c. The Energy Commission should analyze potential business models that would create market opportunities for emerging clean energy technologies to be deployed in a manner that directly benefits low-income customers and disadvantaged communities, including, but not limited to, tribal communities, rural communities, and mobile home communities.

d. The Energy Commission should sponsor prize competitions and challenges to spur novel ideas and solutions for bringing clean energy technologies to low-income customers and disadvantaged communities.

e. The IOUs – PG&E, SCE, and SDG&E – should identify opportunities to locate technology development and deployment projects in disadvantaged communities in all future EPIC Investment Plans, including their 2018-2020 EPIC Investment Plans.

f. The CPUC should review its programs to identify additional investment opportunities for cleaner sources of heating in disadvantaged communities in the San Joaquin Valley to support the goals of Assembly Bill 2672 (Perea, Chapter 616, Statutes of 2014).

12. The State should conduct an in-depth, data-driven study in consultation with local business chambers, CBOs, technical assistance providers (such as small business development centers and the Office of Small Business Advocate) and small businesses to determine actions for increasing contracting opportunities for small businesses in low-income and disadvantaged communities. A potential scope of this work is provided in Appendix C.

Next Steps

After publication of this report, the Energy Commission intends to hold implementation workshops in early 2017, with participation of other state agencies and key stakeholder groups. The purpose of these workshops will be to consider the specific implementation details of this report's recommendations, develop timetables and potential funding sources, and consider new information from ongoing low-income clean energy efforts. Moving forward, the Energy Commission will continue to monitor the status of the recommended actions to help track progress over time.

CHAPTER 1: Introduction

Purpose

Governor Edmund G. Brown Jr. signed the Clean Energy and Pollution Reduction Act of 2015 (Senate Bill 350, De León, Chapter 547, Statutes of 2015) on October 7, 2015. The bill establishes new energy efficiency and renewable electricity targets for 2030 to support California's long-term climate goal of reducing greenhouse gas emissions by 40 percent below 1990 levels by 2030. The statute also finds that there is insufficient understanding of the barriers for low-income and disadvantaged communities to access energy efficiency investments, weatherization, solar photovoltaic energy generation and other forms of renewable generation, and contracting opportunities for small businesses in disadvantaged communities. For this reason, SB 350 directs the Energy Commission to conduct a study on the following topics:

- 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 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 to contracting opportunities for local small businesses in disadvantaged communities.
- Barriers for low-income customers to zero-emission and near-zero-emission transportation options, including those in disadvantaged communities, as well as recommendations on how to increase access to zero-emission and near-zero-emission transportation options to low-income customers, including those in disadvantaged communities (addressed in Part B of this study, to be completed by the Air Resources Board).

Over the last few years, the Energy Commission has repositioned itself to make fuller commitments to promote diversity and empower disadvantaged communities. On November 7, 2013 Chair Robert Weisenmiller expressed a formal commitment to increase the participation of diverse business enterprises in the implementation of the Electric Program Investment Charge (EPIC) Program, and Commissioner Janea Scott made a similar commitment for the Alternative and Renewable Fuel and Vehicle Technology Program (ARFVTP) program. In February 2014, the Energy Commission formed a Diversity Working Group to create a commission-wide approach for this priority and help coordinate diversity efforts within the agency. On April 8, 2015, the Energy Commission adopted the Diversity Policy Resolution, outlining its commitment

to ensure all Californians have an opportunity to participate in and benefit from Energy Commission programs that can lead to job creation and training, improved air quality, and energy efficiency and environmental gains.[1]

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 percent of its electricity from renewable sources by 2020. SB 350 set new goals of doubling the state's energy efficiency measures and procuring 50 percent of electricity from renewable sources by 2030. The important gains that the state has achieved in energy efficiency and renewables, however, are not evenly distributed, and low-income customers often are left behind as California races toward a 21st century energy paradigm.

The findings of this study, therefore, represent a moment 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.

Low-income households with a diminished burden on their utility bills may choose to *increase* their energy consumption to improve the comfort or health of the household. (This situation is commonly referred to as the rebound or take-back effect.)[2] Upgrades and repairs that allow a low-income household to consume more energy to improve family health and comfort drive such programs. Promoting energy equity means striking a balance between social justice and climate change mitigation.

According to the federal poverty guidelines, 33 percent of California households are classified as low-income. The vast majority (93 percent) of low-income households are located in urban areas. 70 percent are renters, 47 percent live in multifamily housing. Just 20 percent of multifamily units are rent-assisted, while the rest operate at market rates. Poverty is not evenly distributed throughout California; the San Joaquin Valley and some areas in Northern California have the greatest concentration of low-income households. The coastal metropolises and the Central Coast region have the lowest rates of low-income homeownership. Fifty-four percent of low-income households use a primary language other than English, and 64 percent identify as nonwhite.[3]

---

1 http://www.energy.ca.gov/commission/diversity/documents/pdfs/diversity_policy_resolution.pdf.

2 Clinton, Jeanne, 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. As an example, according to survey data from 2013, 23 percent of participants reported no net utility bill savings after signing up for CARE. See Evergreen Economics, 2013b, Figure 69.

3 All data are from studies published between 2013 and 2016. See Appendix B for sources and more in-depth data of Californian low-income demographics and energy characteristics.

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; children and the elderly are particularly vulnerable to adverse health effects from energy insecurity. . Reduced lighting can make it difficult for children and adolescents to study and complete school assignments, which, in turn, affects their academic success (Drehobl and Ross, 2016). In addition, 6 percent of low-income Californians use propane, wood, or coal to heat their homes, rather than electricity or natural gas, which presents challenges and opportunities for increasing energy efficiency in low-income homes (Evergreen Economics, 2013b).

Low-income customers also face a disproportionate risk of utility disconnections. In 2014-2015, utility disconnections by California's three largest investor-owned utilities for failure to pay energy bills affected 5 percent of low-income customers, compared with only 1.3 percent of moderate and high-income customers (Evergreen Economics, 2016). 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).

> *"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

Policies that increase low-income adoption of energy efficiency measures and on-site renewable resources can 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 two-thirds of eligible households since 2006, which is both a considerable achievement and an opportunity for further progress.[4] 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

4 These program numbers are for Energy Savings Assistance programs between 2006-2015. The estimate for the number of eligible households is based on the number of CARE participants. See Attachment 1 of *Compliance Filing of Pacific Gas and Electric Company (U 39-m)*, on Behalf of Itself, Southern California Gas Company (U 904-g), San Diego Gas & Electric Company (U 902-m), and Southern California Edison Company (U 338-e), Regarding Annual Estimates of CARE Eligible Customers and Related Information, 2016, http://docs.cpuc.ca.gov/PublishedDocs/Efile/G000/M158/K388/158388665.PDF.

to middle- and upper-income households, the same benefits have not yet accrued for low-income households on a large scale."

Method

There are two parts to this report. Part A is reported herein; Part B (developed by the Air Resources Board) is reported separately. Part A of this study was informed by staff review of the literature, grassroots outreach through seven community meetings across the state, and public technical workshops.[5] In addition, the Air Resources Board's SB 350 efforts provided some insight into barriers low-income customers face to access programs, funding and financing mechanisms, information, and technologies.

Literature Review

The Energy Commission reviewed more than 100 available studies on the topics identified in SB 350. Much of the discussion in this report on access to renewable energy technologies focuses on solar photovoltaic (PV) systems due to the predominant position of solar in the field of residential renewables.[6]

This review highlights that the most common barriers are high upfront 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 seven meetings across the State conducted by community-based organizations. The meetings were held in the following locations: (in chronological order: East Los Angeles, Fresno, Riverside, Oakland, Truckee/South Lake Tahoe/Sierra Mountain region, Ukiah, and Los Angeles). One hundred fifty-eight members of the public participated (see Appendix B). These meetings provide an opportunity for community members to speak about their experiences with energy efficiency, weatherization, and renewable energy programs, as well as roundtable discussions with representatives of program delivery partners. Public comments at the community meetings revealed crucial insights, such as grassroots desire to participate in community solar projects, potential participants' interest in energy upgrades for the related non-energy benefits, and a degree of skepticism toward government action and program offers.

Energy Commission Workshop on Barriers

---

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.

6 Lampton et al (2010) notes 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."

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 energy efficiency and renewable energy (especially rooftop PV) for low-income customers and disadvantaged communities. The workshop also included a discussion on opportunities for addressing barriers for local small businesses in disadvantaged communities. The discussion provided useful input to help identify additional opportunities and solutions.

Energy Commission Workshop on Draft Study

On September 13, 2016, the Energy Commission hosted a workshop to solicit public input on a staff draft of the Low-Income Barriers Study. The public workshop generated robust feedback on technical aspects and on-the-ground implementation of programs and initiatives, as well as targeted suggestions for overcoming key barriers.

Appendix B provides further information on community meetings and public workshops related to this report.

Recommendations

This report provides recommendations to address barriers to low-income customers' access to energy efficiency and renewable energy investments and small business contracting opportunities in disadvantaged communities. The executive summary contains all 12 recommendations. Recommendations are also discussed in Chapters 3-5.

Definitions of Low-Income Customers/Residents and Disadvantaged Communities

This report does not use a specific definition for low-income customers, recognizing that California energy programs use several metrics for determining program eligibility and defining low-income Californians. For example, the California Alternative Rates for Energy (CARE) uses 200 percent of the federal poverty level as an eligibility threshold. By this measure, 32 percent of IOU customers are low-income (Evergreen Economics, 2013b). According to the California Poverty Measure, 21 percent of Californians live in poverty, and another 20 percent live near the poverty line.[7]

This report uses the definition of disadvantaged communities included in SB 350 (PUC Code § 400 [d]), which relies on Health and Safety Code § 39711 to identify disadvantaged communities based on geographic, socioeconomic, public health, and environmental hazard criteria, as addressed in the California Environmental Protection

7 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. 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

Agency's (CalEPA) California Communities Environmental Health Screening tool (CalEnviroScreen).[8]

Companion Study on Access to Zero-Emissions Transportation and Near Zero-Emissions Transportation for Low-Income Customers

SB 350 also finds that there is insufficient understanding of the barriers to access zero and near-zero emission transportation options for low-income customers, including in disadvantaged communities. Thus, the Air Resources Board has been tasked with developing and publishing Part B of this study on or before January 1, 2017.

The Energy Commission and the Air Resources Board are coordinating closely on this effort. Staff will identify areas of synergy between both efforts of this study. Given that there are significant intersections between clean transportation, renewable energy, and energy efficiency, it is unsurprising that several barriers are cross-cutting. For example, there is an outstanding need for community access to information on programs, rebates, and incentives and insufficient marketing, education, and outreach continues to be a barrier to expanding access to and awareness of clean transportation, renewable energy, and energy efficiency. Additionally, some 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. Furthermore, the difficulties to installing energy efficiency and renewable energy home upgrades are applicable in efforts to develop zero-emission and near zero-emission transportation infrastructure in low-income housing, particularly for rental properties.

8 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/.

CHAPTER 2:
Energy-Related Financial Programs for Low-Income Customers in California

This chapter describes the major energy-related programs in 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 facilitate investment in energy efficiency or renewable energy on the customer side of the meter.

- 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)
        - Multifamily 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
- Publicly-Owned Utility Programs
- Other Programs

Table 1: Low-Income Energy Programs

Agency	Program Name	Purpose	Eligibility Definition & Upper Threshold Example for Los Angeles Family of Four	Funding
CSD	Low-Income Home Energy Assistance Program (LIHEAP)	energy bill assistance and crisis, weatherization	60% of state median income. *Upper Threshold: $48,275*	Bill Assistance: $132.4M (2016) Weatherization: $44.1M (2016)
CSD	Weatherization Assistance Program (WAP)	weatherization	200% federal poverty level. *Upper Threshold: $48,600*	$5.8M (2016)
CSD	California Low-Income Weatherization Program (LIWP)	solar, weatherization	60% state median income and in disadvantaged area (80% of area median income (AMI) for PV). *Upper Threshold: $48,275*	$174M (total)
CPUC	Single-Family Affordable Solar Homes Program (SASH)	solar	80% of AMI, single-family homeowners. *Upper threshold: $49,920*	$162M (total)
CPUC	Multifamily Affordable Housing Solar Homes Program (MASH)	solar	multifamily housing; local hiring requirement	$162M (total)
CPUC	California Alternate Rates for Energy (CARE)	energy bill assistance (30-35% discount on electricity and 20% discount on natural gas)	200% federal poverty level. *Upper Threshold: $48,600*	$1.281B (2016)
CPUC	Family Electric Rate Assistance Program (FERA)	energy bill assistance (12% discount on electricity)	250% federal poverty level. *Upper Threshold: $60,750*	$7.43 M (2015)
CPUC	Energy Savings Assistance Program (ESAP)	weatherization	200% federal poverty level. *Upper Threshold: $48,600*	$391M (2016)
CEC	New Solar Homes Partnership (NSHP)	solar	newly constructed single family and multifamily housing	$25.8 (total for affordable housing projects)

Sources: Program funding figures determined through correspondence with relevant program administrators.

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 Home 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, Native American tribes and tribal organizations, and U.S. territories. CSD administers California's share of LIHEAP and allocates LIHEAP funding to private, nonprofit, and local government community-based organizations to provide services to low-income households. The maximum income level for eligibility of LIHEAP services is 60 percent of state median income. LIHEAP services help low-income households pay utility bills, resolve crises such as utility assistance shutoffs, and increase home energy efficiency through weatherization. LIHEAP weatherization is available to all housing types, including renters and homeowners, regardless of the energy fuel used to heat and cool their homes.

California's share of LIHEAP funding was $152.8 million in 2014, $173.6 million in 2015, and $176.5 million in 2016. Most of that funding provides assistance for payment of utility bills. As required in California statute, each year CSD requests a federal waiver to spend up to 25 percent of LIHEAP funding for weatherization services. The total amount of LIHEAP weatherization funding for the past three grant years is nearly $125 million, which is by far the largest source of federal weatherization funding administered by CSD. The energy efficiency measure offerings of LIHEAP weatherization include attic and wall insulation, energy efficiency refrigerators, evaporative coolers, air conditioners, weather stripping, building envelope sealing, and window and door replacements.

California has also used LIHEAP funding to bring the multiple benefits of photovoltaic (PV) solar power to low-income communities. 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)

A second pilot program, administered between 2013 and 2015 in partnership with the investor-owned utilities (IOU) and the CPUC, used $1.6 million of California's LIHEAP allocation to install 311 solar water heating systems on low-income homes. The pilot showed a reduction in the cost of installing solar water heating (compared to systems installed under the existing CSI thermal program), and it leveraged the generous CSI

thermal rebate reserved for low-income installations. In fact, until the pilot began, not a single low-income thermal rebate had been issued.

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 Native American tribes to improve energy efficiency in low-income homes. Funds are allocated by CSD to private, nonprofit, and local government 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 energy efficiency measure offerings of the WAP include attic and wall insulation, energy efficiency refrigerators, evaporative coolers, air conditioners, weather stripping, building envelope sealing, and window and door replacements.

To be eligible for CSD's WAP, applicants must be a California resident, need financial assistance for home energy costs, and meet the income requirement of 200 percent of the federal poverty level or less.

California's share of WAP funding was $4.9 million for 2014, $5.2 million for 2015, and $5.8 million for 2016. Services are provided by community action agencies, energy agencies, and other local providers.

California Low-Income Weatherization Program

CSD's Low-Income Weatherization Program (LIWP) was established in 2014 and is funded with California cap-and-trade auction proceeds. LIWP provides for the installation of solar photovoltaics, solar hot water heaters, and energy efficiency measures in low-income single- and multifamily homes in disadvantaged communities. The program is designed to reduce greenhouse gas emissions while providing important cobenefits to disadvantaged communities like lower energy bills and employment. About $174 million of cap-and-trade auction proceeds were appropriated to CSD for LIWP in the 2014-2015, 2015-2016 and 2016-17 state budgets.

To be eligible, single-family homes and small multifamily dwellings (fewer than 20 units) must be within a disadvantaged community as identified in CalEnviroScreen, 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).

Energy efficiency and weatherization services under LIWP are provided through a network of local nonprofit and governmental agencies. Single-family solar photovoltaic services are managed on a statewide basis by GRID Alternatives, while the Association for Energy Affordability acts as the statewide administrator of the LIWP Large Multi-Family Program component. Single-family, owner-occupied homes with incomes up to 80 percent of the area median income are eligible to receive solar PV. More than $48.8 million of the $154 million allocation is being used to install more than 12 megawatts, benefitting an estimated 3,585 low-income households.

California Public Utilities Commission Programs

California Alternate Rates for Energy

The California Alternate Rates for Energy (CARE) program, established in 1989, 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. On June 10, 2016, in Decision 16-06-018, 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 continue the CARE program through 2016 at existing authorized 2015 funding levels ($1.281 billion). In November 2016, CPUC approved CARE program funding through 2020, with total annual program funding ranging from $1.289 to $1.315 billion.[9]

Survey data from 2013 indicate that 77 percent of eligible households were aware of CARE, up from 74 percent in 2007, although there was a significant gap between households that did or did not speak English as the primary language.[10] Households of seniors, single parents, and Spanish speakers are more likely to be enrolled in CARE,

9 CPUC Decision 14-11-007, http://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M169/K716/169716736.PDF

10 Sixteen percent of English-only eligible households were unaware of CARE, whereas 36 percent of households that did not speak English as the primary language were unware of CARE. See Evergreen Economics, 2013b.

while homeowners and high-energy usage households are less likely to be enrolled (Evergreen Economics, 2013b). According to survey data, 66 percent of eligible households were enrolled in CARE (Evergreen Economics, 2016).[11]

Family Electric Rate Assistance Program

The Family Electric Rate Assistance Program (FERA) is a federal program overseen by CPUC in California. FERA provides bill discounts for families whose income slightly exceeds the CARE allowances and is available for customers of 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 CPUC 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 both renters and homeowners in all housing types, including single-family, multifamily, and mobile homes. 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.[12]

In 2015 PG&E, SCE, SDG&E, and SoCal Gas treated 255,225 homes at a cost of roughly $280.3 million (PG&E et al, 2016).[13] In November 2016, CPUC approved total annual ESA program funding through 2020 ranging between $372.7 and $394.7 million.[14]

---

11 The methodology employed by Evergreen Economics may underestimate the percentage of enrollees in CARE, as SCE points out. SCE estimates that, within its jurisdiction, 82 percent of eligible CARE customers are enrolled in the program. See SCE, written comments, December 8, 2016, http://docketpublic.energy.ca.gov/PublicDocuments/16-OIR-02/TN214705_20161208T150856_Andrew_Dugowson_Comments_SCE_Comments_on_SB_350_Recommendations.pdf

12 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.

13 CPUC Decision 16-06-018 authorized bridge funding for the investor-owned utilities to continue the ESA Program through 2016 at existing 2015 authorized funding levels (about $195 million) through 2016). Decision 16- 06-018 authorized another bridge fund for the period July 1, 2016, to December, 31, 2016, of up to 50 percent of 2015 funding, or roughly $195 million, to continue ESA pending authorized funding for the next program cycle. A subsequent decision addressing funding for future program years is anticipated before the end of 2016.

14 CPUC Decision 14-11-007, http://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M169/K716/169716736.PDF

Consumer awareness of ESA has increased markedly over the past decade. Survey data indicate that just 27 percent of eligible participants were aware of ESA in 2007. That figure increased to 68 percent in 2013. Between 2006 and 2012, the annual ESA participation rate increased from 3 percent to 5 percent. Recent studies indicate that the average ESA household experienced 3 to 6 percent savings in electricity and 2 to 7 percent natural gas savings. Many of the most common measures are fairly simple, such as water heater insulation and faucet and lighting replacement (Evergreen Economics, 2013b).

Renewable Energy Programs – CPUC or California Energy Commission

California Solar Initiative

The California Solar Initiative (CSI), enacted 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 Solar Homes Partnership (NSHP) Program provides incentives for onsite solar on newly constructed homes in IOU territories. Low-income customers in CARE are exempt from paying the surcharge that funds these programs. 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. SASH is administered by GRID Alternatives, a nonprofit organization based in Oakland, California.

SASH connects low-income customers to home solar systems through direct ownership or power purchase agreements with third-party owners. The program has installed and interconnected 6,010 photovoltaic systems, with hundreds more in development.[15] Together, these projects represent 18.8 MW of solar capacity and $100 million in incentives. Average 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 28,800 volunteers[16]; by using volunteer labor, GRID Alternatives has reduced installation costs, since labor normally represents about 10 percent of system cost (McCormick, 2015). As of October 2016, GRID Alternatives reports that 406 of its trainees have found employment in the solar industry since 2015.[17]

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 multifamily housing served by investor-owned utilities to further buy down the cost of a solar electric system beyond the incentives generally available through CSI. It 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. Average annual energy bills for MASH tenants that received direct

15 http://www.cpuc.ca.gov/General.aspx?id=3043.

16 http://www.cpuc.ca.gov/General.aspx?id=3043.

17 Data obtained via email correspondence with Grid Alternatives. GRID Alternatives began tracking job placements in 2015.

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).

MASH offered two incentive levels: a higher incentive level for portions of a system that offset tenant load using virtual net metering and certify through affidavit that tenants will receive 50 percent of the economic benefit of the allocated generation; and a lower incentive level for portions of a system that offset common area load, nonvirtual net metered tenant load, or virtual net metered tenant load that does not commit to a 50 percent tenant benefit.

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. The Navigant CSI study (2015) concluded that SASH and MASH nurtured a nonprofit solar industry targeting low-income customers that might not have otherwise developed.

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 taking rebate reservations through June 2018 and to disburse all rebates by 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.[18] For affordable housing projects, incentives are available for up to 75 percent of total system cost. As of October 2016, the NSHP Program had installed 9.48 MW of solar on affordable housing, representing about 12 percent of total program installed capacity.

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

18 NSHP allows projects to be eligible for the higher affordable housing incentive tier for developments where at least 20 percent of the project units are reserved for low- to moderate-income households for at least 10 years, so long as the photovoltaic system is owned by a tax-exempt entity. See *New Solar Homes Partnership Guidebook, Ninth Edition*, Energy Commission, July 2015.

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). 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 includes two components. The Green Tariff option enables customers to pay an additional charge to the utility so the customer can be served by 50 or 100 percent renewable energy. The Enhanced Community Renewables option promotes community solar projects for IOU customers, enabling them to invest in community-scale (up to 20 MW) renewable projects and receive a bill credit on their utility bill. The program has a statewide cap of 600 MW.

However, GTSR reserves 100 MW of the program total for projects up to 1 MW that are located in the 20 percent of most disadvantaged census tracts in each IOU territory, as identified by CalEnviroScreen. No community solar projects have yet been developed under GTSR.

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 10 percent of available funds from the IOUs' greenhouse gas allowance proceeds or $100 million (whichever is less) annually through 2020, with the possibility of extending the program through 2026 for solar energy systems on qualified affordable multifamily housing.[19] The legislation stipulates that a local hiring requirement must be established. CPUC is in the process of implementing this program.

---

19 According to one estimate, AB 693 might reach one-third of affordable housing units in California. See 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.

Publicly Owned Utility Energy Programs

Publicly owned utilities (POUs), which serve about 24 percent of California's retail electricity sales, offer a variety of programs for low-income weatherization and efficiency upgrades, and low-income rate discounts. Many POUs offered rooftop solar programs pursuant to SB 1. For example, San Francisco PUC operates a rooftop PV program for low-income customers that installed 111 systems (totaling 348 kW) in 2015.[20] Some have also offered community solar programs.[21] For example, the Energy Assistance Program Rate offered by SMUD provides a 44 percent discount on low-income participants'' electric bill. And LADWP's Home Energy Improvement Program offers free energy and water efficiency retrofits and prioritizes its neediest customers. The POUs' myriad energy efficiency and weatherization services, including those targeting low-income housing, spent nearly $163 million (in total) on such programs in the 2014-15 fiscal year.[22]

Other Programs

The list of programs described above is not comprehensive. Rather, those programs represent just the largest or most commonly cited programs. There are many federal, state, and local government funding programs that are targeted at expanding the availability of affordable housing or addressing health and safety dangers in low-income homes. Examples include:

- Programs administered by the California State Treasurer's Office (for example, 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).
- Programs administered by the Department of Housing and Community Development affordable housing financial assistance programs (see http://www.hcd.ca.gov/financial-assistance/).
- California Housing Finance Authority (CalHFA) home loan programs.

---

20 Data from POU reporting on SB 1 activities to Energy Commission staff.

21 Current community solar programs are not typically marketed directly to low-income customers, but they are available. For example, Sacramento Municipal Utility District's (SMUD) SolarShares program buys the output of local, community-scale photovoltaic systems under 20-year PPAs, and then resells the solar power to participating customers. Bill credits, equivalent to the amount of the energy the customer buys from SolarShares, are credited to the customer through virtual net metering at the retail value of the electricity generated. SolarShares has a 1 MW PV system, which was sold out to 700 participating commercial and residential customers within 6 months of program start-up in 2008. The fee to participating customers for the electricity generated is significantly higher than the current cost of electricity supplied by SMUD's grid, but the fee to customers who stay with the program will not increase. See *A Guide to Community Shared Solar: Utility, Private, and Nonprofit Project Development*. U.S. Department of Energy, May 2012.

22 A fuller breakdown of energy efficiency program performance by POU can be found in *Energy Efficiency in California's Public Power Sector: A 2016 Status Report*, NCPA/CMUA/SCPPA, 2016.

- Federal financing programs for upgrades to low-income housing, such as the U.S. Housing and Urban Development (HUD) Federal Housing Administration (FHA) Insured Energy Efficient Mortgage Program.
- Additional IOU energy programs targeting specific sectors of the low-income community, such as programs specifically targeting multifamily housing.

Often funding from these additional sources can be extremely important when used in combination with funding from other 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.

CHAPTER 3:
Structural Barriers and Solutions to Increasing Low-Income Customers' Access to Energy Efficiency and Renewable Energy

This chapter summarizes structural barriers and opportunities to increase low-income customers' access to energy efficiency and renewable energy investments. This chapter reflects information identified in the literature, community meetings, Energy Commission public workshops, and stakeholder commentary. Often, these barriers overlap, compounding one another, as will be discussed below.

Expanding access to energy efficiency and renewable energy for low-income customers requires market segmentation to address the differing needs and circumstances of renters, owner-occupants, and building owners. Where applicable, this report distinguishes among these groups when discussing specific barriers and solutions.

Increasing equitable access to energy efficiency and renewable energy in California requires nuance and sensitivity to the differing challenges facing low-income persons and disadvantaged communities.

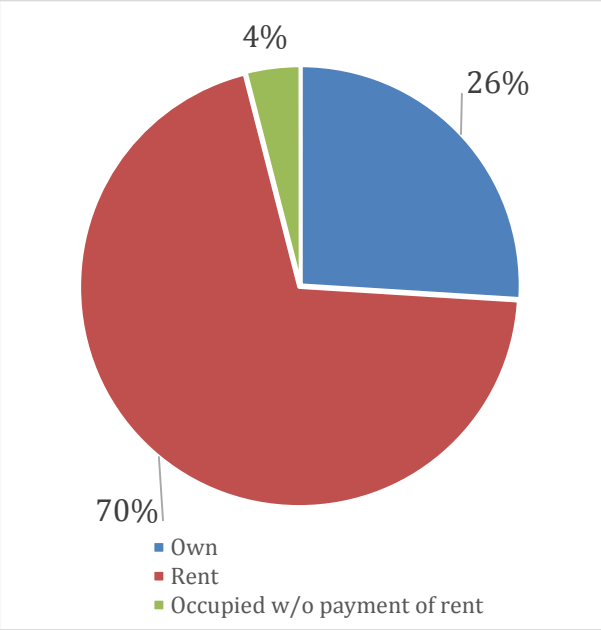
Low Home Ownership Rate

Low-income Californians are disproportionately renters: survey data in 2016 indicate that just 26 percent of low-income Californians own their homes. 47 percent of low-income households live in multifamily housing, and the vast majority of those units are rented at market rates (see Appendix A.) Consequently, any burden of insufficient energy efficiency and renewable energy programs for renters falls disproportionately upon low-income people. At the same time, care should be given to ensure that home energy upgrade efforts do not contribute to the dislocation of low-income renters. Further research into a potential connection between home energy upgrades and gentrification may be warranted.

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 weatherization improvements, or changes such as rooftop solar that have partial incentives. Many low-income renters lack the means and incentive to make fixed improvements to property they do not own. On the property owners' side, getting the renter's permission or trying to plan energy retrofits around periods of vacancy make upgrades more difficult.

The challenge of ensuring low-income renters benefit from energy upgrades while securing the property owner's participation results in a complex barrier referred to as *split incentives*. Split incentives result from situations in which the property owner declines to participate in a program because the owner will not reap the energy benefit, or financial benefits of an energy upgrade program fail to accrue to the low-income renter.

Figure 1: Low-Income Californian Housing



Source: Evergreen Economics, 2016.

The issue is particularly acute in the low-income multifamily housing sector, as low-income Californians are 39 percent more likely to live in multifamily housing than the general population (Evergreen Economics, 2013b).[23] For building units that are master-metered (which tend to be found in older buildings and make up only a small portion of low-income rentals),[24] 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.

Addressing Split Incentives

The split incentives problem is a long-standing challenge for increasing energy equity for low-income customers. A recent survey of potential ESA participants found that split incentives was the most commonly cited barrier to participation.[25] The literature and stakeholder feedback suggests several strategies for overcoming the split incentive, some of which have been highlighted in the Existing Buildings Energy Efficiency Action Plan.[26]

---

23 Forty-three percent of low-income Californian renters live in multifamily housing. See Evergreen Economics, 2013b.

24 Housing data from around 2003 indicate that about 5 percent of low-income Californians lived in master-metered units. That figure is unlikely to have increased in the intervening time. See California Public Utilities Commission, *Energy Efficiency Strategic Plan*, January 2011 Update, file:///C:/Users/nusta/Downloads/CAEnergyEfficiencyStrategicPlan_Jan2011.pdf.

25 According to a survey of CARE participants in 2013, 23 percent of respondents indicated that split incentive issues prevented their participation in an ESA program. See Evergreen Economics, 2013b, Figure 36.

26 AB 758 (Skinner, Chapter 470, Statutes 2009) required the Energy Commission to establish a comprehensive program to achieve greater energy savings in existing buildings. As part of its implementation efforts, the Energy Commission adopted the Existing Buildings Energy Efficiency action plan as a roadmap of strategies to improve energy efficiency. For the Action Plan, see Energy Commission. 2015. *Existing Buildings*

The MASH program has partially addressed the split incentive by sharing the energy savings between the building owner and the tenants and ensuring that the utility subsidy is not adjusted in affordable housing properties.[27] NRDC suggests requiring the owners of market-rate, low-income housing to enter into rent control agreements as a condition of energy retrofit services, such as is practiced by LIWP.[28] Finally, military households living in on-base housing are an often overlooked example of split incentives, since some of these families are low-income and base housing administrations are a single ownership entity.[29]

Empowering low-income persons to make energy upgrade decisions without the need for financial investment from the building owner may help overcome split incentive issues. The following solutions offer creative opportunities to overcome split incentives.

Tariffed On-Bill Investments

A variant of on-bill financing using a tariffed payment approach could be a powerful tool to increase access to energy efficiency investments for low-income renters.[30] Under this model, the utility finances the energy installation and recovers the cost by fixing a charge to the utility bill that is less than the projected energy savings. The major advantage of this approach is that it is debt-free for the customer, as well as it eliminates obstacles for low-income renters to submit to and pass a credit check. The

---

Energy Efficiency Action Plan. http://docketpublic.energy.ca.gov/PublicDocuments/15-IEPR-05/TN205919_20150828T153953_Existing_Buildings_Energy_Efficiency_Action_Plan.pdf.

27 PG&E, written comments, September 29, 2016, http://docketpublic.energy.ca.gov/PublicDocuments/16-OIR-02/TN213838_20160929T141359_Pacific_Gas__Electric_Comments_Pacific_Gas__Electric_Comments_o.pdf.

28 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.

29 Indeed, military housing can be particularly challenging to target in situations where the housing is connected to a federal grid, rather than a state utility. Some potential solutions are in the works for targeting military housing. Virtual net metering can expand the scope of possibilities for rooftop solar in military housing, particularly for buildings that are master-metered. CPUC's latest energy efficiency proceeding may increase options for upgrading military housing through a utility program. See CPUC Decision 14-11-007, http://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M169/K716/169716736.PDF. Additionally, SolarCity notes that it has partnered with owners of privatized military housing to install over 8,000 solar systems throughout the state, and has plans to install an additional 10,000 in 2017. See SolarCity, written comments, December 8, 2016, http://docketpublic.energy.ca.gov/PublicDocuments/16-OIR-02/TN214708_20161208T154814_Francesca_Wahl_Comments_SolarCity_Comments__Revised_Staff_Draft.pdf

30 One version of this model is the Pay-as-You-Save program, which has been successfully implemented in several other states. See Clean Energy Works, written comments, September 29, 2016, http://docketpublic.energy.ca.gov/PublicDocuments/16-OIR-02/TN213841_20160929T151705_Holmes_Hummel_Comments_Comments_on_Draft_Report_for_SB350_Barri.pdf; and Clean Energy Works, written comments, August 25, 2016, http://docketpublic.energy.ca.gov/PublicDocuments/16-OIR-02/TN212958_20160825T170537_Holmes_Hummel_Comments_Comment_on_SB350_Barriers_Study.pdf.

Existing Buildings Energy Efficiency Action Plan calls for evaluating the potential for on-bill financing pilots.[31]

This program would require the utility to finance the upgrade investment cost or facilitate capital commitments for those investments. A reserve fund established by the State could be useful to insure utilities against charge-offs of uncollectible program service charges billed to participants for cost recovery. Any upgrades would likely require permission from the landlord, but there would be no landlord debt obligation or property lien.

Community Solar

Community solar projects can benefit low-income renters and low-income homeowners with unsuitable roofs for onsite solar.[32] At the seven community meetings convened to inform this report, members of the public expressed their desire for community solar options for low-income and disadvantaged communities (Appendix B). Community solar also presents a potential solution for low-income homeowners with older rooftops.[33] Clean Path Ventures argues that community solar programs are geared toward targeting specific community needs.[34] Community solar targeting low-income customers could be sited in local disadvantaged communities, presenting opportunities to address environmental justice issues.

Spotlight Outside California

Colorado's Community Solar Gardens program, established in 2011, requires community solar projects to reserve a 5 percent carve-out for low-income subscribers. As of November 2015, 890 kilowatts of community solar installed capacity have been dedicated to low-income customers. Moreover, in 2015, Colorado launched a pilot with GRID Alternatives to explore varying models for community solar programs geared primarily toward low-income customers.

Source: *Colorado.gov*

A community solar project, if designed properly, can yield several benefits:

- Lower costs for individuals due to economies of scale compared to onsite solar.
- Overall energy savings.
- Local jobs.

---

31 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.

32 The federal government has recently taken steps to support the development of low-to-moderate income community solar options. See Tom Stanton and Katherine Kline, *The Ecology of Community Solar Gardening: A 'Companion Planting' Guide*, National Regulatory Research Institute, August 2016, file:///C:/Users/nusta/Downloads/NRRI%2016-07%20Community%20Solar.pdf.

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

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

- Access to renewable generation for renters, and for homeowners with poor roof conditions.

However, for a community solar project to be appealing to low-income customers, the project must require little or no up-front investment, avoid debt financing, and lower the household's electric utility bill.[35] As noted in Chapter 4, community solar offerings organized under the GTSR program may be hindered by included exit fees, which could make community solar more expensive than grid-supplied electricity and out of reach for low-income persons.

At the same time, community solar dovetails with the goals of Assembly Bill 327 (Perea, 2013), which requires electrical corporations to file distributed resources plans to CPUC.[36] These plans should prioritize areas that maximize locational and ratepayer benefits, and they have the potential to advance development of distributed energy resources such as community solar that could benefit low-income customers and create jobs in disadvantaged communities.

Shifting CARE Funds

CARE is a crucial pillar in California's low-income energy assistance portfolio. However, CARE's utility bill discount substantially lowers a low-income customer's energy costs, which blunts the bill reduction of energy efficiency measures and makes solar less economically appealing.

There may be potential to better deploy CARE funds by allowing customers to reallocate the value of their CARE discount toward energy efficiency and solar investments for low-income customers.[37] For example, IREC's CleanCARE model would redirect CARE funds toward the purchase of renewable generation from a third-party provider, such as a community solar project, which could yield greater overall bill savings.[38] Program

---

35 See, for example, IREC's method 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.

36 http://www.cpuc.ca.gov/General.aspx?id=5071.

37 Analysis conducted by the George Washington University Solar Institute, for example, concludes that shifting rate subsidies to the installation of a residential solar system would generate greater monthly electric bill reductions. See Amit Ronen, Dor Hirsh Bar Gai, and Lucas Crampton, "Can Electricity Rate Subsidies be Reallocated to Boost Low-Income Solar?", GW Solar Institute, Working Paper, July 2016.

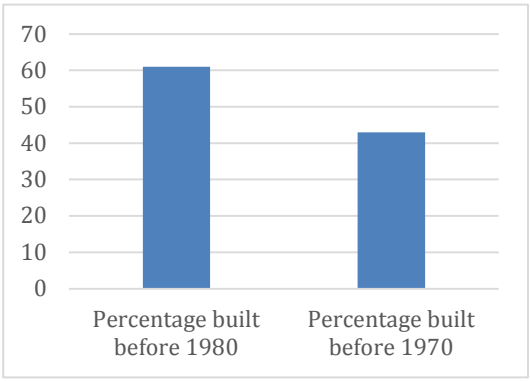
38 IREC points to a proposal it has developed, CleanCARE, in which a typical CARE customer in the SCE service territory could save 24 percent (and potentially more in the future) on the utility bill by moving off the CARE discount and instead applying the CARE funds toward community solar. IREC submitted this proposal under the CARE-ESA and NEM proceedings. The CARE-ESA proceeding, A.14-11-007, deferred the matter to the ongoing NEM proceeding, R.12-06-013. IREC notes that the existing NEM statute may require modification to allow such a proposal. 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; 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; and http://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M169/K716/169716736.PDF.

participants would opt to move to the standard rate for their rate class, freeing CARE funds for investment in community solar. Customers would then gain shares in the community solar instead of the CARE discounts, which would offset a portion of their monthly bills. Enabling the use of CARE funds to be used in this manner may require legislation.

Building Age

Older buildings are more likely to have structural or design issues that make energy efficiency and renewable energy retrofits unviable, particularly for people in disadvantaged communities, who are more likely to live older housing. These structural or design issues are likely to result in remediation costs that increase the cost of making upgrades compared to newer housing. Such costs erect barriers to access to clean energy for low-income Californians.[39]

Figure 2: California Housing Stock



Source: 2014 U.S. Census

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 discovery of asbestos, lead, or mold (IREC, 2016). Structural issues, durability, and moisture problems may also dissuade property owners from pursuing energy upgrades. One stakeholder notes that building owners are reluctant even to consider efficiency retrofits because they are worried about uncovering health and safety issues that are not eligible for program funding.[40]

Homebuilders commonly have not designed older properties to incorporate solar, resulting in physical barriers such as excessive tree shading and rooftop orientation (Grid Alternatives, 2016). And as identified by stakeholders at the community meetings, older rooftops are more likely to require significant repairs and/or structural redesign to install a solar system (Appendix B). Complicating the issue further, solar programs do not have easily accessible funding available to correct roof structural issues.[41] Data on the pervasiveness of rooftops lacking the structural capacity for solar were not identified for this study, which represents an area for future research.

---

39 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.

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

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

Community solar, discussed above, is one way to provide solar access to customers with unsuitable rooftops. Efficiency improvements, on the other hand, are more complicated to target. Mass install initiatives serving entire disadvantaged communities can help ensure that older homes are reached. Program pressures to pursue the most cost-effective projects, however, create an incentive to focus on easy-to-serve homes.

Lack of Capital, Lack of Credit

Even for the minority of low-income customers who own their homes, low-Income homeowners who have limited disposable funds may be more risk-averse and less capable of participating in energy upgrades with high up-front payments or copayments. 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.[42]

A recent study suggests that households with incomes ranging between $40,000-$55,000 have made up a greater share of total solar installations since 2008.[43] However, households under $40,000 appear to have made little progress over the same period.

Scaling up no-charge and low-charge direct install programs may be the most straightforward method for increasing access to energy retrofits within the low-income sector.[44] However, direct installation programs are costly, which makes large-scale expansion of these programs a matter for careful consideration, taking ratepayer or taxpayer willingness-to-pay into account. And mass installation programs typically do not feature deep efficiency retrofits. ESA, for example, targets a variety of simple, effective efficiency opportunities such as weather stripping, attic insulation, lighting, and heating, ventilation, and air-conditioning maintenance or replacement, among others.[45]

Commenters to the Low-income Barriers Study proceeding for this report point out that traditional financing has little value to low-income homeowners because they cannot take on additional debt, they face high competing demands for their income, and they

---

42 See, for example, California SEIA, comments at the SB 350 Low-Income Barriers Study workshop, August 12, 2016.

43 Kevala Analytics' study finds that between 2008-2015, solar installations in zip codes with an average household income between $40,000-$55,000 increased from 22 percent to 28 percent of total installations. For zip codes with an average household income below $40,000 over the same period, the figure increased from 4 percent to 6 percent. See Kevala Analytics, 2015, *White Paper: Income Distribution of Rooftop Solar Customers*, https://www.kevalaanalytics.com/whitepaper-income-distribution-of-rooftop-solar-customers-2/

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

45 Program offerings vary by utility. For a full list of eligible measures under ESA, see pages 31-33 of the *California Statewide Energy Savings Assistance Program Policy and Procedures Manual*, 2013, file:///C:/Users/nusta/Downloads/2013%20ESA%20Policy%20and%20Procedures%20Manual%235f.pdf. Note that CPUC's Decision A.14-11-007, approved in November 2016, expanded the list of eligible measures provided by ESA. See http://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M169/K716/169716736.PDF.

have a limited ability to apply and qualify for credit. Utility on-bill approaches, such as those described above, appear to be more promising than traditional debt-based financing.[46]

Traditional Financing Tools

Several financing tools are available for energy efficiency and renewable energy. While there may be opportunities to more effectively deploy these tools in the low-income sector, these programs are likely to be inaccessible to renters, and for homeowners who do not meet a certain FICO threshold or are unable to take on additional debt.

Property Assessed Clean Energy Financing (PACE)

California has long been a champion of property-assessed clean energy (PACE) financing, and the State has turned it into a success story for middle and high-income single-family homeowners. Backed by a $10 million loan-loss reserve established by Governor Brown in 2013, PACE has unlocked more than $2 billion in private funding for clean energy projects.

PACE financing ties the repayment obligation to the property through the property tax bill. Local governments often must pass authorization for the taxing and bonding authorities needed to make PACE work (Mueller and Ronen, 2015). It is not clear to what extent PACE has reached low-income customers, and most PACE programs do not collect or provide data on income levels of participants.[47] However, one commenter notes that no rent-restricted affordable multifamily housing projects have yet used PACE financing.[48] Although some PACE providers have had successes in the market-rate multifamily housing sector, targeting affordable multifamily housing may be considerably more difficult because these projects having multiple layers of financing and financial partners.

---

46 See, for example, GREEN-Energy Efficiency for All, written comments, September 29, 2016, http://docketpublic.energy.ca.gov/PublicDocuments/16-OIR-02/TN213843_20160929T152126_Maria_Stamas_Comments_Comments_of_the_GREENEnergy_Efficiency_fo.pdf; Greenlining Institute, written comments, September 29, 2016, http://docketpublic.energy.ca.gov/PublicDocuments/16-OIR-02/TN213839_20160929T143312_Sekita_Grant_Comments_Greenlining_Institute_Comments__SB_350_Ba.pdf; Environmental Defense Fund, written comments, September 29, 2016, http://docketpublic.energy.ca.gov/PublicDocuments/16-OIR-02/TN213845_20160929T153826_Comments_of_Environmental_Defense_Fund_on_Study_of_Barriers_and.pdf ; and Clean Energy Works, written comments, September 29, 2016, http://docketpublic.energy.ca.gov/PublicDocuments/16-OIR-02/TN213841_20160929T151705_Holmes_Hummel_Comments_Comments_on_Draft_Report_for_SB350_Barri.pdf.

47 The U.S. Department of Energy (DOE) has published a guide on best practices for residential PACE which includes some additional consumer protection considerations for low-income customers. See US DOE, November 2016, *Best Practices Guidelines for Residential PACE Financing Programs.*

48 GREEN-Energy Efficiency for All, written comments, September 29, 2016, http://docketpublic.energy.ca.gov/PublicDocuments/16-OIR-02/TN213843_20160929T152126_Maria_Stamas_Comments_Comments_of_the_GREENEnergy_Efficiency_fo.pdf.

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 at a rate that may be lower rate than the rate charged by the utility. Leases are similar to PPAs, except in these cases, the participant directly leases the solar panels and owns the generation.

Low-income customers are more likely to have poor credit scores, which can preclude them from participating in lease financing and PPAs (Sanders and Milford, 2014).[49] In California, a FICO score of 650 is typically the threshold for accessing financing such solar arrangements.[50] One commenter suggested that credit enhancements could help expand low-income customers' access to PPAs and leases.[51]

Green Banks and Other Credit Enhancement Programs

Green banks are governmental or quasi-governmental entities that leverage public funding to leverage private capital for clean energy 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).[52] In 2014, the California Infrastructure and Economic Development Bank (IBank) established the California Lending for Energy and Environment Needs Center (CLEEN Center) to use IBank's access to capital markets for state and local government clean energy projects. (This initiative, however, was not designed to facilitate residential lending.)[53]

---

49 Available data indicates a correlation between low-income households and low credit scores. See Board of Governors of the Federal Reserve System, 2007, *Report to the Congress on Credit Scoring and Its Effects on the Availability and Affordability of Credit*, https://www.federalreserve.gov/boarddocs/rptcongress/creditscore/creditscore.pdf

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

51 Ibid.

52 California SEIA suggests that a loan-loss reserve program backing up third-party ownership models might promote 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.

53 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. CLEEN has launched programs designed to facilitate energy efficiency retrofits and efficient street lighting for municipalities, universities, schools, and hospitals. In addition, See http://ibank.ca.gov/clean_energy.htm.

California Alternative Energy and Advanced Transportation Financing Authority (CAEATFA), a branch of the Treasurer's Office, is developing and launching several financing pilots as part of the California Hub for Energy Efficiency Financing (CHEEF). These pilots target single-family housing, master-metered multifamily housing, and commercial properties and may offer credit enhancements such as loan-loss reserves and debt-service reserves, as well as on-bill repayment options.[54] Similar pilots targeting clean transportation infrastructure could be beneficial (see Part B of this study).

Specific Challenges for the Multifamily Housing Sector

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."[55] However, some unique issues contribute to multifamily building owners' limited participation in energy upgrade programs.

Diverse Building Characteristics and Ownership Arrangements

The difficulty in developing standardized efficiency programs for multifamily buildings means that a one-size-fits-all model cannot be applied to the multifamily housing sector.[56] 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)." Furthermore, affordable multifamily buildings can have dispersed or complex building ownership arrangements, which make it difficult for owners to make energy upgrade decisions, and present a challenge for program administrators to develop suitable outreach.[57]

Financing and Budgets

Affordable multifamily buildings are often constrained by the limited income generated by the operation of such buildings. Affordable multifamily buildings are designed,

---

54 The first of the pilots, the Residential Energy Efficiency Loan (REEL) Assistance Program, launched in April 2016 and features a $20 million loan-loss reserve fund to reduce lender risk and extend opportunities to low-income customers. The remaining pilots are expected to launch in 2017. The launch of these pilots is behind schedule due to aggressive timetables, staffing shortages, and program complexities. For more, see http://www.treasurer.ca.gov/caeatfa/cheef/.

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

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

57 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."

contracted, built, and 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 (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.[58] 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." Finding better methods for reaching building owners before they plan on refinancing could be key to advancing energy upgrade goals in multifamily buildings.

Tax Credits

The federal Low-Income Housing Tax Credit (LIHTC) has considerable potential to uniquely encourage energy upgrades in multifamily affordable housing. As Schweitzer (2016) points out, 90 percent of new affordable housing projects in the country are developed in part with LIHTC funds.

The State Treasurer's Office's California Tax Credit Allocation Committee (TCAC) simplifies the investment of private capital into the development of affordable (rent-restricted) 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 the developers have met all requirements of the program and ensures continued affordability and habitability of the developments for the succeeding 55 years. They do this by providing federal and tax credits that subsidize either 30 or 70 percent of development costs at 15-year intervals throughout the life of the buildings for major rehabilitation projects.[59]

TCAC-administered tax credits rehabilitation cycles create crucial trigger events for California's affordable housing. Multiple stakeholders observed that rehabilitation projects organized to take advantage of federal and state tax credits are the single point in time when accomplishing energy efficiency and renewable energy upgrades in affordable housing can be viable on a large scale. TCAC could greatly encourage efficiency and renewable energy in affordable housing projects by enhancing its priority for projects that adopt such measures.[60] As one commenter notes, "Affordable rental properties with rent restrictions…operate close to the margin without the excess cash

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

59 Shan Ahmed and Barbara Byrne Denham, "The Outlook is Positive for Affordable Housing," National Real Estate Investor, November 3, 2016, http://nreionline.com/multifamily/outlook-positive-affordable-housing

60 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.

flow necessary to cover the gap" between incentives and the cost of energy upgrades.[61] In addition, the inability or lack of appetite to take on additional debt for some affordable housing projects is compounded by the difficulty in renegotiating lien priorities with existing lenders. Therefore, "funding energy efficiency retrofits for affordable rental housing via traditional loans is problematic, except as part of a refinancing for substantial rehabilitation of the property."[62]

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 had a large impact on energy efficiency and renewable energy investments in California's affordable housing stock. In 2015, however, TCAC scaled back its push for efficiency and clean energy measures in new building projects.[63] Still, it should be noted that current TCAC requirements for energy efficiency and renewable energy upgrades exceeds the efforts of many other states' LIHTC programs, and therefore establish a strong baseline for making further strides to increase access to clean energy technologies for low-income customers and disadvantaged communities.

Remote or Underserved Communities

Six percent of low-income customers live in remote areas in IOU jurisdictions without natural gas service (Evergreen Economics 2013b).[64] These customers must meet their home heating needs using either electricity or alternative fuels such as propane or wood. These fuels can be more expensive than utility-provided resources, creating an added burden on rural low-income customers. Tribal communities unserved by a utility may be difficult to reach through traditional utility-based home energy upgrade programs. Mobile home communities are another area of opportunity, as these homes are often master-metered and have limited potential for energy upgrades.

61GREEN-Energy Efficiency for All, written comments, September 29, 2016, http://docketpublic.energy.ca.gov/PublicDocuments/16-OIR-02/TN213843_20160929T152126_Maria_Stamas_Comments_Comments_of_the_GREENEnergy_Efficiency_fo.pdf.

62 GREEN-Energy Efficiency for All, written comments, September 29, 2016, http://docketpublic.energy.ca.gov/PublicDocuments/16-OIR-02/TN213843_20160929T152126_Maria_Stamas_Comments_Comments_of_the_GREENEnergy_Efficiency_fo.pdf.

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

64 The regions with the least natural gas service are the Northern California coast and the Sierra Nevada regions, with only about a quarter of low-income customers in those regions being served by natural gas. See *California Lighting and Appliance Saturation Study*, CPUC, 2012.

Recommendations

The following recommendations (as numbered in the Executive Summary) are designed primarily to address the structural barriers discussed above.

2. The State should act to enable the economic advantages of community solar to be readily accessible to low-income and disadvantaged populations across California (for investor-owned utilities [IOUs], publicly owned utilities [POUs], and other load-serving entities). Where feasible, community solar installations should be deployed in the low-income and disadvantaged communities they serve, with priority given to locations that maximize benefits to the distribution system.

    a. The Legislature could authorize exemptions and incentives for low-income IOU customers so that the cost of community solar does not exceed the cost of onsite solar. These subsidies could be time-limited and declining.

    b. The governing boards of POUs should consider developing community solar offerings for low-income customers within their territories.

4. The State should continue developing a series of energy upgrade financing pilot programs to evaluate a variety of models to improve access and participation of low-income customers, including those in disadvantaged communities. The pilot programs would include the cost of health and safety measures required to accomplish energy efficiency upgrades. Possible pilots include:

    a. The CPUC should consider developing a tariffed on-bill pilot for investments in energy efficiency that targets low-income customers regardless of credit score or renter status, and that do not pass on a debt obligation to the customer. Utilities could use the program to make energy upgrade investments and recover the cost through the bill, so long as the recovery charge is less than the estimated savings. The Energy Commission should encourage and provide technical assistance toPOUs and other load-serving entities seeking to implement a tariffed on-bill pilot.

    b. The Legislature could authorize development of a pilot program to provide low-income customers the option to use their California Alternative Rates for Energy (CARE) subsidy or other subsidies to purchase shares in a community solar offering. Flexible CARE alternatives should be guaranteed to reduce energy bills by at least as much as the CARE discount. This model could be extended to enable CARE customers to redirect their CARE subsidy to energy efficiency upgrades.

    c. The State Treasurer's Office, in coordination with other state entities, could offer a credit enhancement pilot program to encourage financing

for energy improvements for market-rate, low-income multifamily housing and commercial, community, and industrial buildings in disadvantaged communities. Options could include establishing a financial warehouse line of credit or subordinated capital.

   d. The State Treasurer's Office could establish a pilot program to evaluate the potential for social impact bonds to increase investment in energy upgrades for low-income customers.

6. The Legislature should expand opportunities for low-income and disadvantaged communities to use photovoltaic and solar thermal technologies by:

   a. Instructing the IOUs to implement programs, such as the Multifamily Affordable Housing Solar Roofs Program, to achieve an equitable penetration rate among low-income customers.

   b. Directing the governing boards of POUs to consider developing or expanding pilot programs that provide solar for low-income customers and disadvantaged communities.

   c. Emphasizing special attention to tribal communities and communities not served by utilities.

7. The California Tax Credit Allocation Committee (TCAC) should consider enhancing the priority of affordable housing tax credits for housing rehabilitation projects to include onsite energy efficiency and renewable energy upgrades. In addition, with funding provided by State policymakers, California Alternative Energy and Advanced Transportation Financing Authority (CAEATFA) should consider providing financial assistance, such as credit enhancements, to support energy efficiency and renewable energy improvements to coincide with TCAC tax credit events at rehabilitation.

CHAPTER 4:
Policy/Program Barriers and Solutions to Low-Income Customers' Access to Energy Efficiency and Renewable Energy

This chapter discusses policy/program barriers and solutions to increase low-income access to energy efficiency and renewable energy, including:

- Market delivery.
- Program integration, collaboration, and leveraging.
- Data limitations.
- Unrecognized non-energy benefits.

Market 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 the values and needs of specific disadvantaged communities into account.[65] In California, Frank and Nowak (2016) 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."

Program Eligibility Criteria

Energy programs for low-income persons commonly call for determination of income eligibility on a dwelling-unit-by-dwelling-unit basis. This requirement creates several barriers to program delivery that reduce participation and substantially increase transaction costs. Installers providing direct install services must work with multiple eligibility frameworks to serve low-income customers in a region. Digging into income qualification of households is intrusive to the privacy of tenants and difficult and time-consuming for building owners to accomplish and document for the substantial number of households in multifamily buildings. 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. At community meetings, members of the public expressed confusion about eligibility requirements. Also, some members conveyed frustration that the income eligibility thresholds for some programs were too low to include the working poor (Appendix B).

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

NRDC notes that a barrier arises when programs specifically target disadvantaged communities, since some buildings exist just outside the boundary of a disadvantaged community but have the same needs and circumstances as those within the target area. 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. NRDC suggests that allowing boundary flexibility could address this.[66] Multiple commenters point out that ESA is hamstrung by a rule that does not allow further retrofits to homes that have previously participated since 2001 (this rule was recently eliminated).[67] In addition, many programs target only customers of the IOUs, leaving a sizeable portion of low-income customers without access to the same services.[68] CPUC notes the inconsistency of program eligibility; in particular, programs targeting households, rather than dwelling units, may have limitations because households are mobile.[69] NSHP staff intend to consider changes to the eligibility requirements to increase participation of affordable housing projects.

Stakeholders have noted several potential solutions. Yolo County states that for many state and federal housing programs, qualification in one housing program automatically qualifies the household for other programs, and that many housing programs only require 51 percent of the dwelling units in the program's geographic area to income qualify for all homes in the area to be eligible.[70] 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 to qualify for the program.[71] GREEN and Energy Efficiency for All recommend universally using a specific percentage of area median income (AMI) for qualification across programs.[72] And reporting on their Coachella Valley project funded by the South Coast Air Quality Management District, Johns Mansville, and NEST Labs, Inc. recommended the delivery of retrofits to entire

---

66 NRDC, comments at the SB 350 Low-Income Barriers Study workshop, August 12, 2016.67 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. CPUC's CARE-ESA Decision A.14.11-007, approved in November 2016, eliminated the "Go Back Rule." See http://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M169/K716/169716736.PDF.

67 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. CPUC's CARE-ESA Decision A.14.11-007, approved in November 2016, eliminated the "Go Back Rule." See http://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M169/K716/169716736.PDF.

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

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

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

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

72 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.

disadvantaged communities, not just those households who qualify as low-income, to make programs more accessible and ease transaction costs for potential participants.[73]

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 could 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:

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). On the other hand, performing non-intrusive load monitoring may be another method for ascertaining these data.

73 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.

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.[74]

Outreach and Delivery

Insufficient outreach and education are critical barriers to expanding energy efficiency and renewable energy resources in disadvantaged communities. This theme recurred throughout the seven community meetings held across California to help inform this report. While many participants at the meetings were aware of CARE, far fewer knew of specific energy efficiency or weatherization programs available to them. And tribal representatives at the community meeting in Ukiah expressed concern that the State has performed insufficient outreach and provided insufficient support for tribal participation in low-income programs (Appendix B). One 2013 survey indicated that 32 percent of eligible low-income customers were unaware of ESA, and the gap was even greater for households in which English was not the primary language.[75] This barrier cuts a swath through a spectrum of other issues. It represents points of disconnection between policy intent to expand low-income access to energy efficiency and renewable energy and customer adoption.

Framing

One study notes that "many consumers decide to move forward with energy improvements to solve other household or business problems (for example, comfort, aging or failed equipment)" (Zimring et al, 2013). These motivations for non-energy benefits were highlighted during the community meetings for this study, particularly issues of family health (Appendix B).

CSE (2016) notes that energy efficiency 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 not always 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,

---

74 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.

75 Twenty-seven percent of English-only low-income households were unaware of ESA, whereas 42 percent of households in which another language was primarily spoken were unaware of ESA. See Evergreen Economics, 2013b.

whereby individuals are motivated to change based on a perception that their peers are doing the same thing."

Finally, 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). Furthermore, some stakeholders at one of the community meetings expressed frustration at feeling like they were being nudged to adopt expensive new technologies when they already struggle to conserve energy and money (Appendix B).

Targeted Outreach

Appropriate marketing is key to meeting the diverse needs and audiences of 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 (for example, language, medium, and so forth) as well as the substance of the materials."

Language and education barriers can impede participation in energy retrofit programs, due to a lack of awareness or difficulty understanding program requirements.[76] 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.[77] Some programs have complex requirements and provisions that may not be simple to explain to potential applicants. Time constraints on the part of low-income residents and resource constraints by utilities make it more difficult to bridge these gaps, limiting program participation (Cluett et al,2016). Concerted effort is needed to address this barrier. For example, "half of the participating households [in SASH] are multilingual" (Nichols and Greschner, 2013).

The effect of language gaps is significant. 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 percent versus 57 percent) among low-income households where English is not the primary language. 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."

---

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

77 "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.

CSE (2016) cite multiple studies that examine how ethnic and cultural differences require tailored energy upgrade outreach. For example, Latino Americans may respond better to messages that about environmental conservation and farmland protection, while Asian-Americans may be more responsive to collective action and community relations and interdependence. Another study concludes that Latino Americans and African Americans have stressed "low levels of trust that both groups expressed with respect to their energy utilities and…. people outside their peer group for [obtaining] information on energy conservation" (Research Into Action et al, 2016).

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."

Delivery

Selecting better points of contact and increasing trust between program deliverers and low-income customers can increase the success of a program. Habitat for Humanity (2015) points to "studies [showing] that many low-income households are…wary of getting involved with government agencies, or unwilling to take on the considerable paperwork burden of applying for weatherization or other available resources." And CPUC observes that some customers are hesitant to have data about them collected by government agencies.[78]

Local contractors and program resources that are sensitive to the specific needs of a community are critical in promoting clean energy upgrades.[79] 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.[80]

Tribal representatives at the community meeting in Ukiah pointed out that their members rely on their tribal organizations for government information. However, some tribes lack the resources to evaluate program requirements and offerings and, consequently, cannot provide program information to their members, which can lead to limited participation (Appendix B).

CSE (2016) points out "that outreach efforts leveraging community-based organizations (CBOs) and community events can be an effective way to reach minority populations

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

79 BayREN, written comments, September 27, 2016, http://docketpublic.energy.ca.gov/PublicDocuments/16-OIR-02/TN213817_20160927T164017_Jennifer_Berg_Comments_Comments_of_the_BayREN_to_SB_350_Draft_M.pdf.

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

who might have lower levels of trust in energy utilities, large institutions, or the government." 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." The Energy Commission's participation in the series of community meetings organized by local organizations provided an example of the benefits of such partnerships. Some stakeholders indicated that the Commission should continue such outreach activities (Appendix B).

CPUC notes that the energy retrofit industries need better regulation to prevent predatory sales practices, an issue that is particularly acute for low-income customers.[81] 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. At the same time, California SEIA points out that it has spearheaded several consumer protection initiatives performed within the industry.[82]

Consideration of appropriate forms of media may also yield better results. For example, a study conducted by Southern California Edison indicated Chinese Americans were more likely to expect to learn about energy programs through newspapers, while African Americans prefer to learn about such programs through television (Kan et al, 2013, cited in CSE 2016).

Lack of Information

Multifamily building owners often lack accurate information about the energy savings potential of building retrofits. For example, a 2012 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 buildings 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). These issues present opportunities for better marketing and education by program deliverers.

Henderson (2014) notes the multifamily housing market suffers from a dearth of standards used to gauge efficiency retrofits and maintenance. Furthermore, building

81 CPUC, comments at the SB 350 Low-Income Barriers Study workshop, August 12, 2016. Furthermore, as one step toward improving consumer decision making processes, CPUC Decision 16-01-004 directs the CPUC to issue information packets to consumers.

82 See CalSEIA, written comments, October 28, 2016, http://docketpublic.energy.ca.gov/PublicDocuments/16-OIR-02/TN214238_20161028T155803_Kelly_Knutsen_Comments_Comments_of_the_California_Solar_Energy.pdf.

owners often have difficulty obtaining tenant-level and whole-building energy data from utilities, reducing awareness of potential benefits from energy upgrades.[83]

Transaction Costs

Transaction costs are ancillary, usually nonmonetized 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 processes associated with securing energy efficiency financing can be onerous for borrowers and the contractors assisting them and may pose major obstacles to participation. For example, 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 persons, many of whom already find their time and energy spread thin, could find these hidden costs to participating in energy retrofit programs untenable. 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."[84] These issues create a considerable "hassle factor" for low-income multifamily building operators with limited time and resources needed to create documentation and apply for programs (EPC 2013).[85]

In addition, plug loads from appliances and other consumer electronics result in a considerable portion of a household's electricity needs, but low-cost devices are often not very energy-efficient.[86] However, researching the energy efficiency and long-term energy costs of a device is time-consuming, and the information is often not easily accessible, which represents another transaction cost.

---

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

84 A recent CPUC proceeding for CARE/ESA included a provision to expand opportunities to make energy upgrades to common areas in affordable multifamily buildings. CPUC's Decision A.14-11-007, approved in November 2016, set new rules allowing IOUs to allocate up to $80 million in unspent ESA funds for treating common areas in affordable multifamily housing buildings in which 65 percent of tenants are eligible for ESA. See http://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M169/K716/169716736.PDF.

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

86 Researcher Marti Frank's work concludes that low-cost appliances and other electronics tend to be the least energy-efficient. However, Enervee points out that this is not always the case, and in fact some low-cost devices are more energy-efficient than more expensive models. Both studies point to the need for better consumer information. See Marti Frank, written comments, September 28, 2016, http://docketpublic.energy.ca.gov/PublicDocuments/16-OIR-02/TN213819_20160928T105226_Marti_Frank_Comments_The_Shift_Model__a_new_program_design_for.pdf; and Enervee, written comments, September 22, 2016, http://docketpublic.energy.ca.gov/PublicDocuments/16-OIR-02/TN213761_20160922T022251_Anne_Arquit_Niederberger_Comments_Enervee_Comments_on_LowIncome.pdf.

Transaction costs can create a barrier on the delivery side 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).

Convenience of Rebate Programs

McKibben (2013) argues that "every aspect of the rebate process, including application processes, forms, and protocols for determining the rebate amounts for multiutility measures, should be considered from the 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).

Spotlight Outside California

Massachusetts' Low-Income Energy Affordability Network (LEAN) program targets low-income multifamily housing. Launched in 2010, the program arose due to concerns from stakeholder concerns that existing programs presented too many barriers for these sectors of low-income multifamily housing. LEAN offers a Web-based single point of contact for building owners to apply to various utility programs, including across jurisdictional boundaries and for buildings served both by natural gas and electricity.

Program Integration, Collaboration, and Leveraging

Poor interprogram coordination results in funding silos and interjurisdictional overlap and conflicts, which result in unrealized potential energy upgrades.[87] For example, there are two weatherization programs in California: one funded federally through LIHEAP and WAP administered by CSD, and another run through the investor-owned 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 increased the participation rate and average energy savings per household (CSD/PG&E, 2014).

Integrated Activities

An integrated, community-based approach is key to the Transformative Climate Communities Program, established by Assembly Bill 2722 (Burke, Chapter 371, Statutes of 2016), which will use cap-and-trade funds to accelerate greenhouse gas reduction and

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

advance local climate action in disadvantaged communities.[88] The program is an opportunity to demonstrate how community engagement coupled with strategic investments in transportation, housing, energy, natural resources, and waste management can reduce greenhouse gas emissions and other pollution, while addressing growing equity issues and enhancing economic opportunity and community resilience.[89]

Coordination Across Programs and Entities

Collaboration among government, utilities, community organizers, tribes, nonprofits, and the private sector may provide opportunities broaden participation and maximize benefits to low-income persons. Such programs can target low-income customers to accomplish multiple objectives, including, but not limited to, energy efficiency, renewable energy, water efficiency, air quality, housing, community development, hazard abatement, financing, and resiliency.

Improved coordination with program partners can substantially extend the performance of a single-focus energy upgrade program. Performing multiple kinds of services "at the same time reduces the number and severity of disruptions for tenants and the building owner" McKibben notes. And developing better and more accessible energy assessments, as recommended in the Existing Buildings Energy Efficiency Action Plan, could improve the crossover potential of energy programs. McKibben (2013) recommends that utilities collaborate with local financial institutions "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."

Spotlight Outside California

Energy Savers, a one-stop shop serving multifamily buildings in the Chicago area, has demonstrated success of such an approach. Launched in 2008, Energy Savers matches comprehensive building audits coupled with technical assistance, low-interest private financing, utility rebates, and construction oversight to assist multifamily building owners in making energy upgrades

Cluett et al (2016) highlight the advantage to "coordinate eligibility requirements between efficiency and bill payment assistance programs to allow for more streamlined participation and share customer information to help address the energy needs of the highest-use households." Harak (2010) suggests "better coordination between WAP and

88 More broadly, Senate Bill 535 (De León, Chapter 830, Statutes of 2012) stipulated that a quarter of cap-and-trade funds should provide a benefit to disadvantaged communities (identified through CalEnviroScreen) and that a minimum of 10 percent of funds should go to projects located within disadvantaged communities.

89 This is an activity ARB is tracking closely as it relates to outreach and education, and the need for technical assistance within low-income communities to participate in our programs.

HUD's Community Development Block Grant (CDBG) program so that energy efficiency investments can be more easily piggybacked on work already being done on the home through CDBG." As an example, high-usage participants in the CARE program are identified and targeted by utility efficiency programs. These customers must enroll in an energy efficiency program to continue their participation in CARE, and this requirement has resulted in "significant subsidy savings for all ratepayers and substantial energy (and bill) savings for targeted customers."[90] Identifying low-income customers with high energy requirements may be an effective strategy in targeting rooftop solar participants in programs like SASH and MASH.

Some air quality management districts offer fuel-switching incentive programs for wood/coal heating equipment. In a region like the San Joaquin Valley, which has many low-income customers unconnected to the natural gas system, collaboration with an efficiency program to install an electric heat pump may be an area of opportunity for energy efficiency improvement.

California has made some progress at integrating program services. As an example of program integration, in 2015 the eligibility criteria of the CSI-Thermal program were expanded to include customers participating in LIWP or LIHEAP.[91] Also, Mueller and Ronen (2015) point to the California Solar Initiative (CSI), which performs a home energy audit and makes potential participants aware of available efficiency incentives and options.[92]

A one-stop shop model can simplify program participation and increase the efficiency of program coordination (McKibben 2013).[93] NRDC recommends the development of regional and statewide concierge services to integrate program offerings and provide technical assistance.[94] This model could be particularly useful for multifamily building owners who need to interface with several programs. Programs that provide non-energy services, such as housing programs targeting health and safety improvements, could be

---

90 CARE's high-usage process has resulted in the removal thousands of ineligible CARE participants and tens of thousands of enrollments in ESA. CPUC, *Proposed Decision of ALJ Colbert: DECISION ON LARGE INVESTOR-OWNED UTILITIES' 2015-2017 CALIFORNIA ALTERNATE RATES FOR ENERGY (CARE) AND ENERGY SAVINGS ASSISTANCE (ESA) PROGRAM APPLICATIONS*, 2014, http://docs.cpuc.ca.gov/PublishedDocs/Efile/G000/M167/K502/167502394.PDF.

91 PG&E, written comments, September 2016, http://docketpublic.energy.ca.gov/PublicDocuments/16-OIR-02/TN213838_20160929T141359_Pacific_Gas__Electric_Comments_Pacific_Gas__Electric_Comments_o.pdf.

92 CSE, however, notes that there is considerable room for improvement in the CSI efficiency auditing process. CSI participants may not have understood the results of the audit or may not have received the results at all. See CSE, written comments, September 28, 2016, http://docketpublic.energy.ca.gov/PublicDocuments/16-OIR-02/TN213829_20160928T165444_Stephanie_Wang_Comments_CSE_Comments_on_350_Barriers__Solutions.pdf.

93 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.

94 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.

included in the one-stop shop portfolio. Such a solution, StopWaste notes, could help significantly reduce transaction costs for potential program participants.[95] On the other hand, Community Energy Services Corporation contends that a one-stop shop solution is too low-level. Rather, multiple programs should be coordinated so that services are bundled as a single package.[96]

Other Leveraging Opportunities

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).

Many financial product programs, such as those from HUD and EPA, can be leveraged to provide coordinated funding, although putting together a multifunded package can be complex.[97]

Rate Setting and Regulatory Challenges

Net energy metering (NEM) 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 is that NEM credits are based on a customer's retail electricity rate, so CARE customers are credited for NEM at a lower rate than non-CARE customers. Consequently, payback periods for CARE customers with net metered solar can be considerably longer than for general customers.

Potential changes to the net metering tariff offered by utilities may result in additional barriers for low-income customers, if they include reductions to customers' compensation for exporting onsite generation.[98] At the same time, Assembly Bill 327 (2013) instructs the CPUC develop alternative tariffs to ensure continued growth of distributed generation among IOU residential customers in disadvantaged communities.

Stakeholders within the solar industry note that the possibility of an exit fee for leaving a utility's customer base, such as the Power Charge Indifference Adjustment (PCIA), may make joining a community solar program organized under GTSR cost-prohibitive,

---

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

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

97 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.

98 California SEIA notes that some POUs have already met the state requirement (AB 510, 2010) to offer net metering contracts for up to 5 percent of peak load. See CalSEIA, written comments, December 8, 2016, http://docketpublic.energy.ca.gov/PublicDocuments/16-OIR-02/TN214702_20161208T070438_Kelly_Knutsen_Comments_Comments_of_the_California_Solar_Energy.pdf

particularly for low-income customers.[99] The effect of such a fee is not yet clear, since no community solar projects have yet been organized under GTSR.

Insecure, Inadequate, or Inequitable Program Funding

Some low-income programs can have a limited transformative effect 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 to improve program functioning. Some stakeholders have pointed out that a major drawback to bridge funding is that program delivery providers may experience high employee turnover due to worker concerns about insecure long-term funding. This can drain a program of its workforce capacity and technical expertise.[100] NRDC recommends a minimum of four-year budget cycles for low-income multifamily programs.[101]

Programs should be reviewed to ensure that they are targeting low-income customers adequately and are equitably funded.[102] Programs that do not exclusively serve low-income customers could consider ways to expand their services these populations.

Some existing California programs have demonstrated sensitivity to the needs of low-income customers. Forty-nine percent of the Proposition 39 K-12 school funds for clean energy projects have gone to local education agencies in disadvantaged communities.[103] And the Energy Commission's research funds administered through the Electric Program Investment Charge (EPIC) develops some solicitations that allocate funding specifically for demonstration and market facilitation projects in disadvantaged communities (identified through CalEnviroScreen), or provide preference points to

---

99 The Power Charge Indifference Adjustment is a fee authorized by the CPUC and added to the bill of a customer that is 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. For stakeholder commentary, see, for example, Solar City, written comments, September 29, 2016, http://docketpublic.energy.ca.gov/PublicDocuments/16-OIR-02/TN213852_20160929T160040_Damon_Franz_Comments_SolarCity_Comments__Draft_SB_350_Barriers.pdf ; Vote Solar, comments at the SB 350 Low-Income Barriers Study Workshop, August 12, 2016.

100 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. The CPUC recently issued an alternative proposed decision would authorize funding ESA and CARE for 2017-2020. If this decision is approved, these programs will not need to rely on bridge funding until at least 2021.

101 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.

102 LADWP, for example, noted at the Barriers Study workshop that 40 percent of its customers are eligible for some type of energy upgrade program, but they have funding to serve only a miniscule portion each year. Without greatly increasing funding, LADWP observed, the challenge of retrofitting low-income homes could take a century. See LADWP, comments at the SB 350 Low-Income Barriers Study workshop, August 12, 2016.

103 This figure is based on data as of October 2016. Proposition 39 program administration identifies a school as being in a disadvantaged community if 50 percent of the students are enrolled in the Free or Reduced Meal Program.

applicants who propose demonstration projects in disadvantaged communities.[104] Furthermore, the Energy Commission is scoping the EPIC research investment plan for 2018-2020 and plans to propose additional funding to bring benefits of emerging electricity technologies to disadvantaged communities.

These issues are particularly relevant as well to low-income customers' access of clean transportation infrastructure, as discussed in Part B of this study.

Data Limitations

Program Data

Better data collection can help shape and improve program design. For example, CSD notes that it is difficult to assess market saturation and community needs and to track program investments due to data constraints.[105]

A 2016 survey 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, nonwhite, or non-English-language-speaking" (Frank and Nowak, 2016). 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 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." Furthermore, the study concludes that not only is there a dearth of data, but there is a lack of good data collection and organization standards.[106]

In 2015, the Energy Commission published California's *Existing Buildings Energy Efficiency Action Plan* pursuant to Assembly Bill 758 and anticipating Senate Bill 350 and

---

104 The Energy Commission, through EPIC, administers about $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 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. Several EPIC projects that will benefit residents of disadvantaged communities are underway. In March 2016, seven projects, totaling $10 million, were selected in disadvantaged communities to develop innovative approaches to plan, permit, and finance advanced energy communities. In August 2015, a project for $4.5 million was selected to a project to recruit workers from disadvantaged communities into an apprenticeship program and provide them with comprehensive classroom and on-the-job training on the installation and maintenance of AutoDR communications equipment. In December 2015, four projects were selected, totaling $12.5 million to demonstrate energy-efficient retrofits and zero-net-energy construction practices in single-family and multifamily housing in disadvantaged communities.

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

106 Frank and Nowak (2016) 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 percent of studies collecting demographic data) and primary language spoken the least frequently collected (20 percent of studies)."

Assembly Bill 802. 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 activating the market, monitoring the effects, and determining the effectiveness of local, regional, and state initiatives.[107] Making such data publicly available could help trigger market-based solutions. 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, while ensuring adequate safeguards for privacy and confidentiality.[108] Another key goal from the Existing Buildings Energy Efficiency 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.[109] Ongoing efforts are being made to integrate WAP, LIHEAP, LIWP, and ESA databases in the state. AB 802 requires the establishment of a mandatory benchmarking and disclosure program that will generate significant data about the commercial and multifamily building sectors, which could enable programs to better target these sectors.[110]

---

107 There are several needs that the data goals outlined by the Existing Buildings Energy Efficiency 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 collection 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 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 to develop sector- and location-specific outreach and understand market opportunities and risks. Moreover, knowledge of one's energy use can be a powerful motivator for making energy efficiency improvements.

108 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.

109 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 use 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 using 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."

110 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 these energy use data by building owners and state and local government agencies will be essential to the success of the program. Both government and the marketplace will thus be in improved positions to develop targeted initiatives and monitor the actual results over time. See also StopWaste, comments at the SB 350 Low-Income Barriers Study workshop, August 12, 2016.

Stakeholder commentary stresses the need for these types of data initiatives. CSD states that getting the right kind of energy information about homes can help energy efficiency programs look for homes that have the highest energy burden and the right type of housing stock to achieve the greatest impact when doing weatherization and efficiency work.[111] NRDC notes that for multifamily property owners to do retrofits and get the financing they need, they have to have access to both whole-building and tenant energy bill data, which has been a real struggle for owners to get.[112] BayREN agrees that difficulty in obtaining historical usage data from utilities is an important barrier to programs aimed at serving low-income customers.[113] LADWP points to the importance of providing legal specificity so that it is "absolutely black and white what data is sharable, with whom, under what conditions."[114]

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).[115]

---

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

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

113 To this end, BayREN points out that the alternative proposed decision in the CPUC's CARE/ESA proceeding addresses the possibility of greater collaboration between the IOUs and CSD. See BayREN, written comments, September 27, 2016, http://docketpublic.energy.ca.gov/PublicDocuments/16-OIR-02/TN213817_20160927T164017_Jennifer_Berg_Comments_Comments_of_the_BayREN_to_SB_350_Draft_M.pdf.

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

115 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 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."

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 (for example, rebates, tax credits)" (Zetterberg and Ng, 2013). Such data could help inform and improve the impact of future energy efficiency and renewable energy programs for low-income customers.

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 calculus for future energy policy.[116] For example, a 2012 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).

At the August 12 Low-Income Barriers Study workshop, CPUC staff stated that utility programs are statutorily required to address cost effectiveness, and statutory changes may be needed for the CPUC to incorporate non-energy benefits into its cost-effectiveness tests.[117] 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.[118] CPUC representatives also point out that the CPUC is considering how non-energy benefits can be better addressed in low-income programs both for energy efficiency and solar.[119]

A fuller accounting of non-energy benefits could be necessary, especially given the multifaceted needs that low-income energy retrofit programs are intended to address.[120] In the case of LIHEAP and WAP, improving the health, safety, and comfort of treated homes are the paramount goals; saving energy is a cobenefit of the program. Responses from the community meetings for this study commonly listed family health as a stronger motivator for efficiency and weatherization upgrades than economic savings (Appendix B). Recognizing non-energy benefits not only helps justify the costs of such

116 Nationally, there is little agreement on the best practices for incorporating non-energy benefits. See Sanders and Milford, 2014.

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

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

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

120 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.

programs, but can convey a clearer picture of the societal benefits from such investments of public funds (McCormick, 2015).[121]

Table 2: 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.
Low-income customers	Improved ability to afford necessities such as food, medicine, health care, and rent; reduced fires due to replacement of dangerous space heaters and inadequate wiring; avoided deaths, injuries and property damage due to fire and avoided carbon monoxide poisoning; increased comfort and security including elimination of drafts, improved lighting quality, safety and ease of house cleaning; avoided moving expenses and homelessness; avoided time investment in utility collections and avoidance of health problems and death associated with not enough heat in winter or air conditioning in the summer; prevention of termination of energy service; avoidance of health problems including bronchitis, hay fever, sinusitis, asthma and hypertension; avoidance of children's respiratory allergies, and ear infections.
Owners	Reduced tenant turnover, reduced maintenance needs, increased property values, and higher likelihood of on-time rental payments due to reduced energy bills.
Society	Less vulnerability to climate change, fewer environmental impacts, economic development due to energy bill savings multiplier effect that puts more money in the hands of low-income households to spend on goods and services, creating more jobs and real estate and sales tax revenue; reduced fire department costs, reduced Medicaid costs, reduced homeless shelter costs; increased energy security, and greater energy equity and sense of fairness.

Sources: McCormick, 2015; Sanders and Milford, 2014. Oppenheim and MacGregor, 2011[122]

Cluett et al (2016) note that the CPUC Total Resource Cost test for ESA programs addresses 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 be evaluated at the portfolio level and with significant non-energy benefits included.[123]

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

122 This list is not exhaustive. For further examples and analyses of non-energy benefits, see, for example, Skumatz Economic Research Associates and Cadmus. 2010. *Non-Energy Benefits: Status, Findings, Next Steps, and Implications for Low Income Program Analyses in California*, Prepared for SDG&E, SCG, PG&E, SCE; and TecMarket Works, Skumatz Economic Research Associates, and Megdal and Associates. 2001. *Low Income Public Purpose Test (LIPPT) Report*, Prepared for RRM Working Group Cost Effectiveness Committee, San Francisco, California.

Recommendations

The following recommendations (as numbered in the Executive Summary) are designed primarily to address the policy and program barriers discussed above.

1. The State should establish a task force to facilitate coordination of all state agencies administering energy, water, resilience, housing, and low-emission transportation infrastructure programs for low-income customers and disadvantaged communities. To reach more customers, the task force should seek to align program eligibility requirements and reduce redundancies and administrative overhead. This effort should encourage collaboration, standardization, streamlining, integration, and cofunding opportunities with related federal, state, and local agencies, including actions to:

    a. Expand existing direct-install energy programs to include upgrades for water-efficient appliances for customers in low-income and disadvantaged communities.

    b. Initiate pilot programs that address entire neighborhoods in disadvantaged communities, rather than building-by-building. Future expansions could include neighborhoods outside disadvantaged communities but that include a significant proportion of low-income households.

    c. Ensure that energy retrofit programs facilitate access to available funds from programs that address non-energy work, such as asbestos, lead, and mold removal and structural maintenance so that work can be conducted in conjunction with energy upgrade projects. Explore the potential for energy upgrade programs to coordinate with local housing rehabilitation efforts in low-income and disadvantaged communities.

    d. Develop a comprehensive action plan on improving opportunities for energy efficiency, renewable energy, demand response, energy storage, and electric vehicle infrastructure for multifamily housing, with attention to pilot programs for multifamily rental properties in low-income and disadvantaged communities.

    e. Engage with the federal government to explore program development opportunities, share best practices, and leverage research and cofunding potential for all energy, water, and housing programs.

---

123 NRDC makes several other suggestions to tailor cost-effectiveness tests to the low-income multifamily building sector. See NRDC, 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

f. Ensure all state programs identify and prioritize best practices in other states with high-functioning programs that serve low-income and disadvantaged communities.

g. Leverage local government planning initiatives to enhance low-income clean energy deployment programs.

h. Establish common definitions of non-energy benefits, develop standards to measure them, and attempt to determine consistent values for use in all energy programs.

i. Establish an expert advisory committee to align future low-income program modifications with the latest market trends and industry best practices. This committee should be comprised of representatives from clean energy finance, information technology experts, building property owners, and other marketplace actors with expertise needed to design and implement effective financial, housing, and related energy service programs for low-income customers and disadvantaged communities.

j. Use program data resulting from recommendation #5 to inform actions taken by the task force.

5. The Legislature should require collaboration among all program delivery agencies to establish common metrics and collect and use data systematically across programs to increase the performance of these programs in low-income and disadvantaged communities, including requirements to:

    a. Develop standardized energy equity indicators as metrics to ensure low-income customers are being served. Use these metrics to set a statewide baseline, advance energy savings, and track performance.

    b. Target program services to increase coverage and improve equity.

    c. Develop a common database for use by program delivery agencies and other community partners.

    d. Use market intelligence to achieve data-driven program design and target best intervention strategies that serve low-income needs.

    e. Ensure that low-income persons have product selection options and information necessary to avoid driving up their plug-load energy use, recognizing that low-cost appliance and consumer products are commonly less energy-efficient than other appliances and products.

    f. Ensure that program participation includes a condition for permission to access participant, project, and pre-/post-consumption data by the State to enhance service delivery, evaluation, and planning. Where viable, such data should be made public.

g. Establish standardized metrics to track employment and job quality impacts of clean energy programs.

8. The State, in consultation with Energy Commission, CPUC, ARB, CSD, and other related state and local agencies, should establish a pilot program for multiple regional one-stop shops to provide technical assistance, targeted outreach, and funding services to enable owners and tenants of low-income housing across California to implement energy efficiency, clean energy, zero-emission and near-zero emission transportation infrastructure, and water-efficient upgrades in their buildings. This pilot program should also support a range of local service delivery providers, coordinate with local government energy programs, and leverage existing Web portals, such as Energy Upgrade California®, with information provided in a variety of languages and in a format relevant to local low-income communities. Regional pilot programs should build on the best models for comprehensive one-stop models both in California and other states.

9. The State, in coordination with local authorities and consumer protection agencies, should investigate the need for heightened consumer protection to help prosecute companies that use misleading information or engage in predatory practices to take advantage of low-income customers and small businesses in disadvantaged communities seeking access to clean energy benefits.

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

This chapter summarizes support available for small businesses in California and identifies barriers related to contracting opportunities for small businesses in disadvantaged communities. This chapter also discusses potential solutions government agencies, the private sector, and other stakeholders can undertake to address the barriers.

The identified barriers, in order of most frequently mentioned to least, are:

- Lack of access to information.
- Technical assistance and workforce needs.
- Financial obstacles.
- Keeping the playing field level.

Support for Small Businesses in California

California has a goal to meet or exceed 25 percent small business participation and share innovative procurement and contracting practices from the public and private sectors to increase opportunities for small businesses. For fiscal year 2014-2015, California exceeded this goal, with mandatory departments achieving 25.61 percent (more than 480,000 contracts for more than $2 billion).[124]

Senate Bill 535 requires that in addition to reducing greenhouse gas emissions, 25 percent of the monies allocated from the Greenhouse Gas Reduction Fund (GGRF) must go to projects that provide a benefit to disadvantaged communities, and a minimum of 10 percent of funds must go to projects located within and providing benefits to disadvantaged communities. Assembly Bill 1550 (Gomez, Chapter 369, Statutes of 2016) adds requirements for low-income communities. The California Environmental Protection Agency (CalEPA) defines disadvantaged communities as the top 25 percent of census tracts in OEHHA's CalEnviroScreen based on geographic, socioeconomic, public health, and environmental hazard criteria.[125] In 2016, an update of the CalEnviroScreen

124 California Department of General Services. December 2015. *Fiscal Year 2014-15 Statewide Consolidated Annual Report.* Office of Small Business and DVBE Services.

125 http://www.calepa.ca.gov/EnvJustice/GHGInvest/.

is underway.[126] The *2016 Annual Report to the Legislature on California Climate Investments Using Cap-and-Trade Auction Proceeds* states that, excluding high-speed rail, 51 percent of GGRF investments through 2015 ($469 million of $912 million) funded projects that benefit disadvantaged communities, and 39 percent ($356 million) funded projects in disadvantaged communities. As of November 2015, the high-speed rail project brought investment to the Central Valley, including contracts with 100 small businesses located in disadvantaged communities.[127]

The California Department of General Services maintains a searchable database of certified small (and micro) businesses (Cal eProcure).[128] A list of California's disadvantaged communities is available from CalEPA.[129] Table 3 shows counties with certified California small businesses and microbusinesses in zip codes with disadvantaged communities based on these two data sources. Table 4 shows counties that do not have small businesses and microbusinesses in zip codes with disadvantaged communities but have small businesses and microbusinesses zip codes with census tracts with poverty scores in the top 25 percentile.

Table 3: California Counties With Small Businesses and Microbusinesses in Zip Codes With Disadvantaged Communities (October 2016).

Counties with Small Businesses and/or Micro Businesses in Zip Codes with Disadvantaged Communities (By Region)	Number of Small Businesses and Microbusinesses
Southern California (Imperial, Los Angeles, Orange, Riverside, San Bernardino, San Diego, Santa Barbara, Ventura)	More than 5,100
Central California (Fresno, Kern, Kings, Madera, Merced, Sacramento, San Joaquin, Solano, Stanislaus, Tulare, Yolo)	More than 2,800
Northern California (Alameda, Butte, Contra Costa, Monterey, San Francisco, San Mateo, Santa Clara, Santa Cruz, Tehama, Yuba)	More than 1,400

Source: California Department of General Services Cal-e-Procure database; Calenviroscreen 2.0 (top 25 percent of census tracts)

126 OEHHA. September 6, 2016. CalEnviroScreen 3.0 Draft. http://oehha.ca.gov/calenviroscreen/report/calenviroscreen-30-draft.

127 California Air Resources Board. March 2016. *2016 Annual Report to the Legislature on California Climate Investments Using Cap-and-Trade Auction Proceeds.* https://arb.ca.gov/cc/capandtrade/auctionproceeds/cci_annual_report_2016_final.pdf.

128 California Department of General Services. 2016. Cal-e-Procure. The State of California Certifications. https://caleprocure.ca.gov/pages/PublicSearch/supplier-search.aspx. Accessed October 26, 2016.

129 CalEPA. Greenhouse Gas-Reduction Investments to Benefit Disadvantaged Communities. SB 535 List of Disadvantaged Communities (Excel). Based on CalEnviroScreen 2.0 (top 25 percent of Census Tracts). Available from http://www.calepa.ca.gov/EnvJustice/GHGInvest/.

Table 4. Counties Not Listed in Table 3 With Small Businesses and Microbusinesses in Zip Codes with Census Tracts with Poverty Scores in the top 25 Percentile (October 2016)

Counties not listed in Table 3 with Small Businesses and Microbusinesses in Zip Codes with Census Tracts with Poverty Scores in the top 25 Percentile	Number of Small Businesses and Microbusinesses
Central California (San Luis Obispo, Tuolumne)	More than 50
Northern California (Del Norte, El Dorado, Glenn, Humboldt, Lake, Lassen, Marin, Mendocino, Modoc, Napa, Nevada, Placer, Plumas, San Benito, Shasta, Siskiyou, Sonoma, Sutter)	More than 1,100

Source: California Department of General Services Cal-e-Procure database; Calenviroscreen 2.0 (top 25 percentile score for poverty)

In April 2015, the Energy Commission approved a diversity policy to improve fair and equal opportunities for small businesses; women-owned, disabled veteran-owned, minority-owned, and LGBT-owned business enterprises; and economically disadvantaged and underserved communities to participate in and benefit from Energy Commission programs.[130] As reported by Zelen (2016), the Energy Commission staff developed a voluntary survey of Electric Program Investment Charge (EPIC) funding recipients to better track progress toward the Energy Commission's goal of ensuring that participation in the EPIC Program reflects the rich and diverse characteristics of California and its people. For 2015, 52 of 81 approved EPIC projects completed surveys. More than 70 percent of the surveyed projects included a small business as either a prime or a subcontractor. (About 30 percent included a small business as a prime contractor). Also, more than 20 percent of the surveyed EPIC projects approved in 2015 include work (headquarters or a demonstration site) in a disadvantaged community.

In October 2015, Governor Brown signed Assembly Bill 865 (Alejo, Chapter 583, Statutes of 2015), which directs the Energy Commission to establish a diversity task force to consider and make recommendations about diversity in the energy industry. AB 865 efforts build on actions outlined by Energy Commission Chair Robert Weisenmiller in 2013 to ensure a diverse range of potential applicants are aware of competitive funding opportunities and understand how to prepare and submit an application.[131]

Also, California's Public Utilities Code Section 8283 requires the CPUC and CPUC-regulated entities to take actions to increase supplier diversity. Through General Order

130 California Energy Commission. April 8, 2015. Resolution Regarding Diversity Policy Statement. Resolution No: 15-0408-3.

131 Letter to CPUC President Michael Peevey from California Energy Commission Chair Robert Weisenmiller, http://www.energy.ca.gov/research/epic/documents/2013-11-07_Letter_from_the_Chair_re_AB_340-Docket_12-EPIC-01.pdf.

(GO) 156, the CPUC requires each utility to establish goals for procurement from diverse suppliers. For 2015, the CPUC reports that Southern California Gas Company, Pacific Gas and Electric Company, Southern California Edison, San Diego Gas & Electric, and Southwest Gas spent more than 40 percent of their purchases of services, goods, and fuel from diverse suppliers (CPUC 2016d). In October 2016, Pacific Gas and Electric Company received a national award from the National Minority Supplier Development Council (NMSDC), adding to several honors over the past 12 months recognizing its success in accelerating the growth of minority-owned businesses. In 2015, PG&E spent $1.6 billion with minority-owned businesses, a company record.[132] New entrants, such as community choice aggregators and preferred technology companies should do more to advance small businesses and diversity and set a goal to meet or beat the performance of traditional utilities by this measure of success.

Federal programs California can connect with and leverage to support small businesses include:

- The U.S. Small Business Administration programs to provide loans, facilitate access to private sector investment capital, and guarantee surety bonds.[133]
- The U.S. Treasury small business and community development programs to support state programs and private sector investment in small businesses, such as the small business credit initiative, small business lending fund, community development financial institutions fund, and the office of small business utilization.[134]
- U.S. Department of Energy Office of Energy Efficiency and Renewable Energy Small Business Vouchers Pilot to with national laboratory scientists to accelerate innovation in clean energy.[135]
- U.S. Department of Agricultural Rural Development programs for loans, loan guarantees, and grants for rural small businesses, including programs for energy efficiency and renewable energy.[136]
- Federal government contracting programs for small businesses at the U.S. Department of Energy, U.S. Department of Agriculture and other federal agencies.[137]

---

132 Pacific Gas and Electric Company. November 17, 2016. PG&E Receives National Award for Minority Supplier Development. https://www.pge.com/en/about/newsroom/newsdetails/index.page?title=20161117_pge_receives_national_award_for_minority_supplier_development

133 https://www.sba.gov/loans-grants

134 https://www.treasury.gov/resource-center/sb-programs/Pages/default.aspx

135 http://energy.gov/eere/articles/doe-s-innovative-small-business-vouchers-pilot-selects-33-small-businesses-lab

136 https://www.rd.usda.gov/programs-services/programs-services-businesses

137 For example, see http://energy.gov/osdbu/mission and http://www.dm.usda.gov/osdbu/index.php

The Caltrans Office of Business & Economic Opportunity (OBEO) is committed to increased participation of small business (SB), disadvantaged business enterprise (DBE), and disabled veteran business enterprise (DVBE) firms in both federal and state contracting and procurement. It has a disadvantaged business enterprise (DBE) goal of 12.5 percent on federal-funded projects and a small-business participation goal of 25 percent and a DVBE participation goal of 5 percent on state-funded projects. The California Department of Transportation (Caltrans) pursues "SB/DVBE and DBE business participation in all projects and procurement opportunities and has developed a comprehensive small business and disadvantaged business infrastructure with representatives in the 12 Caltrans districts."[138]

Similarly, the California High-Speed Rail Authority (HSR) targets small businesses in disadvantaged communities for assistance and keeps track of contracting dollars that go to them. This is driven by an aggressive goal of having 30 percent of its federal and state contracts go to small business,[139] including 17 percent for small businesses, 10 percent for disadvantaged business enterprises (DBE), and 3 percent for disabled veteran business enterprises.[140] HSR has committed to eliminating barriers and increasing small business participation and created a Business Advisory Council in 2012. The council includes California construction and professional services business trade associations and provides input to HSR in support of small businesses.[141]

Furthermore, to help small businesses understand procurement and contracting processes and ensure small business compliance with agency regulations and relevant statutes, most state agencies are required to have small business liaisons with duties that include providing technical advice and assisting small businesses in resolving problems and questions regarding compliance (California Government Code Section 11148.5).

Remaining challenges facing small businesses in California's disadvantaged communities are described below, followed by recommendations to address these challenges.

---

138 Caltrans, www.dot.ca.gov/obeo.

139 See Appendix D.

140 HSR staff has shared that, according to its *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. Proposition 209 amends to the California Constitution allow this. See hsr.ca.gov/docs/programs/small_business/Small%20and%20Disadvantaged%20Business%20Enterprise%20Policy.pdf and www.leginfo.ca.gov/.const/.article_1.

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

Lack of Access to Information

Data and Information on Small Businesses in Disadvantaged Communities

Although state agencies are committed to expanding contracting for small businesses and investment in disadvantaged communities, state agencies are somewhat restricted in their ability to target small businesses in disadvantaged communities[142] and are not required to obtain data from small businesses in disadvantaged communities that could help identify their unique needs and challenges with respect to participating in state contracting. The California Department of General Services (DGS) staff has shared that it is working on collecting demographic data from small and large public works businesses to better understand their needs.[143]

Measuring Success

Indicators tracking the number and success of small businesses can help ensure efforts to create more small business contracting opportunities are effective, particularly for small businesses in disadvantaged and low-income communities in the clean energy industry. Metrics of the CPUC's General Order (GO) 156 provide a leading example of measuring success for supplier diversity.[144]

California ARB, DGS, and other state agencies also provide helpful indicators of success, but further work is needed to better identify and share successes and opportunities to expand contracting opportunities for small businesses in disadvantaged communities.

Information About Current Funding Opportunities

In 2009, DGS funded a study to assess the economic impact of California's small business and disabled veteran business enterprise programs. The study surveyed a sample of 200 certified small businesses and disabled veteran business enterprises in California. They found that[145] one of the main reasons certified small businesses

---

142 State agencies may target contracting opportunities to small businesses in disadvantaged communities based on income, environmental pollution, or other factors, provided the factors are not prohibited by Proposition 209. Proposition 209, passed in 1996, prevents granting preferential treatment to any individual or group on the basis of race, sex, color, ethnicity, or national origin in the operation of public employment, public education, or public contracting in California. However, it does not prohibit action that must be taken to establish or maintain eligibility for any federal program, where ineligibility would result in a loss of federal funds to California.

143 Conversation with DGS staff, August 19, 2016.

144 "General Order (GO) 156 is a CPUC supervised voluntary Supplier Diversity Program. The program encourages active participation of the investor-owned utilities (IOUs) to procure or contract goods and services from women, minority, disabled veteran and/or LGBT- (lesbian, gay, bisexual and transgender) owned business enterprises (WMDVLGBTBE)." www.cpuc.ca.gov/uploadedFiles/CPUC_Public_Website/Content/About_Us/Supplier_Diversity/Landing_Page_Snippets/GO156WhatIsCertification.pdf. This program is CPUC's response to AB 3678 (Moore, Chapter 1259, Statutes of 1986).

145 Varshney and Tootelian (2009) note that 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.

participating in their research did not bid for state contracts was they "did not know of bid opportunities (28 percent)." Additional results indicate 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."

Although outreach in this area has been improved since publication of the study in 2009 (for example, DGS conducted 183 outreach events in fiscal year 2014-2015 alone),[146] APEN, Greenlining, and peers suggest outreach could be refined and better targeted through:[147]

1. Improving transparency of data to support clean energy outreach and accountability.
2. Removing policy barriers to targeting contracting opportunities with small and diverse-owned businesses.[148]
3. Increasing and improving outreach to small and diverse-owned businesses.
4. Developing targeted and equitable solicitations.

California's Target Area Contract Preference Act (TACPA) could be used to help advance some of these suggestions.[149] The program was established to encourage business investment in distressed areas of the state. The TACPA preference applies only to California-based firms that demonstrate and certify under penalty of perjury that at least 50 percent of the total labor hours for manufactured goods or 90 percent of the total labor hours for service contracts will be performed in qualifying areas. The law requires that TACPA preference information be included in contract solicitations in excess of $100,000. Prospective bidders can determine if their business is located in a qualified area by accessing the Interactive TACPA Map.[150] The number of TACPA

---

146 California Department of General Services. December 2015. *Fiscal Year 2014-15 Statewide Consolidated Annual Report.* Office of Small Business and DVBE Services.

147 Greenlining submitted written comments summarizing input from a public workshop APEN and Greenlining hosted on July 20, 2016. The comments reflect input from APEN, Brightline Defense Project, Center for Sustainable Energy, Coalition for Clean Air, Energy Solidarity Cooperative, the Greenlining Institute, Jobs to Move America, Rising Sun Energy Center, and Strategic Concepts in Organizing & Policy Education (SCOPE LA) APEN/Greenlining, written comments, Sep. 16, 2016, docketpublic.energy.ca.gov/PublicDocuments/16-OIR-02/TN212959_20160825T173803_Sekita_Grant_Comments_350_Recommendations_for_Jobs_Workforce_Tr.pdf.

148 Diverse-owned businesses refers to businesses owned by underrepresented groups such as women and people of color.

149 "The TACPA program was established in 1983 to stimulate economic growth and employment opportunities in designated distressed areas throughout the state of California. The Procurement Division (PD), Dispute Resolution Unit (DRU) within the Department of General Services (DGS) oversees the TACPA preference program and evaluates all TACPA applications. DGS derives its authority from California Government Code, Title I, Division 5, Chapter 10.5, Section 4530 et seq., and California Code of Regulations, Title II, Division 2, Chapter 3, Subchapter 9, Article 1, Sections 1896.30 -1896.41." www.documents.dgs.ca.gov/pd/poliproc/tacpapage.pdf.

150 tacpa.dgs.ca.gov/.

applications is small and has been decreasing over the past six years.[151] Further research is needed to understand why this program is underused and determine actions to help this program more effectively advance contracting opportunities for businesses in traditionally distressed areas. For example, TACPA does not include a specification for local hiring.

Information About Funding and Funding Criteria

Stakeholders have shared that lack of "specific knowledge of available funds and funding criteria" is a barrier to clean energy contracting "at the state and local levels."[152]

As stated above, while the State has a 25 percent contracting goal with small businesses in general, it is not required to track, among other data points, how much state funding is going to small businesses in disadvantaged and low-income communities. APEN and Greenling recommend these data be captured, "with a particular focus on businesses with less than 20 employees."[153]

Regarding training and hiring criteria, CalSEIA suggested the following: "The State should explore options for giving priority to training and hiring individuals meeting the criteria of Public Utilities Code Section 2870 (a)(3), which would provide additional opportunities and economic development in disadvantaged communities and people with low incomes. This is similar to the Housing and Urban Development (HUD) Section 3 program, which gives priority for training and employment opportunities to persons in public and assisted housing, persons in the area where HUD financial assistance is expended, participants in HUD Youthbuild programs, and homeless persons."[154]

Insufficient Targeted Outreach

The latest DGS annual report on small business and disabled veteran business enterprise participation in California state contracting 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."[155] 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 most agencies do not have full-time small-business advocates; therefore, their bandwidth to step out of the office for agency-driven outreach efforts is limited.[156] To fill these gaps,

---

151 Communication with DGS staff, October 18, 2016.

152 Communication with DGS staff, October 18, 2016.

153 Communication with DGS staff, October 18, 2016.

154 http://docketpublic.energy.ca.gov/PublicDocuments/16-OIR-02/TN214238_20161028T155803_Kelly_Knutsen_Comments_Comments_of_the_California_Solar_Energy.pdf.

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

156 Conversation with DGS staff, August 19, 2016.

DGS partners with federal, state and local community-based organizations and nonprofits (such as chambers, economic development agencies, and other organizations) supporting small business interests statewide.

The environmental equity stakeholders add: "The State and private groups can improve outreach by partnering with local community-based organizations and nonprofits such as chambers, economic development agencies, and other organizations supporting small business interests."[157]

Coordination among groups supporting small businesses in disadvantaged communities can help streamline connections and promote success. Examples of state and federal organizations working in this area include the following:

- The U.S. Small Business Administration partners with SCORE, a nonprofit association that has been mentoring small businesses for more than 40 years. The SCORE Web page lists more than 70 offices in California, including many in disadvantaged communities. The staff and volunteers at these offices provide free local mentoring, workshops, and other resources.
- The U.S.D.A. has more than 15 local rural development offices in California, including Bakersfield, Fresno, Merced, and Modesto and a statewide office in Davis.
- The California Governor's Office of Business and Economic Development (GO Biz) has several programs of interest to small businesses in disadvantaged communities, including a small business advocate office, the iHub Program, and workforce development partnerships.[158]
- The Energy Commission has funded regional innovation clusters, advanced energy communities, and the California Sustainable Energy Entrepreneur Development (CalSEED) Initiative to help identify and support energy entrepreneurs and clean energy innovation. Small businesses in disadvantaged communities are encouraged to participate in these programs. For example, the CalSEED initiative includes $4 million of Series A and Series B funding for underrepresented groups, including small businesses and disadvantaged communities.[159]

---

157 APEN/Greenlining, written comments, Sep. 16, 2016, docketpublic.energy.ca.gov/PublicDocuments/16-OIR-02/TN212959_20160825T173803_Sekita_Grant_Comments_350_Recommendations_for_Jobs_Workforce_Tr.pdf.

158 For more information, see http://gov-gobiz-elb-1780917013.us-west-2.elb.amazonaws.com/Programs/Innovation-and-Entrepreneurship.

159 California Energy Commission. March 9, 2016. California Clean Energy Fund California Sustainable Energy Entrepreneur Development (CalSEED) Initiative. Contract Request Form. http://www.energy.ca.gov/business_meetings/2016_packets/2016-03-09/Item11_%20300-15-007.pdf.

The literature and organizations surveyed by staff suggest that relevant agencies and departments, including the Energy Commission, the CPUC, DGS, GO-Biz, the California Air Resources Board (ARB), 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.

Technical Assistance and Workforce Needs

Certification and Solicitation Processes

Several surveyed stakeholders cited technical complexity or volume of (paper)work associated with the state certification and solicitation processes as an obstacle to broader participation of small businesses in state-funded contracting opportunities.[160]

With respect to the solicitation process, 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.[161] 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."[162]

To address these concerns, the coalition led by APEN and Greenlining suggests the State could offer dedicated technical assistance in the form of "case managers to navigate and apply for funding opportunities, build important business and networking skills, connect small businesses to contracting opportunities, and avoid contracting risks."

A number of stakeholders recommended the State set up *one-stop shops* to assist customers in low-income and disadvantaged communities. Perhaps these one-stop

160 For example, see BayREN Comments September 27, 2016, http://docketpublic.energy.ca.gov/PublicDocuments/16-OIR-02/TN213817_20160927T164017_Jennifer_Berg_Comments_Comments_of_the_BayREN_to_SB_350_Draft_M.pdf.

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

162 APEN/Greenlining, written comments, Sep. 16, 2016, docketpublic.energy.ca.gov/PublicDocuments/16-OIR-02/TN212959_20160825T173803_Sekita_Grant_Comments_350_Recommendations_for_Jobs_Workforce_Tr.pdf.

shops could also provide technical assistance to small businesses to help them successfully navigate the certification process and understand how to apply for competitive solicitations.

Greenlining also said the Energy Commission's CalSEED grant is a good example of a partnership connecting businesses in less-resourced communities to competitive funding opportunities. The environmental equity coalition adds: "There is an opportunity for public and private entities to support and partner with organizations that are successfully connecting small and diverse-owned businesses with contracting opportunities."[163] According to the coalition, the following organizations have strong programs in this area:

1. Sustainable Business Network (Philadelphia, Pennsylvania)
2. Sierra Business Council
3. Governor's Office of Business and Economic Development
4. Advanced Energy Economy
5. The Grant Farm
6. California Clean Energy Fund (CalCEF)

Specialization Issues

In its annual report, DGS "recognizes the challenges departments encounter due to the lack of certified SB/DVBE [small business and disabled veteran business enterprises] businesses in highly specialized fields."[164]

Several training programs are in place and under development in California to address this issue. For example,

- IOU workforce education and training (WE&T) programs.[165]
- Utility Pre-Craft Trainee program jointly operated by the Los Angeles Department of Water and Power and the International Brotherhood of Electrical Workers.[166]

---

163 APEN/Greenlining, written comments, Sep. 16, 2016, docketpublic.energy.ca.gov/PublicDocuments/16-OIR-02/TN212959_20160825T173803_Sekita_Grant_Comments_350_Recommendations_for_Jobs_Workforce_Tr.pdf

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

165 For more information, see http://docketpublic.energy.ca.gov/PublicDocuments/16-OIR-02/TN214252_20161028T164254_Israel_Salas_Comments_San_Diego_Gas__Electric_and_Souther_Calif.pdf. Also see, http://docketpublic.energy.ca.gov/PublicDocuments/16-OIR-02/TN214234_20161028T144114_Pacific_Gas__Electric_Comments_Pacific_Gas__Electric_Comments_o.pdf.

166 For a discussion of this program, see a 2016 report from the UC Berkeley Labor Center, Training for the Future II. http://laborcenter.berkeley.edu/training-for-the-future-ii/.

- Local workforce development board programs to convene, analyze, broker, advocate, and build local and regional workforce capabilities.[167]
- Industry-specific workforce services offered by the California Community Colleges Economic and Workforce Development program.[168]

To complement these efforts, California's clean energy and small business development agencies could expand efforts to develop specialized supplier networks. For example, APEN and Greenlining 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."[169]

Liker and Choi (2004) summarize successful supplier management tools and tactics based on their research of Toyota and Honda. They found that the process toward developing strong ties with their suppliers follows six 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*.
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 toward improving their technical capabilities.
5. Develop the habit of constant information sharing.
6. Become partners in the habit of *continuous improvement*.

The State could consider ways to use contracting opportunities as a pipeline for developing small business supplier networks that focus on expanding workforce development opportunities in disadvantaged communities.

Some firms in the construction industry have already translated their commitment to enhancing their business partners' performance into supplier development programs. For example, Turner, a New York-based international construction services company, is a leader in diverse market segments. Through its School of Construction Management,

---

167 California Workforce Development Board. Local Workforce Development Boards: California's Workforce Development System. http://cwdb.ca.gov/local_boards.htm.

168 California Community Colleges Economic and Workforce Development program. http://www.cccewd.net/.

169 APEN/Greenlining, written comments, Sep. 16, 2016, docketpublic.energy.ca.gov/PublicDocuments/16-OIR-02/TN212959_20160825T173803_Sekita_Grant_Comments_350_Recommendations_for_Jobs_Workforce_Tr.pdf.

initiated in 1969, it has trained minority- and women-owned businesses in the disciplines practiced in the construction industry and it has enhanced participants' "technical, administrative and managerial skills." While the program is designed to "prepare small, minority and women-owned contractors for contract procurement opportunities in New Jersey," it recently held a seven-week long program in Oakland, California.[170]

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." 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.[171]

To expand local workforce involvement in clean energy projects, comments provided jointly by the BlueGreen Alliance, California State Pipe Trades Council, San Mateo County Union Community Alliance, and other education and labor groups suggested the use of community workforce agreements, where possible, which can be used to tie together labor standards and local hire provisions.[172] For example, San Francisco adopted a local hiring policy for construction in December 2010.[173] In 2016, the policy was credited for more than doubling the proportion of construction opportunities going to local hires.[174]

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

---

170 Conversation with DGS staff (October 12, 2016) and Turner's website (www.turnerconstruction.com).

171 APEN/Greenlining, written comments, Sep. 16, 2016, docketpublic.energy.ca.gov/PublicDocuments/16-OIR-02/TN212959_20160825T173803_Sekita_Grant_Comments_350_Recommendations_for_Jobs_Workforce_Tr.pdf.

172 http://docketpublic.energy.ca.gov/PublicDocuments/16-OIR-02/TN212955_20160825T164922_Ross_Nakasone_Comments_Comments_on_SB_350_Barriers_Report_Works.pdf.

173 City and County of San Francisco Office of Economic and Workforce Development. Local Hire. http://oewd.org/local-hire.

174 "Local Hiring Law Succeeding Despite Concerns Over Skilled-Labor Supply," *San Francisco Examiner,* June 7, 2016, available at http://www.sfexaminer.com/local-hiring-law-succeeding-despite-concerns-skilled-labor-supply/, as cited in Brightline October 27, 2016 Brightline Defense Project Comments on Staff Draft Recommendations. Submitted to Energy Commission Docket 16-OIR-02. http://docketpublic.energy.ca.gov/PublicDocuments/16-OIR-02/TN214215_20161027T154439_Ivan_Jimenez_Comments_Brightline_Defense_Project_Comments_on_St.pdf.

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."

However, further career training opportunities are hindered by challenges related to workforce retention. For example, energy upgrades reflect broader trends in the construction industry, in particular, the construction slowdown during the winter months. These challenges can result in some energy upgrade jobs being temporary or seasonal; even permanent jobs may face reduced hours during slow periods. 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.[175]

Furthermore, program instability issues, due to changes in funding and reduced production, have resulted in PG&E losing 41 percent of the 2,000 ESA workers it hired in local communities.[176] The CEO of ECO shares that this start-and-stop behavior of state programs can affect the ability of associated small businesses to retain employees.[177]

Another stakeholder notes that workers from low-income households may have more difficulty than others managing difficulties related to unreliable transportation or intermittent childcare. These challenges could interfere with availability for work and may prompt an employer to terminate employment.[178] For example, events held in November 2016 by the San Francisco Public Utilities Commission in partnership with Oakland Tradeswomen, Inc., and others included discussion of help available to cover fees, tools, and childcare.[179]

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.[180] To help ease 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

---

175 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.

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

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

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

179 San Francisco Public Utilities Commission. Women on the Rise: Increasing Women in the Construction Trades. Events held November 17 and November 18, 2016. http://www.sfwater.org/index.aspx?page=1038

180 Brightline October 27, 2016 Brightline Defense Project Comments on Staff Draft Recommendations. Submitted to Energy Commission Docket 16-OIR-02. http://docketpublic.energy.ca.gov/PublicDocuments/16-OIR-02/TN214215_20161027T154439_Ivan_Jimenez_Comments_Brightline_Defense_Project_Comments_on_St.pdf.

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 career pathways that create opportunities for higher-paying and more sustainable jobs in the clean energy industry.

For instance, with respect to the concept that clean energy jobs should be thought of as more than installation jobs only, IREC has created a solar career map that considers different types of expertise (installation and operations, project development, system design, manufacturing), as well as different levels of expertise (entry-, mid-, and advanced level).[181]

The environmental equity coalition highlights four local Workforce Education & Training (WE&T) programs as good models for others to follow:

- Asian Neighborhood Design (Employment Training Center, San Francisco)
- CityBuild Academy (Office of Economic and Workforce Development, San Francisco)
- Several Proteus training programs (Proteus, Central Valley)
- San Mateo County Union Community Alliance's Trades Introduction Program

The International Brotherhood of Electrical Workers further points out that "SB 350 [already] contemplates a responsible contractor requirement that goes beyond just requiring compliance with licensing requirements. [These] should also identify responsible contractors as contractors that are investing in training programs and providing opportunities to disadvantaged workers—such as through participation in apprenticeship programs."[182] Subsequent comments from a group of labor and environmental organizations added, "State-approved apprenticeship programs are particularly effective in helping to deal with the barriers that people from low-income

181 IREC, Solar Career Map, irecsolarcareermap.org.

182 IBEW, public comment, September 29, 2016, http://docketpublic.energy.ca.gov/PublicDocuments/16-OIR-02/TN213850_20160929T155235_Thomas_Enslow_Comments_CA_IBEW_NECA_LMCC_comments_on_draft_SB_3.pdf.

communities and underrepresented groups face in attempting to enter into clean energy jobs."[183]

During the community outreach phase of this study, several 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 can make ideal partners in sharing program information with local residents, as well as in training the local workforce.[184]

To help fund collaboration and expansion of workforce development efforts for clean energy, Brightline suggests California create a "green workforce fund" for workforce development programs. This fund would help ensure collaborative efforts do not inadvertently reduce the amount of resources available for local workforce development.[185]

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 a larger quantity in support of more than one contract.[186] In the experience of the CEO of ECO, small businesses tend to buy retail.[187]

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 subcontractor fails to meet deadlines. Both of these requirements are very expensive and consequently exclude many small businesses."[188]

---

183 http://docketpublic.energy.ca.gov/PublicDocuments/16-OIR-02/TN214239_20161028T160302_Ross_Nakasone_Comments_Joint_Comments_on_SB_350_Barriers_Recomm.pdf.

184 Expressed by residents at SB 350 low-income barriers community meetings attended by Energy Commission staff in Los Angeles, Fresno, Oakland, and Riverside (August 2016).

185 http://docketpublic.energy.ca.gov/PublicDocuments/16-OIR-02/TN214215_20161027T154439_Ivan_Jimenez_Comments_Brightline_Defense_Project_Comments_on_St.pdf.

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

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

188 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.

Insufficient Private Funding Available

Comments provided by environmental equity organizations indicate that insufficient private financing is available for businesses in disadvantaged and low-income communities. The California Infrastructure and Economic Development Bank (IBank) offers a small business finance program to help address capital access barriers.[189] CalCEF and DBL Investors are leaders of profitable investing in small businesses and underserved communities, but additional investment is needed. To address this concern, Greenlining et al. suggest "using public dollars and policies to encourage clean energy investments in target communities."[190]

Community Energy Services Corporation (CESC) notes that the size of funding that small businesses may need for certain projects ranges between $500 and $2,500, which may not seem "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."[191]

The CEO of ECO further shared at the Barriers Study workshop that small businesses cannot easily take on debt, let alone qualify for a loan, citing to an example that if a small business has "had a late payment, then that might disqualify them."[192]

Yet, contract awards at the state level indicate some small businesses have secured the needed financial resources. The dollar amount awarded using the small business (SB) and DVBE Option by all state departments has increased by 43 percent in 2014-15. Departments awarded $531 million for 22,647 contracts, The SB and DVBE Option procurement method is statutorily permitted by Government Code Sections 14838.5(a) and 14838.7(a). Departments may use this streamlined solicitation by contracting directly with SB or DVBE firms after obtaining price quotes from at least two like firms. This option applies for contracts greater than $5,000 and less than $250,000, and up to $291,000 for public works contracts.

Keeping the Playing Field Level

Varshney and Tootelian (2009) found that "success rates clearly are higher among respondents who have bid for more state contracts. For example, 56.9 percent of the respondents who have bid two to five times have been successful at least once, and 85.4 percent of the respondents who bid for at least six contracts have been successful at

189 California Infrastructure and Economic Development Bank. Small Business Finance Center. http://www.ibank.ca.gov/

190 http://docketpublic.energy.ca.gov/PublicDocuments/16-OIR-02/TN212959_20160825T173803_Sekita_Grant_Comments_350_Recommendations_for_Jobs_Workforce_Tr.pdf.

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

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

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."[193]

Greater access to mentorship, networking, and subcontracting opportunities can help small businesses gain experience participating in competitive solicitations and winning bids without shouldering the full cost of preparing an application on their own.

Also, DGS and environmental equity stakeholders have identified the need for 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, when 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.[194]

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.[195]

Recommendations

The following recommendations (as numbered in the Executive Summary) are designed primarily to address the barriers to contracting opportunities for small businesses in disadvantaged communities.

3. The Energy Commission, CPUC, and CSD should partner with the California Labor and Workforce Agency, the Workforce Investment Boards, community colleges, and other agencies, as well as consult with employers, the UC Berkeley Labor Center and the relevant trade unions and community-based organizations, to strategize and track progress of workforce, community, and clean energy goals. This strategy should consider the following:

    a. The Legislature should establish a green workforce fund to allow state-administered clean energy and transportation programs to include a local workforce development component for low-income and disadvantaged

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

194 Conversation with DGS staff, August 19, 2016.

195 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.")

communities. This workforce development should be provided through direct hiring and training, through community-based organizations that have demonstrated to have hired and trained locally, or with organizations that run pre-apprentice or apprenticeship programs.

b. Energy service companies that demonstrate a commitment to hiring employees in low-income and disadvantaged communities should receive preference points, similar to incentives offered through the Target Area Contract Preference Act (TACPA), when competing for state or utility contracts. A set of contractor and workforce standards and other interventions should be included in the program requirements for clean energy incentive programs.

c. Expand the use of community workforce agreements for clean energy contracting in disadvantaged communities.

d. IOUs should coordinate their workforce education and training programs with California's main training and education institutions, with a focus on disadvantaged communities.

10. The Legislature should direct funding for all state programs to collaborate with trusted and qualified community-based organizations in community-centric delivery of clean energy programs, in coordination with local governments, to:

    a. Communicate program information to customers and obtain ongoing feedback from customers.

    b. Communicate contract information to local small businesses in disadvantaged communities.

    c. Develop local workforce to expand access to entry-level and high-quality jobs in the clean energy economy.

11. The Energy Commission and CPUC should direct research, development, demonstration, and market facilitation programs to include targeted benefits for low-income customers and disadvantaged communities.

    a. The Energy Commission's Electric Program Investment Charge (EPIC) Program should target a minimum of 25 percent of technology demonstration and deployment funding for sites located in disadvantaged communities.

    b. Energy Commission research development and deployment programs should conduct forums to share best practices and case studies on current projects located in disadvantaged communities.

    c. The Energy Commission should analyze potential business models that would create market opportunities for emerging clean energy technologies to be deployed in a manner that directly benefits low-

income customers and disadvantaged communities, including, but not limited to, tribal communities, rural communities, and mobile home communities.

d. The Energy Commission should sponsor prize competitions and challenges to spur novel ideas and solutions for bringing clean energy technologies to low-income customers and disadvantaged communities.

e. The IOUs – PG&E, SCE, and SDG&E – should identify opportunities to locate technology development and deployment projects in disadvantaged communities in all future EPIC Investment Plans, including their 2018-2020 EPIC Investment Plans.

f. The CPUC should review its programs to identify additional investment opportunities for cleaner sources of heating in disadvantaged communities in the San Joaquin Valley to support the goals of Assembly Bill 2672 (Perea, Chapter 616, Statutes of 2014).

12. The State should conduct an in-depth, data-driven study in consultation with local business chambers, CBOs, technical assistance providers (such as small business development centers and the Office of Small Business Advocate) and small businesses to determine actions for increasing contracting opportunities for small businesses in low-income and disadvantaged communities. A potential scope of this work is provided in Appendix C.

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 energy 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 5: HHS Poverty Guidelines for 2016 for the 48 Contiguous States and the District of Columbia

Persons in Family/Household	Poverty Guideline
1	$11,880
2	$16,020
3	$20,160
4	$24,300
5	$28,440
6	$32,580
7	$36,730
8	$40,890

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 plant 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 multimeter property owner to allocate the energy credits of a solar system 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

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

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 & 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

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.

Ahmed, Shan, and Barbara Byrne Denham, "The Outlook is Positive for Affordable Housing," National Real Estate Investor, November 3, 2016, http://nreionline.com/multifamily/outlook-positive-affordable-housing.

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)

Attachment 1 of *Compliance Filing of Pacific Gas and Electric Company (U 39-m)*, on Behalf of Itself, Southern California Gas Company (U 904-g), San Diego Gas & Electric Company (U 902-m), and Southern California Edison Company (U 338-e), Regarding Annual Estimates of CARE Eligible Customers and Related Information, 2016, http://docs.cpuc.ca.gov/PublishedDocs/Efile/G000/M158/K388/158388665.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,

Board of Governors of the Federal Reserve System. 2007. *Report to the Congress on Credit Scoring and Its Effects on the Availability and Affordability of Credit*, https://www.federalreserve.gov/boarddocs/rptcongress/creditscore/creditscore.pdf

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/.

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

CPUC (California Public Utilities Commission). 2012. *California Lighting and Appliance Saturation Study*.

——2014. *Decision on Large Investor-Owned Utilities' 2015-2017 California Alternative Rates for Energy (CARE) and Energy Savings Assistance (ESA) Program Applications,* http://docs.cpuc.ca.gov/PublishedDocs/Efile/G000/M167/K502/167502394.PDF.

——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.

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.

Energy Efficiency in California's Public Power Sector: A 2016 Status Report, NCPA/CMUA/SCPPA, 2016.

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.

Evergreen Economics. 2016. *Needs Assessment for the Energy Savings Assistance and the California Alternate Rates for Energy Programs, Volume 1 (Review Draft)*.

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. 2016. *Who's Participating and Who's Not? The Unintended Consequences of Untargeted Programs.* ACEEE Summer Study on Energy Efficiency in Buildings.

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

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.

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 customers*.

Kevala Analytics. 2015. *White Paper: Income Distribution of Rooftop Solar Customers*, https://www.kevalaanalytics.com/whitepaper-income-distribution-of-rooftop-solar-customers-2/

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*.

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.*

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

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

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.

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.

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.

Oppenheim, Jerrold and Theo MacGregor, 2011. *The Massachusetts Model for Low-Income Energy Service Delivery.* http://www.democracyandregulation.com/attachments/140/mass_model_for_li_e_services_100311.pdf

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.

Research Into Action, Inc., Ghoulem Research, Dena Gromet. 2016. *Literature Review: Housing, Energy Use, Decision-Making and Messaging among Key Ethnic Groups in California.* Center for Sustainable Energy. Prepared for the California Energy Commission under Grant #EPC-14-037.

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.*

Ronen, Amit, Dor Hirsh Bar Gai, and Lucas Crampton. July 2016. "Can Electricity Rate Subsidies be Reallocated to Boost Low-Income Solar?", GW Solar Institute, Working Paper.

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). May 2012. *A Guide to Community Shared Solar: Utility, Private, and Nonprofit Project Development*.

——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.

——2016c. *Best Practices Guidelines for Residential PACE Financing Programs.*

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%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.*

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

There are about 4.133 million low-income households in California (those whose incomes are at or below 200 percent of the federal poverty guidelines), representing 33 percent of all California households (Evergreen Economics, 2016).

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 finding 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 A-1). The median energy burden for a low-income multifamily household was also significantly higher than each city's median household energy burden.

Table A-1: Energy Burdens in California Cities

City	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). 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 A-2: Home Ownership by Population (2016)

	Percent of California Moderate and High-Income Population	Percent of California Low-Income Population
Owned, Single Family Home	50%	26%
Rent, Single Family Home	11%	23%
Rent, Multifamily Housing	34%	47%
Other	6%	4%

Source: Evergreen Economics, 2013b, Table 10.

Table A-3: 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 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 the 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

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 A-4: Housing Type by Population (2011)

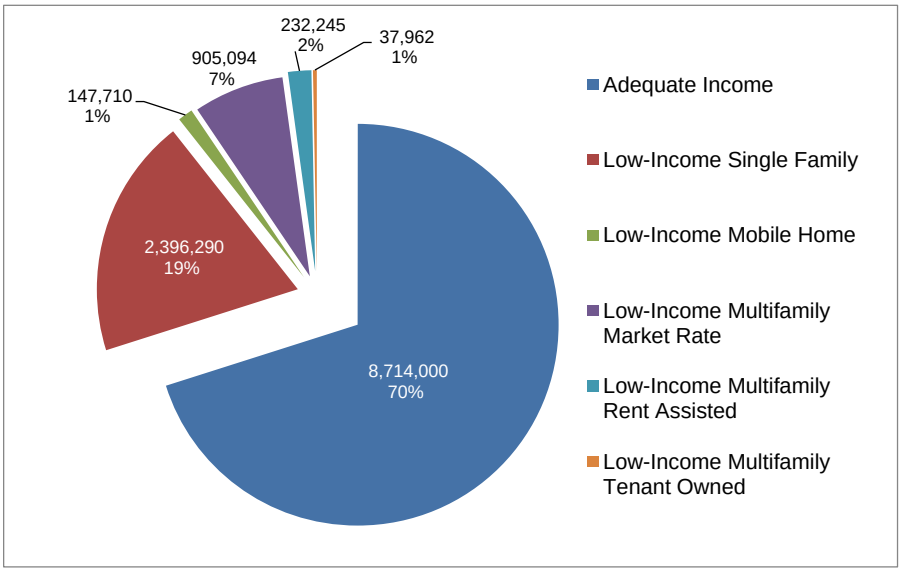
Housing Type	Percent of California Population	Percent of California Low-Income Population
Single-Family	66%	51%
Multifamily	31%	43%
Mobile Home	4%	6%

Source: Evergreen Economics, 2013b, Table 9.

Figures A-1 and A-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 A-1: Estimated Number of California Households, Including Low-Income Multifamily

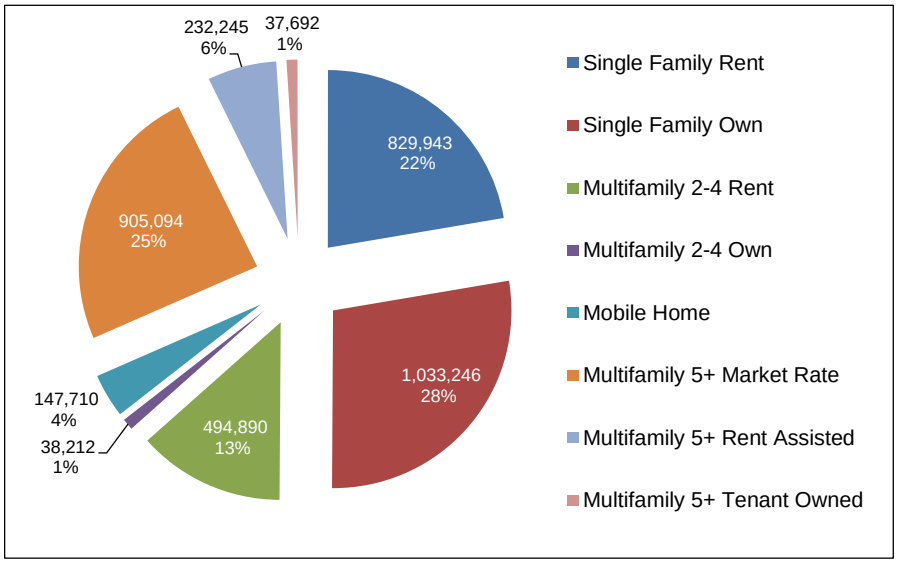


Source: West et al, 2013, Figure 3.

Building Age

Forty-three percent of California's housing stock was built before 1970, and 61 percent was built before 1980, according to U.S. Census data from 2014. (2014 U.S. Census). Although low-income customers on the whole are not more likely than the general populace to live in older homes, 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 the average age of low-income multifamily housing units.

Figure A-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

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 A-5: 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 doubled 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 A-6: 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 A-7: 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 A-8: 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

Low-income Californians spent a greater share of their incomes on energy. According to survey data in 2016, low-income households averaged an energy burden of 5.6 percent, whereas moderate and high-income households averaged just 1.6 percent (Evergreen Economics, 2016).

Low-income homes in California are on average smaller than other homes in the state – 1,311 square feet compared to 1,643 square feet (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.

Disconnections

Low-income customers face a disproportionate risk of utility disconnections. In 2014-2015, utility disconnections by California's three largest investor-owned utilities for failure to pay energy bills affected 5 percent of low-income customers, compared with only 1.3 percent of moderate and high-income customers (Evergreen Economics, 2016).

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).

More than 4, 134,000 California households are classified as low-income according to the federal poverty level (FPL). 15 percent of California's households have incomes below the FPL, with another 18 percent below 200 percent of the FPL (Evergreen Economics, 2016). According to research by Evergreen Economics (2013b), the average

household income for all California homes is $80,684, while the average income of households that are at or below 200 percent of the federal poverty level is $20,621. The average income for low-income households showed no real gains in household income between 2004 and 2011, even while the average California household income increased by more than $11,000.

Table A-9: Average Low-Income Californian 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 A-10: 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 A-11: Employment Status of Head of Low-Income Household by Housing Type and Language in California (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.

Languages 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)." (Research Into Action et al, 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 an Asian language and 7 percent "other."

Table A-12: Language Spoken in Low-Income Households in California by Housing Type (2011)

	English Only	Spanish	Asian & Pacific Island	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 customers 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 substandard 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).

The following table 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 A-13: 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 A-14: Linguistic Isolation by Housing Type and Language for Low-Income Households (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 A-15: Race/Ethnicity of Low-Income Householder by Housing Type and Language in California (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 isolated	10%	1%	24%	64%	1%

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 subpar 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 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 A-16: 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 A-17: Education of Head of Household by Housing Type and Language Among Low-Income Households (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 A-18: 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 A-19: 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 2.0) 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 census tracts in some areas of Los Angeles, Sacramento, San Francisco, and San Diego; the San Joaquin Valley, and the Coachella and Imperial regions (OEHHA, 2014).

Table A-20: CalEnviroScreen Indicators

Pollution Burden: Exposure and Environmental Effect Indicators	Population Characteristics: Sensitive Population and Socioeconomic Factor Indicators
• Air Quality: ozone and fine particle polution • 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 for economically, socially, and health disadvantaged communities. The indicators are assigned to "domains," which are assigned different weights.

Table A-21: 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
  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
	• Economic Resources
	  o Poverty
	  o Crowding
	  o High Housing Cost
	  o Unemployment Rate
	  o No Auto Access
	  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 A-22: Domain Mean Disadvantage Scores by California Region (2010)

Region	Education	Environment	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 energy efficiency, weatherization, and renewable energy investments for low-income customers, as well as the barriers to small business contracting opportunities in disadvantaged communities. The primary objective for public engagement in this study 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 level of engagement provided a comprehensive approach in understanding barriers and identifying solutions and opportunities.

Multilayered Approach

A combination of many types of events and efforts were executed to promote public engagement, including:

- Public workshops.
- Community stakeholder meetings.
- Community stakeholder workshops and roundtable discussions.
- EJAC community meeting.
- Low-Income 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 clean energy upgrades 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 East Los Angeles, Fresno, Riverside, Oakland, Truckee/South Lake Tahoe/Sierra Mountain region, Ukiah, and Los Angeles.

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's schools.

Upfront Costs Are Prohibitive

Unsurprisingly, some residents identified that the up-front costs of implementing energy efficiency technologies or procuring renewable energy such as solar were 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 their budgets. Suggested recommendations to address this included additional financial assistance opportunities, particularly if 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, several 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. (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 they participate in them. While a handful of participants at each meeting indicated they participate in a variety of programs, community members generally felt strongly 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 a household participated in one program, it would be ineligible to participate in others. Moreover, some 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 multiyear 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 would be, 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 (SB 350) study on barriers to access for low-income residents 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, the Center for Sustainability, and the California Air Resources Board.

- *June 20, 2016, Berkeley*—The Center for Sustainable Energy and the Greenlining Institute cohosted a roundtable discussion and breakout workshops with energy experts from a wide array of organizations. Energy Commission staff participated in these discussions. 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.
- *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 improve access to energy efficiency and renewable energy. Twenty-three residents attended this meeting, which was conducted completely in Spanish with English translation available. Some community members stated they live in their own homes; others stated they live 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 improve access to energy efficiency and renewable energy. This meeting was conducted in English with Spanish translation available. Thirty-four participants attended. Some community members stated they live in their own homes (including mobile homes); others stated they live in rented homes.
- *August 12, 2016, Sacramento*—The Energy Commission hosted a public workshop with guest speakers from government agencies, environmental justice groups, utilities, and industry partners
- *August 18, 2016, Riverside*—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 improve access to energy efficiency and renewable energy. This meeting was attended by 10 residents; the meeting was conducted in English with Spanish translation available. Some community members stated they live in their own homes (including trailer homes); others stated they live 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 improve access to energy efficiency and renewable energy. Eleven residents attended the meeting, which was conducted in English with translation available in three Asian languages (Mandarin, Laotian, and Mien). Some community members stated they live in their own homes; others stated they live 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 improve access to energy efficiency and renewable energy. Nineteen participants, including one who joined via WebEx, attended the meeting, which was conducted in English. Most 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 improve access to energy efficiency and renewable energy. 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 some members of their communities live in their own homes, and others live 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 improve access to energy efficiency and renewable energy. Forty-two participants this meeting, which was conducted in English with Spanish translation. Some community members stated they live in their own homes; others stated they live in rented homes.
- *September 13, 2016, Sacramento*—The Energy Commission hosted a public workshop to present the draft study for public comment.

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	• 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 applied, 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 Lake Tahoe/Sierra Mountain Region	• Energy Savings Assistance Program, the Residential Energy 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.

Community	Response
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 multiunit 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	• For most attendees: health, economic, environmental.
Oakland	• For most attendees: health, economic, environmental. • For others, saving money is most important.
Truckee/South Lake Tahoe/Sierra Mountain Region	• Community members identified financial savings, comfort, and climate change.
Ukiah	• Not questioned or no responses
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	• Not questioned or no responses
Riverside	• 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	• Not questioned or no responses

Community	Response
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

Community	Response
	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. 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, and 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. o Including that, if people are already benefiting from one or more programs, that does not disqualify them from other programs. o The State should launch a massive public awareness campaign. • Simplify requirements for all programs—and avoid asking for SSN (use ITIN if needed). o 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 at utilities and other companies providing these programs need to improve as well. They need to have better information and attitude. o Flexible hours for customer service representatives to accommodate various customers' working shifts. • Do not reduce current programs. o 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. o What formal, legal recourse does the community have to force IOUs 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

Community	Response
	want a higher premium/collateral. • Perform a statewide assessment of low-income families (both, those currently participating in Energy Efficiency/Renewable Energy programs and those that are not) 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	• Better information is required 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 California, 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 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, and 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

Community	Response
	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 o Must-include languages: Cantonese & Mandarin, Laotian, Mien, Thai, Vietnamese, Spanish. o 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. o No need to print millions of flyers in different languages—just post the info in multiple languages on a website. o Launch a public campaign: upload videos to the Web, send maquettes to schools and community centers. ▪ Use Facebook. o 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. o Install solar on, say, community centers, so folks can see and learn from the example. • Address the split incentive o Renters cannot apply sometimes because they do not easily qualify. o Landlords have little/no incentive to install, for they do not (seem to) benefit; both should benefit, landlords and tenants. o 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?) o Encourage the use of natural light instead of light bulbs. (New building designs could address this.) • Not being able to apply for new upgrades if the house has been weatherized is a big issue o One person was told that he 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	• Incentives for homeowners o 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)

Community	Response

Mountain Region	• Incentives that apply to homes off the grid (propane users)
	• Reclassification of the term *disadvantaged community* to acknowledge poverty-stricken but relatively unpolluted communities
	• Financing mechanisms that apply to the discrepancies between living costs and average wages in the area
	  o Low-income subsidies to fund community solar instead of the CARE program
	  o 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.
	• Use of the following technologies in the region:
	  o Geothermal heat pumps for building and school heating
	  o Passive solar (buildings facing a warmer direction to garner heat and light)
	  o Small-scale bioenergy grouping incentives
	• Customizing building and tree-cutting requirements
	  o 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
	• Expand the existing Liberty Utility Program to offer incentives for building renovations, not just to low-income customers
	• Modify the Pointer-Cologne Act to remove the clause requiring the pumping of heated wastewater out of the Tahoe Basin

Ukiah	• Establish an Energy Commission 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.

Community	Response

	• Adopt the right solution for each community's situation:
	  o Community solar allows enables ideal locations to be selected 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/information on programs, 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 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 CBOs 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.
	  ▪ For example, 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

Community	Response
	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 IOUs champion this, so they can further spread the idea – instead of making excuses” ▪ “Hold IOUs 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 Andrew McAllister commented that perhaps it is not that IOUs 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	• People asked for the Energy Commission 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 • Forty percent of the region's customers are not part of the electric grid system and, thus, are ineligible for energy saving or weatherization opportunities • Strict regulations for tree cutting to use 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 first year, PG&E would add back charges – so people got scared off solar.

SB 350 Low-Income Barriers Study Web Page

A dedicated SB 350 Low-Income Barriers study was launched in February 2016 and provided an overview of the planning approach and process. The Web page 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. The page can be found at http://www.energy.ca.gov/sb350/barriers_report/.

APPENDIX C: Recommended Scope for Future Small Business Study

Staff recommends the research scope below for a study addressing key information gaps to contracting barriers and opportunities for small businesses in disadvantaged communities.

What are the characteristics of local small businesses in low-income and disadvantaged communities compared to small businesses elsewhere in California?

What kinds of small businesses in the low-income and disadvantaged communities seek to provide clean energy services for state government, large businesses, and/or residential customers?

What characteristics, qualifications, and financial indicators do small businesses need to win contracts with state government, large businesses, and/or residential customers? To what extent do these requirements pose barriers for contracting with local small businesses in low-income and disadvantaged communities?

- What is needed to address these barriers and advance contracting success for local small businesses in disadvantaged communities?

What are the unique needs and challenges that local small businesses in low-income and disadvantaged communities should overcome to win and successfully complete clean energy contracts with state government and large businesses?

What role do *supplier development programs* and other similar efforts aimed at heightening small-business performance have in improving overall industry supply chains in California?

- Determine the extent to which these programs are currently helping small businesses.
- Determine whether the auto industry or the construction industry examples are good models for other sectors.
- Describe the desirable characteristics and best practices of supplier development programs applicable to clean energy in California.

What role do apprenticeship programs, trainee-level pay, and other workforce development efforts have in improving overall local workforce dynamics and local economics?

- Determine the extent to which these solutions are currently helping small businesses in low-income communities and disadvantaged communities.

Perform a cost-benefit analysis of expanding these programs for small businesses in low-income communities and disadvantaged communities in California.

Describe the desirable characteristics and best practices recommended for current or new workforce development programs for small businesses in low-income communities and disadvantaged communities in California.

How can the Target Area Contract Preference Act (TACPA) or California small-business contracting policies and targets be modified to further benefit local small businesses in low-income and disadvantaged communities?

Determine the extent to which TACPA is working as intended.

Determine whether TACPA, a specific participation goal, and/or a new program could advance local workforce development efforts and expand state contracting with local small businesses in low-income and disadvantaged communities.

Describe the desirable characteristics and best practices recommended for current and new programs to enhance state contracting opportunities for small businesses in low-income and disadvantaged communities.

How can state government spark investment in a stronger supply chain strategy for small businesses in low-income and disadvantaged communities?

What other specific recommendations can effectively increase contracting opportunities for small businesses in low-income and disadvantaged communities?