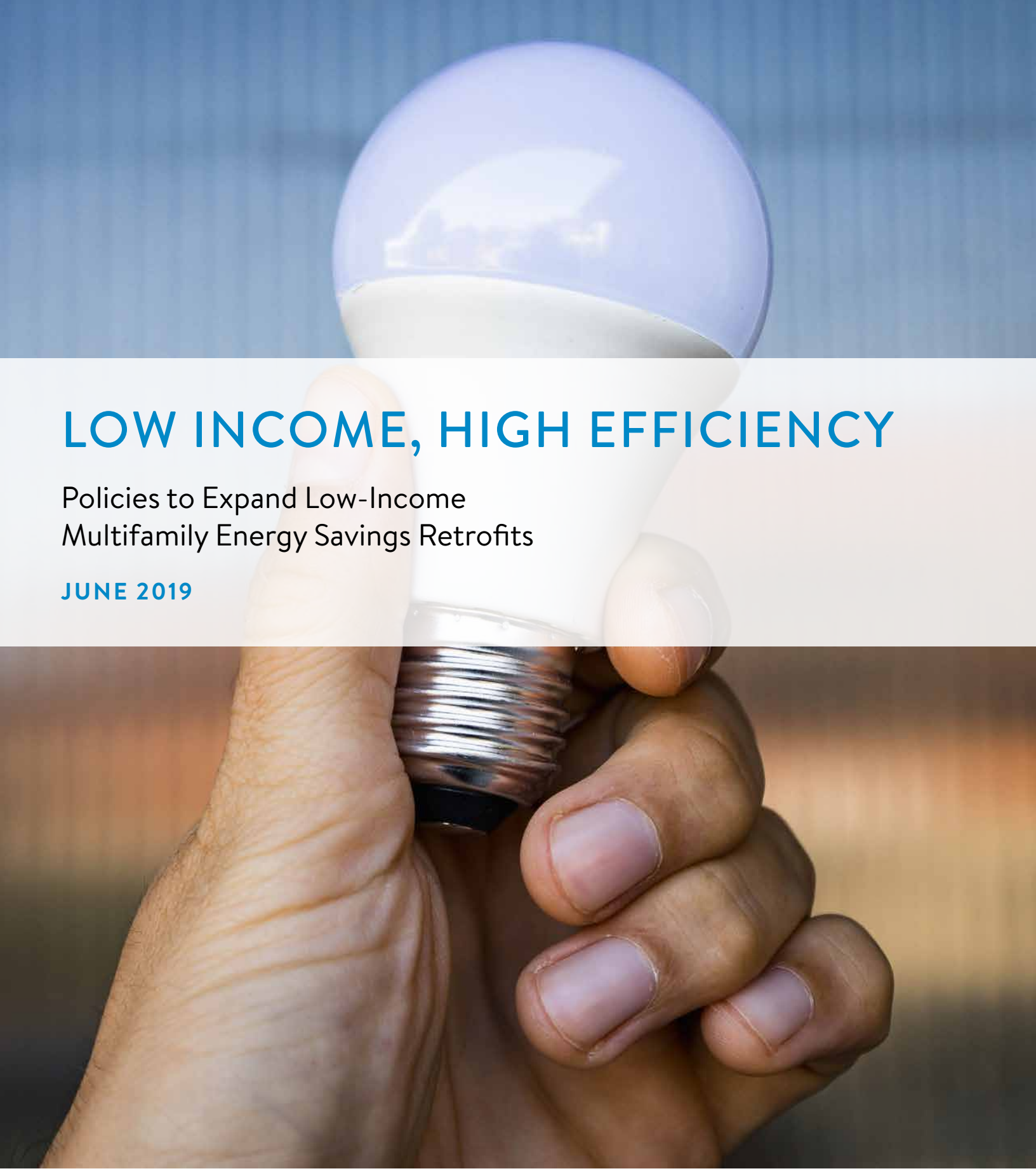

LOW INCOME, HIGH EFFICIENCY

Policies to Expand Low-Income Multifamily Energy Savings Retrofits

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BANK OF AMERICA

BerkeleyLaw
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Center for Law, Energy & the Environment

UCLA School of Law
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About this Report

This policy report is the twentieth in a series on how climate change will create opportunities for specific sectors of the business community and how policy makers can facilitate those opportunities. Each report results from workshop convenings that include representatives from key business, academic, and policy sectors of the targeted industries. The convenings and resulting policy reports are sponsored by Bank of America and produced by a partnership of UC Berkeley School of Law's Center for Law, Energy & the Environment (CLEE) and UCLA School of Law's Emmett Institute on Climate Change and the Environment.

Authorship

The authors of this report are Ethan N. Elkind, Director of the Climate Change and Business Program at CLEE and UCLA School of Law's Emmett Institute on Climate Change and the Environment, and Ted Lamm, Research Fellow in the Climate Program at CLEE. Additional contributions to the report were made by Jordan Diamond of UC Berkeley School of Law and Sean Hecht and Cara Horowitz of UCLA School of Law.

This report and its recommendations are solely a product of the UC Berkeley and UCLA Schools of Law and do not necessarily reflect the views of all individual convening participants, reviewers, or Bank of America.

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For more information, contact Ted Lamm at tlamm@law.berkeley.edu and Ethan Elkind at eelkind@law.berkeley.edu and elkind@law.ucla.edu.

Glossary of Terms

Assembly Bill 32 (Nuñez, Chapter 488, Statutes of 2006):
California law that sets out the state's initial goal of reducing greenhouse gas emissions to 1990 levels by 2020.

Assembly Bill 758 (Skinner, Chapter 470, Statutes of 2009):
California law that requires CEC to develop a comprehensive program to achieve greater energy efficiency in the state's existing buildings, leading to the state's 2015 Existing Buildings Energy Efficiency Action Plan.

Assembly Bill 802 (Williams, Chapter 590, Statutes of 2015):
California law that increases the availability of building-wide energy use data by instituting the use of normalized metered energy consumption and allowing building owners to have access to their buildings' energy usage information.

California Air Resources Board (CARB):
An entity within the California Environmental Protection Agency responsible for maintaining clean air, including enforcement of the state's greenhouse gas reduction laws.

California Alternate Rates for Energy (CARE):
A California program that provides monthly discounts on electricity and gas bills to qualifying low-income customer households in investor-owned utility service territories.

California Alternative Energy and Advanced Transportation Financing Authority (CAEATFA):
An agency within the Office of the State Treasurer responsible for administering a range of innovative financing programs designed to reduce greenhouse gas emissions, including clean energy bonds, PACE-related programs, and CHEEF pilot programs.

California Department of Community Services and Development (CSD):
California's agency dedicated to helping low-income families achieve and maintain self-sufficiency and energy efficiency, including administration of LIHEAP and LIWP.

California Energy Commission (CEC):
The state's primary energy policy and planning agency, with roles including supporting energy research, developing renewable energy resources, and advancing alternative and renewable transportation fuels and technologies.

California Hub for Energy Efficiency Financing (CHEEF):
A public-private partnership among state agencies, utilities, lenders, contractors, and borrowers, administered by CAEATFA, to help California achieve its energy savings goals by increasing the availability of lower-cost financing for energy efficiency investments.

California Public Utilities Commission (CPUC):
California's agency in charge of regulating privately owned electric and gas utilities, as well as investor-owned water utilities and railroad, passenger transportation, and telecommunication companies.

California Solar Initiative (CSI):
A CPUC rebate program for customers of California's IOUs that provided performance-based incentives for residential rooftop solar installations.

Community Development Financial Institution:
A private financial institution dedicated to providing affordable financing and capital opportunities to low-income and/or disadvantaged people and communities.

Energy Savings Assistance Program (ESA):
A ratepayer-funded energy efficiency program, administered by electric and gas utilities, that provides no-cost energy efficiency measures to qualifying low-income customer households.

Energy Savings Assistance Cost-Effectiveness Test (ESACET):
A tool to assess the cost-benefit ratio of an energy efficiency measure that incorporates utility and participant costs and energy savings, including some health and safety and other non-energy benefits, used only for low-income programs.

Executive Order B-55-18:
Executive order issued by Governor Jerry Brown establishing a goal of statewide carbon neutrality by 2045.

Investor-Owned Utility (IOU):
A privately owned electric company that in California is regulated by the CPUC. California's three major investor-owned electric and gas utilities are Pacific Gas & Electric (PG&E), San Diego Gas & Electric (SDG&E), and Southern California Edison (SCE).

Low-Income Home Energy Assistance Program (LIHEAP):
A federal program that provides funding to community-based organizations to help low-income households pay utility bills and increase home energy efficiency through weatherization.

Low-Income Weatherization Program (LIWP):
A California cap-and-trade funded program, administered by CSD, that installs solar panels, solar hot water heaters, and energy efficiency measures in low-income dwellings in disadvantaged communities to reduce greenhouse gas emissions and save energy.

On-Bill Financing/Repayment (OBF/OBR):
Loan programs that utilize the customer's utility bill as the repayment mechanism for efficiency improvements. On-bill financing involves an investor-owned utility originating a loan (from ratepay-

er funds), while on-bill repayment involves a loan from a third-party lender that the customer repays via the utility bill.

Senate Bill 32 (Pavley, Chapter 249, Statutes of 2016):
California law requiring statewide greenhouse gas emissions to be reduced 40 percent below 1990 levels by 2030.

Senate Bill 100 (de León, Chapter 312, Statutes of 2018):
California law requiring the state to achieve 60 percent renewable electricity by 2030 and 100 percent by 2045.

Senate Bill 350 (de León, Chapter 547, Statutes of 2015):
California climate and clean energy legislation that requires a 100 percent increase in energy efficiency of all buildings statewide by 2030 and required the CEC to study the barriers faced by low-income residents to energy efficiency investment and financing and prepare a set of recommendations to increase access.

Tariffed On-Bill Investment:
A mechanism for financing efficiency improvements, similar to on-bill financing, based on a utility offer that pays for upgrades under the terms of a new, additional charge (or "tariff") on the bill that is associated with the meter at the address of the property, rather than the customer, but does not constitute a loan or debt obligation.

Total Resource Cost (TRC):
A measure of the cost-benefit ratio of an energy efficiency program based on the total costs of the program, including both the participant's and utility's costs.

EXECUTIVE SUMMARY

California's ambitious climate change policies require significant greenhouse gas emission reductions throughout the state's economic and social fabric, ranging from electricity generation and industrial production to land use and transportation. Key among these sectors are residential buildings, which, through their consumption of electricity and natural gas, are responsible for over one tenth of California's emissions.[1] In 2015, the state set a goal of doubling energy efficiency in all buildings by 2030.

The state has long enforced strict energy efficiency requirements for newly constructed homes as well as minimum efficiency improvements for renovations of existing homes. But approximately half of California's residential buildings were built prior to the introduction of the efficiency standards, and the vast majority of Californians live in buildings that are not efficient enough for the state to meet its target.

Achieving statewide efficiency targets is most challenging in the low-income multifamily residential sector. Unlike single-family, owner-occupied homes, these buildings are subject to "split incentives" between owners who might pay for an efficiency retrofit and tenants who would reap the savings based on reduced energy consumption in their units. Low-income property owners also typically face reduced access to capital to fund a project, increased restrictions on their ability to finance one, and older construction that requires significant renovation in other areas. To overcome these barriers, California and its electric and gas utilities have devised a suite of incentive and rebate programs that provide low-income multifamily building owners with access to a range of efficiency retrofit measures. To participate, owners first need to be able to prioritize energy efficiency upgrades among the many demands for limited capital. For those owners that pass this barrier, a range of factors such as limited owner/developer staff expertise and resources, inadequate energy data, and general program complexity can limit participation.

To address these structural and program challenges, UC Berkeley and UCLA Schools of Law convened low-income multifamily housing owners and developers, state and local government representatives, program implementers and contractors, housing and environmental advocates, and energy efficiency experts on February 27 and November 1, 2018 for two discussions on ways to increase uptake of efficiency retrofit projects and incentives. The latter convening included five case study presentations from California low-income multifamily property owner/developers to highlight their recent experiences undertaking major efficiency projects.

Energy Efficiency: Defined

Energy efficiency encompasses all measures that allow a structure or process to use less energy to perform a given task. For residential buildings this can include appliances, building shell (or "envelope") improvements, electrical and water systems, operational modifications, and more. The California Energy Commission's SB 350 Barriers Study, citing the California Public Utilities Commission, 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."

Low-Income Multifamily Housing: Defined

No single definition or threshold exists for what constitutes "low-income" or "multifamily" housing. In its SB 350 Low-Income Barriers Study, the California Energy Commission uses "low-income" to refer to households whose incomes do not exceed 80 percent of the median family income for the area and "multifamily" to refer to buildings with five or more individual units. This report will generally refer to these definitions when using these terms. However, as described in the next section, federal and state incentive programs, including some of those under the jurisdiction of the California Public Utilities Commission, employ multiple, varying definitions to determine eligibility. Many of the recommendations included in this report can be applied not just to the low-income multifamily housing sector, but to all of California's residential energy efficiency programs. Since many of the programs and entities referenced in this report serve a broad range of residents and owner/developers, the streamlining and coordination concepts discussed herein could benefit all Californians. But each solution shares a common goal in addressing the uniquely difficult challenges facing the low-income multifamily sector.

This report encapsulates those discussions, case studies, and participant recommendations. It begins with a group-suggested vision of a low-income multifamily energy savings retrofit program design framework that reduces barriers to participation and helps the state achieve its efficiency goals. The report outlines the top challenges limiting realization of that vision, including:

1. **Lack of Program Integration**
2. **Lack of Reliable, Long-Term Funding**
3. **Lack of Data and Confidence in Savings and Non-Energy Benefits**

The report then describes a suite of policy recommendations designed to overcome each challenge. Among the range of solutions, the following high-priority items can serve as focus points for efforts by lawmakers, regulators, utilities, and program implementers:

- Lawmakers, regulators, and utilities could collaborate to **create a statewide "one-stop shop" efficiency program administrator** that serves as a single point of contact for customers and facilitates access to and combination of all available incentives.
- Lawmakers could **launch a stable, long-term public fund to support existing incentive programs** and provide building owners and developers with the certainty they need to plan retrofit projects now that sometimes may need to start construction in a few years or more.
- Lawmakers and regulators could **authorize and fund pilot projects for innovative private and public/private financing structures** to help create a robust market for deep retrofit projects.
- Lawmakers and regulators could **create a statewide database of energy, financing, and rehabilitation needs and timelines** to inform owners, program administrators, and third-party contractors and financing entities.
- Regulators and incentive program administrators could **adopt cost-effectiveness metrics that better account for health and environmental benefits associated with efficiency projects** to increase their financial viability and to support tenants' quality of life.
- Financing entities and contractors could **develop innovative efficiency performance guarantee and insurance products** to help owners and consumers secure minimum gains.

The following pages detail the complete set of challenges and proposed solutions. The report also incorporates five case studies of individual energy efficiency projects that highlight the challenges and solutions described in the report.

CHALLENGE 1: LACK OF PROGRAM INTEGRATION CAUSES COMPLEXITY FOR END USERS

Solutions:

State legislators could:

- Create a single, statewide "one-stop shop" efficiency program administrator
- Increase support for coordinated technical assistance across design, engineering, and financial needs
- Restructure the timing of incentives and financing programs to align with planned renovations and refinancing events
- Create incentives for existing programs to increase coordination

- Ensure that programs address or do not exacerbate the housing shortage and preservation concerns

State utility, energy, and housing regulators could:

- Harmonize definitions of terms and eligibility for existing programs
- Restructure the timing of incentives and financing programs to align with planned renovations and refinancing events
- Harmonize cost-effectiveness metrics and savings targets across existing programs
- Expand outreach to owners and developers about available programs and incentives
- Optimize deployment of existing funds for the highest-order energy retrofit needs that entail the most energy-saving benefits
- Ensure that programs address or do not exacerbate the housing shortage and preservation concerns

Electric and gas utilities could:

- Harmonize definitions of terms and eligibility for existing programs
- Increase support for coordinated technical assistance across design, engineering, and financial needs
- Expand outreach to owners and developers about available programs and incentives
- Optimize deployment of existing funds for the highest-order energy retrofit needs that entail the most energy-saving benefits

CHALLENGE 2: LACK OF RELIABLE, LONG-TERM FUNDING INHIBITS MARKET TRANSFORMATION

Solutions:

State legislators could:

- Create a stable, long-term public fund to support the one-stop shop administrator and subsidize advanced efficiency measures
- Fund existing programs on longer timelines and with fixed eligibility requirements
- Promote pilot programs to facilitate financing mechanisms that leverage public and private funds and aggregation
- Enable greater access to on-bill financing and on-bill repayment arrangements
- Create a statewide database that combines financing, general rehabilitation, energy needs, eligibility, and other key data to identify trigger points that can inform consumers and target high-priority projects and owners

State utility, energy, and housing regulators could:

- Institute utility tariffed on-bill programs that capitalize energy efficiency retrofits without making loans
- Review the utility efficiency incentive programs to ensure they provide deep savings and non-energy benefits to buildings
- Create a statewide database that combines financing, general rehabilitation, energy needs, eligibility, and other key data to identify trigger points that can inform consumers and target high-priority projects and owners

Next Steps: Valuing and Prioritizing Investments

This report raises—but does not directly address—questions about the precise cost-benefit value of specific low-income multifamily efficiency investments, which could inform the operational parameters that help determine specific program priorities. These include:

- The relative value and priority of individual energy efficiency measures (or bundles of measures) within the low-income multifamily sector;
- The relative value of incentivizing energy efficiency for low-income multifamily housing in terms of emissions reductions achieved per dollar and ease of implementation compared to other building and economic sectors and their respective investment opportunities; and
- The operational parameters—such as the share of deed-restricted and market-rate low-income housing, the ability of owners and tenants to cost-share alongside public funds, the magnitude of performance risk, and options for risk mitigation—that will determine both the best-fit measures for individual properties to undertake and the optimal level and allocation of public dollars.

As state leaders and representatives of the agencies and entities discussed in this report consider these types of solutions, they may benefit from organizing a collaborative process to assess those questions in order to establish program priorities and determine the level of funding required to achieve them. The enhanced coordination and streamlining detailed in this report could, in turn, support and enhance those processes.

- Leverage the welfare exemption from local property taxes (which affords tax-free status to qualifying affordable housing) to encourage building owners to undertake efficiency projects with tax incentives
- Harmonize Tax Credit Allocation Committee (TCAC) requirements with efficiency program criteria and timelines to better incentivize efficiency projects
- Reduce administrative costs and redirect the savings to project expenses

Electric and gas utilities could:

- Enable greater access to on-bill financing and on-bill repayment arrangements
- Promote pilot programs to facilitate financing mechanisms that leverage public and private funds and aggregation
- Institute utility tariffed on-bill programs that capitalize energy efficiency retrofits without making loans Reduce administrative costs through program consolidation and redirect the savings to project expenses

"Energy efficiency can generate savings, but generally not enough to become a priority over other high-return projects. It falls behind major renovations, community relations, and revenue maximization. But if there were a single overarching vision for the role of efficiency in affordable multifamily housing in California, that would allow owners to spend more effort on it."

Lane Jorgensen, MG Properties Group

CHALLENGE 3: LACK OF DATA AND CONFIDENCE IN SAVINGS AND NON-ENERGY BENEFITS LIMITS INVESTMENT

Solutions:

State legislators could:

- Expand public and program implementer access to building energy data through customer opt-out programs to address privacy concerns
- Increase funding and support for long-term energy use monitoring, maintenance, and training to help owner/developers ensure consistent savings
- Establish and fund loss reserves for any projects that do not generate savings as predicted, in order to encourage more participation from risk-averse developers and owners

State utility, energy, and housing regulators could:

- Expand public and program implementer access to building energy data through customer opt-out programs
- Update Title 24 building energy metrics to permit quality-of-life improvements that may increase electricity consumption
- Increase funding and support for long-term energy use monitoring, maintenance, and training to help owner/developers ensure consistent savings
- Measure non-energy benefits and co-benefits and identify third-party beneficiaries like public health agencies

Electric and gas utilities could:

- Expand public and program implementer access to building energy data through customer opt-out programs to address privacy concerns
- Measure non-energy benefits and co-benefits and identify third-party beneficiaries like public health agencies

Program implementers, contractors, and financial industry leaders could:

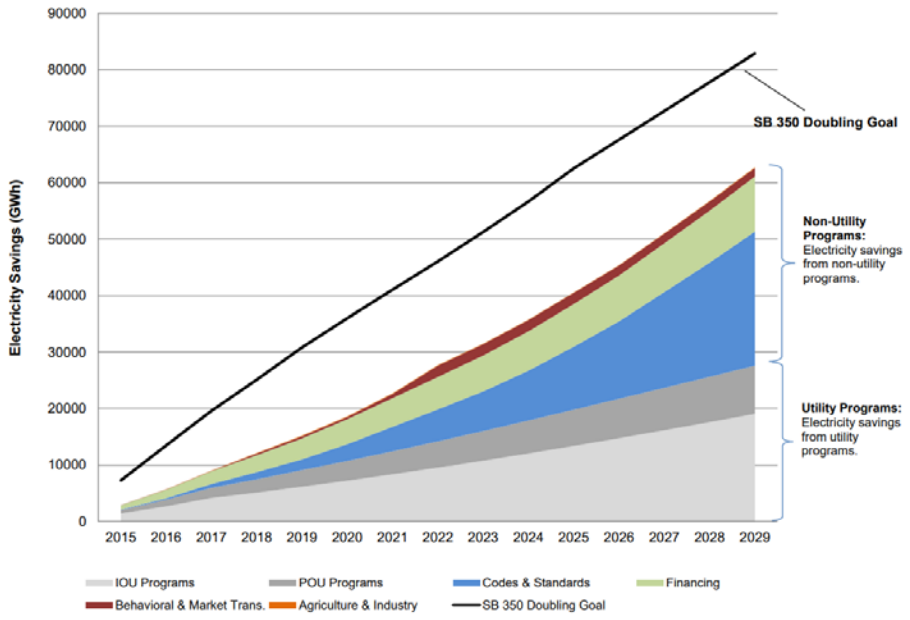
- Create and offer innovative instruments such as efficiency performance guarantees or insurance

I. INTRODUCTION

A. California's Climate Change and Energy Efficiency Goals

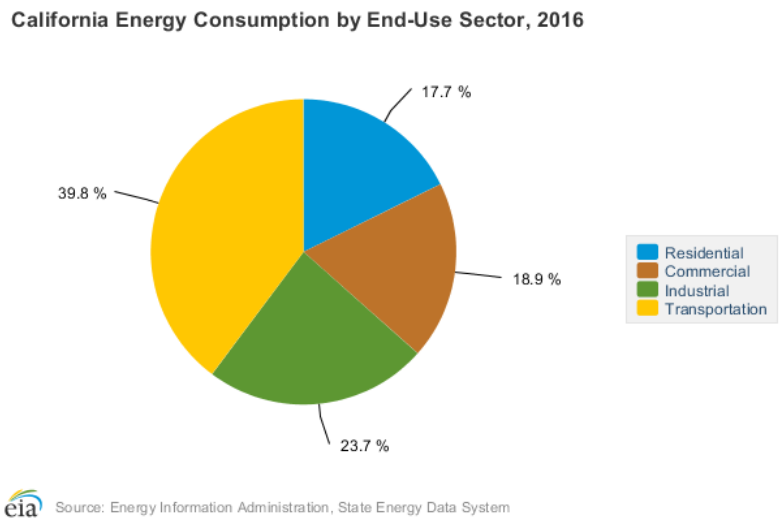
California's nation-leading climate change laws, AB 32 (Nunez, Chapter 488, Statutes of 2006) and SB 32 (Pavley, Chapter 249, Statutes of 2016), call for a 40 percent greenhouse gas emission reduction below 1990 levels by 2030.[2] In order to achieve these ambitious goals, the state has enacted a suite of policies, including SB 350 (de León, Chapter 547, Statutes of 2015), which requires a doubling of energy efficiency savings in buildings by 2030. As the California Energy Commission has recognized, improving the energy efficiency of existing buildings will be essential to achieving this required increase in statewide efficiency.[3] Former Governor Jerry Brown's Executive Order B-55-18, which calls for statewide carbon neutrality by 2045, will require even greater increases in efficiency. In response, the state legislature, the Energy Commission, and the California Public Utilities Commission have developed a number of proposals to improve and align the state's existing energy efficiency programs and incentives in order to increase energy efficiency markets and improve customer access and uptake.

SB 350 Doubling Target for Electricity



Source: CEC, 2017 Integrated Energy Policy Report.

California Energy Consumption by Sector



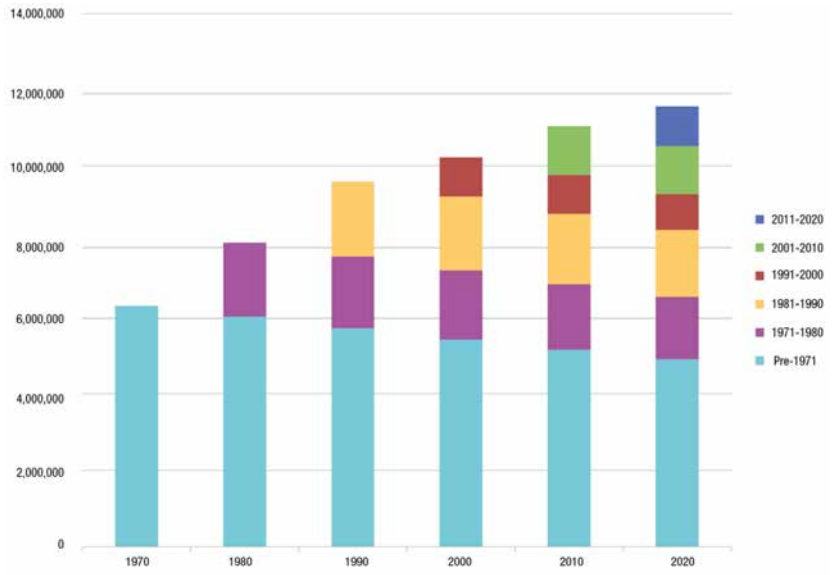
Source: US Energy Information Administration.

B. Energy Efficiency in California's Residential Buildings

While California's per capita residential energy use is second-lowest in the nation, residential buildings still account for over 17 percent of statewide energy consumption (including both electricity consumption and natural gas consumption).[4] Over half of California's residential buildings were built prior to the state's introduction of building energy efficiency standards in 1978, and nearly five million of these buildings will still be occupied in 2020 (in addition to millions more pre-2000 buildings).[5] Even as more newly constructed, efficiently designed buildings enter the housing stock and large household appliances become more efficient, other developments such as the proliferation of plug-load devices within the home—more household appliances and an ever-increasing number of digital devices—may hinder the achievement of efficiency goals.[6] In fact, plug-in equipment may account for up to 69 percent of the growth in building electricity consumption by 2030, underscoring the need for increased awareness of and access to efficiency measures.[7]

Furthermore, a significant proportion of the residents of these buildings have low incomes, limiting their ability to pay for efficiency improvements (and the amount of rent revenue available to building owners). According to the California Department of Housing and Community Development, over 50 percent of California's rental households are low-income (at or below 80 percent of area median income), and data prepared for the California Public Utilities Commission indicates that low-income households represent between 38 and 66 percent of all multifamily households for the three major investor-owned utilities.[8] The California Energy Commission adds that "the vast majority (93 percent) of low-income households are located in urban areas. Seventy 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."[9] (This market rate category, which includes units that are affordable due to market factors such as location rather than legal deed restrictions, is also sometimes referred to as "naturally occurring" affordable

California Single- and Multi-Family Homes by Decade of Construction



Source: CEC, 2015 Integrated Energy Policy Report.

housing. This report and its recommendations apply to both deed-restricted and market rate low-income or affordable housing unless stated otherwise.) Low-income households spend more than twice as high a share of their income on energy costs compared to all households, are more often forced to choose between energy and necessities, and face a disproportionate risk of utility disconnections.[10] SB 350 therefore recognized that ensuring increased efficiency in low-income communities would be essential to achieving the larger energy efficiency goal equitably and that low-income residents face particularly onerous barriers to accessing the necessary tools.

SB 350 required the Energy Commission to study the barriers faced by low-income residents to energy efficiency investment and financing and prepare a set of recommendations to increase access.[11] In December 2016 the Energy Commission released Part A of its SB 350 Low-Income Barriers Study, which engaged community members, public agencies, industry, utilities and environmental advocates in detailing a set of barriers and preliminary recommendations. As an initial step to address these barriers, the report offered five principal recommendations for state action to assist low-income and disadvantaged populations:

1. **Facilitating coordination of all efficiency-related programs, including aligning eligibility requirements;**
2. **Enabling access to the economic advantages of community solar;**
3. **Partnering between state energy and workforce agencies and other labor organizations to prepare a strategy for clean energy and workforce development;**
4. **Developing a series of pilot programs for instruments such as tariffed on-bill financing and credit enhancement; and**
5. **Requiring collaboration among all program delivery agencies to develop standardized energy and equity metrics.**[12]

Many of these recommendations, and their implementation by the Energy Commission and related agencies, revolve around improved coordination and alignment among existing state efficiency programs and agencies. The Energy Commission's stated goal includes reducing the "green divide" whereby the benefits of California's copious efficiency incentives accrue disproportionately to middle- and upper-income households that have better access to financial resources.

California Energy Commission: Barriers Limiting Access to Clean Energy for Low-Income Customers

STRUCTURAL BARRIERS	POLICY AND PROGRAM BARRIERS
• Low home ownership rates • Complex needs, ownership, and financial arrangements for low-income housing • Insufficient access to capital • Building age • Remote or underserved communities	• Market delivery • Program integration • Data limitations • Unrecognized non-energy benefits

"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."

Source: CEC, *SB 350 Low-Income Barriers Study, Part A.*

C. Existing California Energy Efficiency Programs

California's programs to increase energy efficiency in buildings predate its climate change efforts, dating to the 1978 adoption of the Building Energy Efficiency Standards, often referred to as Title 24. These standards apply to all newly constructed buildings (and alterations to existing buildings), ensuring that the state's housing stock has become among the most efficient in the nation since the standards first went into effect. But since renovation and replacement of housing stock occur slowly, improving energy efficiency at existing buildings—particularly those built before 1978—has remained a stubborn challenge.

The state has created and funded a wide range of programs to facilitate customer investment in energy efficiency improvements to existing structures, with a number of agencies responsible for administration. These programs seek to improve statewide energy utilization while addressing the structural barriers to efficiency improvements described earlier. Below is a summary of key programs and entities that are most relevant for low-income residents.

California Low-Income Energy Programs, Administrators, and Agencies	
PROGRAMS	
Energy Savings Assistance Program (ESA)	A California program that provides over $300 million annually in direct energy efficiency installation services, including weatherization and efficient appliances, to customer households in investor-owned utility service territories that earn a household income below 200 percent of the federal poverty guidelines (in addition to a separate program for common area measures).
Low-Income Weatherization Program (LIWP)	A California program, funded by cap-and-trade auction proceeds, that provides solar installations and energy efficiency upgrades for low-income multifamily properties (earning no more than 80 percent of area median income) located in or near disadvantaged communities (in addition to single-family and farmworker household programs). Over $50 million has been allocated to the program since 2014/15.
California Alternate Rates for Energy (CARE)	A California program, funded by over $1 billion in annual utility bill surcharges on middle- and high-income customers, that provides monthly discounts to customer households in investor-owned utility service territories that earn a household income below 200 percent of the federal poverty guidelines. The CARE program does not directly fund energy efficiency investments, but it is integral to state efforts to serve the energy needs of low-income customers.
Low-Income Home Energy Assistance Program (LIHEAP)	A federal program that provides over $100 million in annual funding to community-based organizations primarily to help low-income households pay utility bills, with a subset of funds available to increase home energy efficiency through weatherization, available to residents of all housing types who earn no more than 60 percent of state median income.
ADMINISTRATORS AND AGENCIES	
California Department of Community Services and Development (CSD)	California's agency dedicated to helping low-income families achieve and maintain self-sufficiency and energy efficiency, including administration of LIHEAP and LIWP.
California Hub for Energy Efficiency Financing (CHEEF)	A public-private partnership among state agencies, utilities, lenders, contractors, and borrowers that operates state-funded pilot programs to increase the availability of lower-cost financing for energy efficiency investments.
California Public Utilities Commission (CPUC)	California's agency in charge of regulating the state's investor-owned electric and gas utilities, including oversight of the CARE and ESA programs (together with administration by the utilities).

In addition to these programs, a number of recent state laws outline the policy landscape for low-income multifamily efficiency efforts:

Senate Bill 350 (de León, Chapter 547, Statutes of 2015)

Expanding the building energy efficiency program established by Assembly Bill 758 (Skinner, Chapter 470, Statutes of 2009), SB 350 set the state's overarching target of doubling energy efficiency in existing buildings by 2030, as detailed in annual targets set by the California Energy Commission, in consultation with the California Public Utilities Commission and investor-owned utilities. The law directs the Energy Commission to adopt requirements for contractor responsibility and consumer protection and study barriers to uptake in low-income communities. It also directs the Public Utilities Commission to develop strategies specifically designed to maximize savings in disadvantaged communities.

Assembly Bill 3232 (Friedman, Chapter 373, Statutes of 2018)

AB 3232 requires the Energy Commission, in consultation with the Public Utilities Commission, the California Air Resources Board, and the California Independent System Operator (CAISO, the state's electrical grid manager), to assess the state's ability to reduce residential and commercial building greenhouse gas emissions by 40 percent below 1990 levels by 2030, in accordance with the statewide goal of SB 32. The analysis will be included as part of the Energy Commission's Integrated Energy Policy Report, a biennial set of assessments and recommendations that guides statewide energy policy.

Assembly Bill 802 (Williams, Chapter 590, Statutes of 2015)

AB 802 established a statewide energy benchmarking and public disclosure program for large multifamily and commercial buildings, requiring utilities to compile comprehensive data that allow comparisons of building energy use before and after a project is completed, known as normalized metered energy consumption. This measurement facilitates accurate analysis of the effectiveness of energy efficiency programs and assists state agencies and utilities in determining where financing is needed. Utilities must also deliver the data to building owners or operators, which can lead to greater uptake of efficiency projects and related financing and incentives, especially for buildings that do not have advanced energy monitoring systems. The initial data are expected to be released in late 2019.

Assembly Bill 793 (Quirk, Chapter 589, Statutes of 2015)

AB 793 requires utilities to provide education and incentives to residential and business customers for the installation of energy management technology such as smart meters. Such technology can significantly increase efficient energy use, particularly for owners and operators with limited resources to conduct full-scale audits and retrofits.

Senate Bill 1477 (Stern, Chapter 378, Statutes of 2018)

SB 1477 directed the Public Utilities Commission to develop the BUILD Program, which will require incentives for low-emitting technologies in new low-income multifamily construction; as well as the TECH Initiative, a market-development program requiring gas utilities to provide education and incentives to increase installation of new low-emission space and water-heating technologies.

These policies and programs demonstrate the substantial extent of the state's efforts to promote energy savings measures, particularly in the low-income multifamily sector. They also provide some indication of the complexity of available incentives and administrators and the challenges that low-income multifamily building owners and residents can face in identifying and accessing them. While state leaders have set ambitious goals for increasing the efficiency of buildings and have allocated substantial funds to support those goals, energy agencies and owner/developers still require better tools, data, and incentives to help achieve statewide greenhouse gas emission reduction targets.

II. VISION

Participants at both convenings described a vision for a low-income multifamily energy savings retrofit program framework that:

- **Reduces barriers to participation and serves all or most of the state's low-income, multifamily residents;**
- **Breaks down silos between government agencies and programs and facilitates bundling of incentives;**
- **Centers on clear numerical targets for market penetration and clear definitions of retrofit success;**
- **Promotes and accounts for tenant quality-of-life benefits; and**
- **Supports the state's broader affordable housing and sustainable communities goals.**

In particular, this ideal system was defined by the following characteristics:

A single entity for energy efficiency program administration	A "one-stop shop" providing comprehensive access to retrofit financing resources would allow individuals and developers to compare their needs to the full suite of available programs and create a single point of contact for simplified administration and ease of access.
Long-term funding for state efficiency programs	State incentive programs would receive dedicated funding for 10+ year timeframes, allowing property owners to rely on availability of future funds and engage in long-term retrofit planning across their portfolios.
Financing opportunities that align with renovation and refinancing plans	Administrators would have information and tools to target financing and incentives to owners when they are most likely to take advantage of them: at the periodic intervals when large-scale renovations are planned or when existing financing becomes due for renewal or renegotiation.

"Anything that can improve a person's quality of life or upward mobility, including workforce development, belongs in the vision for an ideal system for energy efficiency savings."

Carmelita Miller, Greenlining Institute

"Outside of California, utilities and their regulators have worked together on solutions that can draw in large amounts of private capital to achieve the necessary scale of investment, even in persistent poverty areas. Simply optimizing spending programs we currently have won't achieve this result."

Holmes Hummel, Clean Energy Works

Support for tenant benefits and protection of affordable housing	Tenants would be assured a portion of financial savings, program cost-effectiveness measures would account for non-financial benefits such as quality of life improvements, and rent increases would be limited.
Widespread owner, tenant, and program access to building energy data	All stakeholders would have access to building- and unit-level energy use data for multiple years to allow for informed decision-making and prioritization of retrofit projects.
Guarantees of minimum retrofit performance	Insurance, guarantee agreements or other innovative instruments would offer owners assurance that retrofits and new installations will provide a minimum level of savings necessary to justify a project.

"The ideal vision is a Black Friday rush for energy efficiency. No government subsidies needed, no application requirements—customers just have to say they want to do it. We need to have the people involved making money, not spending money."

Tammy Agard,
EEtility

An essential supporting element for this system would be an ongoing cross-agency analysis of priorities for public subsidy in general and specific efficiency measures and bundles of measures in particular. State energy, utility, and housing regulators could assess the value of public subsidy for low-income multifamily programs in terms of energy savings and equity benefits, the availability of private capital, and the performance of alternative programs and measures, to ensure the proper allocation of funds within the state's broader climate change and environmental regime. Within the programs, regulators and implementers could conduct iterative reviews of the measures that offer the greatest "bang for the buck" in terms of dollars-to-efficiency performance, need for subsidy, and potential to scale.

III. TOP CHALLENGES AND SOLUTIONS FOR BOOSTING LOW-INCOME MULTIFAMILY ENERGY SAVINGS RETROFITS

At the February 27, 2018 convening, participants identified a number of barriers to building the system outlined in their ideal vision and a wide range of solutions to overcome those barriers. At the November 1, 2018 convening, property owner/developers presented case studies highlighting successes and challenges in implementing recent efficiency retrofit projects, and participants discussed specific actionable reforms that could promote future successes. (The case studies are summarized throughout this report.) Primary among the barriers identified is the complexity of the state's network of incentive and financing programs, the limited ability of implementing agencies to coordinate them, and the resulting difficulty that owners and residents face when accessing them. The following section details the barriers and solutions identified by both groups, together with summaries of five individual case studies.

CHALLENGE 1: LACK OF PROGRAM INTEGRATION CAUSES COMPLEXITY FOR END USERS

Among the challenges identified by participants, the lack of coordination among various state and utility financing programs and incentives—resulting in inefficiency and complexity for residents and owners contemplating retrofits—was the single greatest barrier to greater uptake of available resources. While an impressive range of financing and incentives is currently available in California, determining if an applicant is eligible, and if those funds will render a project economical, can be prohibitively time- and resource-intensive. This challenge is especially acute for smaller owners and developers, who often do not have energy-focused staff. Program administrators may also tend to operate within isolated silos, leading to inefficiency in the allocation of funds and duplication of (or conflict between) marketing and outreach efforts. Thus, complexity at both the back end (among programs) and the front end (between programs and users) renders these valuable resources less effective than necessary in order to achieve state efficiency goals.

> "We need a single entity that can understand the target populations, think about solutions that are focused on the market in all its different segments, and also think about what it takes to get adoption. We need an entity that thinks bottom-up, rather than top-down."
>
> **Jeanne Clinton, Energy and Sustainability Consultant**

Community Choice Aggregators (CCAs)

Community Choice Aggregators (CCAs) allow electricity consumers to group together into a single community purchasing entity, by collecting and pooling their electricity rate payments and acting as a single customer for the local utility.[13] CCAs are currently available in a number of the state's most densely populated (and multifamily housing-rich) areas, including Los Angeles County and the Bay Area. CCAs can serve as a platform for customers to negotiate favorable rates from utilities and/or procure minimum percentages of their power from renewable sources and have enjoyed significant popularity as a result. Some CCAs have begun to operate their own efficiency incentive programs, such as Marin Clean Energy's LIFT program, discussed in one of this report's case studies. Further growth of CCAs could increase consumer access to incentives, but could also increase the complexity of the efficiency market in general. If CCAs continue to expand throughout the state, legislators and leaders at the California Public Utilities Commission may need to assess their impact on the efficiency program landscape and potential reforms needed to ensure integrated implementation.

State legislators could create a single, statewide "one-stop shop" efficiency program administrator.

The top solution for increasing program coordination and reducing user complexity is the creation of a single, comprehensive efficiency program access point. Participants uniformly agreed that a "one-stop shop" for users to obtain information about available programs, determine applicability, submit necessary filings, and manage participation, if properly designed, would be the most effective way to increase alignment throughout the ecosystem of retrofit financing. By giving owners and residents a single point of access to all available incentives, it would reduce their administrative costs and increase their ability to identify all cost-effective retrofits to undertake. Simultaneously, by channeling all state and utility programs through a single administrator, it would require staff to align relevant definitions, focus resources on a unified outreach campaign, and eliminate conflict among programs.

The state legislature would likely need to take action to align the existing programs that this new entity would administer—including LIWP, ESA, LIHEAP, and CARE—both because they currently operate pursuant to distinct federal and state statutory mandates and because additional administrative funding (or a reallocation of current funding) would be needed for program staff and organization. Participants suggested a range of government-led, independent nonprofit, for-profit, B-corporation, and pilot program models. Developing the one-stop shop would necessarily involve an iterative, staged process with funding and mandates to conduct cross-program information gathering and administrative coordination, integrate procedures and financing streams, and develop new unified offerings and public-facing websites. The process would also rely heavily on input from city and county governments that currently play a role in low-income multifamily efficiency efforts, including creating a forum for those entities to integrate the state's new offering into their own local outreach and facilitation efforts.

A group of other states have created programs that deliver on (or strive for) this alignment goal and could serve as useful examples for the state legislature:

Oregon:

The Energy Trust of Oregon, a utility-funded nonprofit created in 2002 to increase energy efficiency and renewable energy for customers of the main state utilities, is a top example of how a state like California might better connect building owners with incentives and financing assistance. The trust provides a complete informational resource for multifamily properties seeking to improve energy efficiency, including free building walkthroughs to identify potential savings and contacts with licensed contractors. The trust also offers an easily digestible survey of all state incentives, broken down by type of installation, basic requirements and amounts available.[14] By providing owners with a complete picture of the type and scope of incentives on offer, and putting them in contact with advisors and contractors who can evaluate and complete the work, the trust helps to increase overall utilization of existing programs and document statewide progress.

The trust is funded by a three percent public purpose charge collected by the state's electrical and gas utilities.[15] Importantly, it is subject to oversight by the Oregon Public Utility Commission and must file financial and energy statements, submit projects for third-party evaluation, and conduct regular public meetings. The trust facilitated projects at over 45,000 residential sites in 2017 and has delivered over $3 billion in customer savings and reduced over 22 million tons of carbon dioxide emissions since its inception.[16] While these gains are not limited to the low-income sector, the financial and energy savings success of the Energy Trust offer a compelling model for California lawmakers to consider in designing a streamlined access and administration program for the existing incentive and rebate programs. The state legislature could consider enabling legislation like Ore-

Energy Trust of Oregon Multifamily Incentive Guidebook Sample

WINDOWS AND SLIDING GLASS PATIO DOORS

EQUIPMENT AND EFFICIENCY TYPE	UNIT INCENTIVE
FOR SIDE-BY-SIDE OR DUPLEX, TRIPLEX, FOURPLEX PROPERTIES ONLY	
Windows - Electric or gas heated buildings, U-value 0.28 to 0.30.	$1.75 per sq. ft. of window
Windows - Electric or gas heated buildings, U-value 0.27 or lower.	$4.00 per sq. ft. of window
FOR STACKED STRUCTURES WITH 5 OR MORE UNITS ONLY	
Windows - Electric-heated building, U-value 0.30 or lower, replacing single-pane or storm windows.	$3.00 per sq. ft of window

INSULATION

EQUIPMENT AND EFFICIENCY TYPE	EXISTING CONDITION	RETROFIT REQUIREMENTS	UNIT INCENTIVE
FOR ALL PROPERTY TYPES			
Attic/Ceiling Insulation	R-18 or less	Electric or gas heated building. R-49 or fill attic space.	$0.25 per installed sq. ft.
Flat Roof Insulation - Buildings up to 3 stories	R-5 or less	Electric or gas heated building. R-20 or greater.	$0.30 per installed sq. ft.
FOR SIDE-BY-SIDE OR DUPLEX, TRIPLEX, FOURPLEX PROPERTIES ONLY			
Floor Insulation	R-11 or less	Electric or gas heated building. R-30 or fill cavity.	$0.30 per installed sq. ft.
Wall Insulation	R-4 or less	Electric or gas heated building. R-11 or fill cavity. All heated exterior wall surfaces must be insulated.	$0.30 per installed sq. ft.

Source: Energy Trust of Oregon.

gon's Senate Bill 1149 (1999) and Senate Bill 838 (2007), which initiated the three percent utility fee and outlined the structure of the program, to create a California equivalent.[17]

Massachusetts:

The Massachusetts Low-Income Energy Affordability Network (LEAN) program is an example of a centralized access point that integrates available incentives "behind the curtain" while offering users a seamless way to evaluate their eligibility and apply to begin the process. The program is a collaboration between the state's major utilities and a group of local community agencies that constitute LEAN. While the utilities legally administer the program and include it in their regulated budgets, LEAN members are entirely responsible for implementation and customer contact. The utilities and LEAN members collaborate on program design and updates to improve delivery.[18]

The application itself begins with an easy-to-use, publicly accessible Google form.[19] All multifamily buildings with at least 50 percent of tenants at or below 60 percent of area median income are eligible to apply, regardless of location in the state, electric or gas service, or relevant utility (criteria that would apply to between two

CASE STUDY: MARIN CLEAN ENERGY (MCE)

Overcoming Split Incentives at Smaller Properties

"Underserved communities are targeted by energy efficiency programs, but aren't always represented in the program design, planning, and administrative staff. When conceiving these programs, we should also consider the true needs and constraints of the communities we serve."

Grace Peralta, Marin Clean Energy

Properties

Marin Villa: A three-building, 12-unit development in a dense, low-income section of San Rafael consisting of naturally occurring affordable housing.

Barrett Avenue: A four-unit owner-occupied building in Richmond consisting of naturally occurring affordable housing.

Projects

Marin Villa: MCE provided rebates for energy efficiency and electrification upgrades for the common areas—LED lighting and a new heat pump for the complex pool—and new, Title 24-compliant windows for individual units. In addition, MCE, replaced in-unit electrical panels, identified as fire hazards, with safe and energy efficient models. MCE also provided rebates for Marin Villa's rooftop solar installation.

Total estimated savings: over 5,800 kWh and $7,600 per year.

Barrett Avenue: MCE worked with the property owner to identify a scope of work that could deliver savings at a scale the owner could afford—new tankless water heaters and Energy Star refrigerators, plus LED lighting and low-flow water fixtures.

Total estimated savings: nearly 60 kWh and over $1,600 per year.

Programs

Marin Villa: MCE operates the Low Income Families & Tenants (LIFT) Pilot Program, which offers up to $1,200 in rebates per qualifying low-income unit (using ESA funds) for common-area measures such as LED fixtures and pipe insulation and in-unit measures including efficient appliances, lighting, weatherization, and more. The property owner accessed over $14,000 in LIFT rebates for in-unit efficiency measures, including new windows. MCE also enrolled the owner in a partner program, the Green and Healthy Homes Initiative, a four-state program targeted at eliminating home health hazards, which provided $30,000 worth of new electric panel upgrades.

Total cost: $93,625. Total rebates/incentives: $45,000 (48%).

Barrett Avenue: MCE operates a Multifamily Energy Savings program that provides free comprehensive assessments, technical assistance, and rebates for energy efficient building upgrades and appliances to its entire service area. MCE also provides, in partnership with the City of Richmond, the Energize Richmond program to cover out of pocket costs of multifamily properties participating of the Energy Savings program in Richmond. MCE worked with the property owner to complete and assessment and maximize rebates from both programs to cover the new common area and in-unit measure installations.

Total cost: $3,296. Total rebates/incentives: $2,138 (55%).

Increasing Program Access and Efficiency Benefits

As a Community Choice Aggregator (CCA), MCE is an electricity provider and does not own or operate any residential properties. MCE purchases predominantly renewable electricity directly from suppliers on behalf of customers within its service area. Thus, it has a direct interest in increasing its constituents' efficiency and can generate savings by providing staff time and expertise to small property owners to identify retrofit projects that match building needs and available rebates. However, MCE's programs are limited geographically to properties within its service area, which include all of Marin and Napa counties and portions of Contra Costa county.

In addition, the low-income requirements for some of California's energy efficiency programs do not align with the economic demographics of MCE's service area. The ESA and CARE programs limit eligibility to residents who earn less than 200 percent of the federal poverty line, or approximately $50,000 for a family of four. In much of northern California and the Bay Area, the high cost of living renders this an inaccurate measure of the ability to pay the upfront costs of retrofit measures. A large number of low-income residents may not qualify for ESA and CARE incentives and property owners are thus unable to improve their units' efficiency. Moreover, multifamily owners must be able to attest that 80 percent of their residents meet the income eligibility requirements or must conduct in-unit verification of incomes. This is both administratively challenging and a significant barrier for residents who are not comfortable submitting unnecessary paperwork to the federal government. Thus, even with MCE's help identifying available incentives, property owners and residents are often unable to qualify or unwilling to participate.

SOLUTIONS:

- **Create LIFT-equivalent programs in other CCAs and local agencies throughout California to increase uptake at smaller properties.**
- **Devise an adjusted, county- or region-specific income eligibility measure that accounts for the higher cost of living and incomes in many areas of California.**
- **Allow anonymized income verification to alleviate resident concerns about privacy and immigration status.**

and three million rental households in California[20]). Eligible participants have access to any cost-effective federal-, state-, or utility-level incentives available in Massachusetts, with cost-effectiveness measured on a whole-building (rather than individual efficiency measure) basis.[21] The program makes incentive payments directly to contractors, rather than providing rebates for completed work, further simplifying administration and increasing ease of use. The program offers a specific roadmap for users who are incorporating a retrofit into a larger refinancing, addressing a key "trigger point" to maximize uptake.[22] By combining all these elements into a single point of access, LEAN insulates users from all of the complexity of evaluation, accounting, cost allocation, and combining of different programs that can reduce owner/developers' ability to maximize disparate incentives. Since the program sits atop existing pots of incentive funds—providing simplified access and administration—it could be a viable model for California legislation seeking to streamline and increase access to current federal and state incentive programs.

"It's not enough for agencies just to coordinate—there needs to be a seamless experience that includes lots of technical assistance, program and eligibility coordination, and everything else on the back end for the end-user to access what they need at once."

Stephanie Wang,
California Housing Partnership Corporation

New York:

The New York State Energy Research and Development Authority (NYSERDA) runs a Multifamily Performance Program for existing buildings that also directs customers through a centralized incentive and rebate access portal for efficiency upgrades. Applicants work with agency-approved technical services providers to identify retrofit measures that can achieve a minimum of 20 percent energy savings using a state-supported analysis and verification tool. Eligibility is limited to developments that consist of a minimum of 25 percent units housing residents at or below 80 percent of the higher of state or area median income (as referenced above, criteria that would apply to over three million rental households in California).[23] Incentives are between $700 and $1,500 per unit depending on projected savings and actual performance.[24] The agency is also able to centralize program access statewide via its own website, including a directory of approved providers and introductory questionnaires. By running the core efficiency incentive program directly, NYSERDA relieves some of the administrative complexity that can arise under implementation by multiple utilities—an arrangement that generated market confusion and resulted in a directive for further consolidation of state and utility incentives into a true one-stop shop.[25] This type of consolidated incentive program could be a useful model for California legislators seeking to create a new one-stop shop efficiency program administrator.

California legislators and regulators have begun to craft solutions that would address the need for streamlined administration and access that a one-stop shop could create:

- In 2013, the Public Utilities Commission issued a decision creating the California Hub for Energy Efficiency Financing (CHEEF), a "central enabling entity…to provide a simple, streamlined structure through which energy users, financial institutions, [energy efficiency] providers, and IOUs can participate in a standard 'open market' for energy improvement transactions."[26] This finance-focused entity will include a program for low-income multifamily housing (see sidebar) that has the potential to create a platform for broader integration of public incentives and private financing through a single responsible entity.
- In 2015, proposed legislation (SB 765, Wolk) would have required the Public Utilities Commission to retain a private contractor to serve as "California Market Transformation Administrator." The entity would be tasked with coordinating and modifying energy efficiency programs to incorporate market transformation initiatives and streamline planning and outreach. This bill did not become law.
- Newly proposed legislation in 2019 (AB 383, Mayes) would create a Clean Energy Financing Clearinghouse within the State Treasurer's office with a broad mandate to "coor-

dinate all government programs that invest capital in energy technologies that advance environmental protection goals."[27] The clearinghouse would be responsible for working across California agencies to create a central informational resource and maximize efficacy of funds, ensure owner/developer access to all incentives, directly facilitate private capital transactions, and other one-stop shop administrative duties. This clearinghouse could potentially serve many of the purposes identified in this section. (As of June 2019, this bill remains under consideration and may be modified.)

CHEEF Affordable Multifamily Energy Efficiency Financing Pilot Program

The California Hub for Energy Efficiency Financing (CHEEF), an arm of the State Treasurer's California Alternative Energy and Advanced Transportation Financing Authority (CAEATFA), is a public-private platform for contractors, private financial institutions, utilities, and state agencies to conduct transactions and share data supporting efficiency projects.[28] CHEEF is funded by utility ratepayers through the Public Utilities Commission. Its goal is to enlist financial institutions to provide capital and offer pilot credit enhancement instruments that can grow the market for private investment in energy efficiency in California. While CHEEF's mandate is limited to the pilot programs described in the Public Utilities Commission decision that created it, the centralized administrative hub could offer a model or potential future home for a one-stop-shop financing entity.

CHEEF's Affordable Multifamily Financing Pilot is focused on providing access to credit enhancement, on-bill financing, and instruments such as energy services agreements (discussed later in this report) to allow owner/developers to access private financing to cover project costs that exceed incentives available under ESA, LIWP, and other existing state programs. By effectively guaranteeing a portion of loan repayment via a loss reserve or similar mechanism, credit enhancement will reduce lenders' risk in financing low-income multifamily retrofits. In turn, owner/developers will be able to undertake more comprehensive retrofit projects that maximize available incentives (or initiate basic projects that otherwise would have been financially infeasible).[29] The pilot will be available to deed-restricted low-income properties with more than five units, for projects that already qualify for incentives from ESA, LIWP, or certain other state programs. Projects may incorporate up to 30 percent non-energy savings measures. An on-bill repayment option (discussed later in this section) may also be available for master-metered properties to increase lender security and customer simplicity.[30]

The pilot program is expected to launch in mid-2019. While its scope is limited and total loss reserve funding is just under $3 million, it represents an important step in program integration and drawing private capital into the efficiency retrofit market. Specifically, by creating a public-private partnership that facilitates transactions and data among owners, contractors, lenders, utilities, and regulators, it offers a potential base structure for the financing element of a one-stop shop. In addition, the targeted attention to state-funded credit enhancement (and potential on-bill repayment component) will render valuable information on the efficacy of these instruments. The pilot could thus provide state legislators and regulators with a template maximal leverage of public and private funding and opportunities to streamline administration.

Key questions and project elements the pilot could address include:

- Offering incentive funds and credit enhancements prior to or during project installation to ease cash flow concerns for owners;
- Designing template on-bill financing agreements and energy services agreements, to streamline lender approval and minimize transaction costs;
- Ensuring adequate borrower protections; and
- Maximizing owners' ability to combine on-bill financing and other private financing with state and utility incentives.

State energy regulators and utilities could harmonize definitions of terms and eligibility for existing programs.

Even if creating a true "one-stop shop" for program access is infeasible or significantly delayed, participants emphasized the value of aligning existing programs' eligibility definitions and other essential terms. For example, the Low-Income Weatherization Program, Low-Income Home Energy Assistance Program, and the Energy Savings Assistance Program have eligibility thresholds of 80 percent of area median income, 60 percent of state median income, and 200 percent of the federal poverty line, respectively. It can be challenging for a multifamily property manager to determine eligibility of multiple residents under any one of these standards—particularly for managers of non-deed-restricted low-income properties with no income limits for renting. Trying to combine multiple incentives with different thresholds can therefore prove prohibitively challenging. Eligibility for properties as well as key definitions of qualifying technologies can also differ across programs.

While aligning the substantive eligibility requirements would likely require new legislation (including federal legislation, in the case of LIHEAP), the state agencies—such as the California Public Utilities Commission and California Department of Community Services and Development—and utilities that implement these programs could collaborate to develop easy-to-understand definitions for eligibility thresholds and other essential criteria. For example, a multi-agency web-based tool or "dictionary" that displays expected eligibility for all programs based on income, property size, and zip code, could substantially increase access for program participants.

"Energy efficiency has historically been perceived as not being wildly profitable. But if you can go deep on these buildings, and can underwrite a significant portion of the savings, you unlock much larger pools of investment for bigger rehabilitation projects."

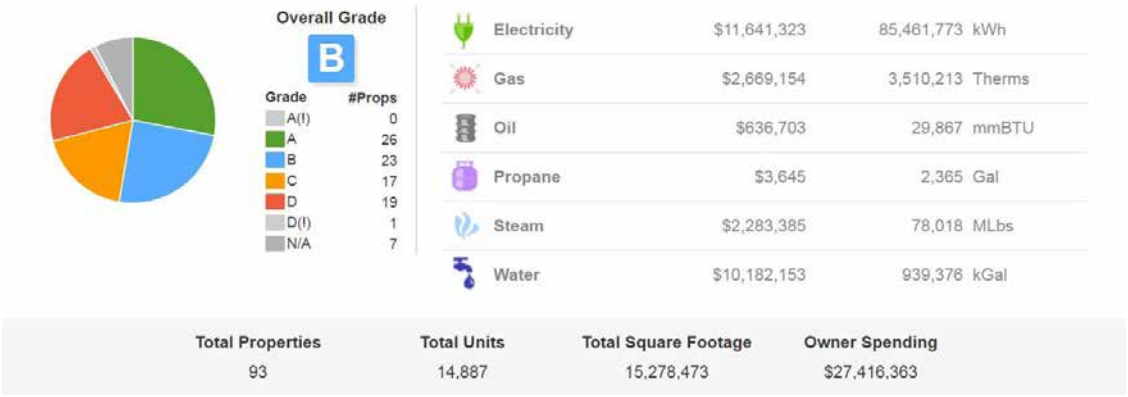
Martha Campbell,
Rocky Mountain Institute

State legislators could increase funding for coordinated technical assistance across design, engineering, and financial needs.

Adequate technical assistance can be the difference between success and failure for energy efficiency projects in the low-income multifamily sector. Free, state-provided, or state-subsidized consultation on the identification of building energy needs and deficiencies, selection of best-fit project components, comparison of available technologies, overall project design, and installation and operation is among the top incentives available to draw owners and developers into the market for efficiency retrofits. For example, the Low-Income Weatherization Program offers no-cost consultations (provided by Association for Energy Affordability) that are essential to many owners' ability to undertake retrofit projects.[31] However, many smaller developers and single-property or residential/live-in landlords may require technical assistance on not only engineering aspects, but also financial aspects of project design—particularly at deed-restricted properties that have complicated financing restrictions and at older properties that have never undertaken a major retrofit project before—that is not universally available.

Technical assistance often begins with a whole-property energy audit, which can estimate the savings and resident benefits that will motivate an owner to begin a project. As one example of comprehensive audit-engineering-financing-monitoring services, some participants cited Bright Power, a New York-based energy management firm that provides an "intelligence-driven energy management" service for multifamily properties.[32] (A number of mission-driven organizations in California, such as Association for Energy Affordability, California Housing Partnership, and GRID Alternatives offer similar service packages at no or low cost, with a greater focus on tenant savings that can be particularly vital in the low-income multifamily context, using utility ratepayer or cap-and-trade program funds.) Management begins with the preparation of a building's "energy scorecard," which is a detailed analysis of consumption and use throughout the building; this scorecard is followed by an energy audit to identify top priorities for retrofits or improvements and a feasibility study to determine best-fit strategies and financially practical implementations. Perhaps most importantly, the program assists owners in accessing and receiving state and federal financing and incentives. After installing the proposed efficiency measures (in addition to potential on-site generation, alternative procurement and resiliency strategies), Bright Power monitors the building on an ongoing basis to maintain performance and savings and identify future solutions.

Bright Power Energy Scorecard Sample



Source: Bright Power.

This comprehensive services model—from audit and incentives analysis to implementation and monitoring—can ensure that owners undertake the most cost-effective projects and access all available incentives. It can be particularly beneficial for low-income multifamily properties that face slim margins but have access to a wide range of incentives.[33] Many firms offer such services, but they can prove too expensive upfront for some low-income owners; they are particularly valuable when the audit and consultation are provided at no cost and include a focus on tenant benefits. (In addition, existing programs may have varied requirements for the audits they offer, such as performing only in-unit or common area audits—when providing a comprehensive audit would be most efficient and useful for owners.) Participants cited the no-cost technical assistance provided under the Low-Income Weatherization Program and the tenant benefit focus of services offered by organizations like AEA, California Housing Partnership Corporation, and GRID Alternatives as key elements to maximize program access, cost-effectiveness, and deep efficiency gains. The state legislature could authorize new funding for similar programs for applicants to all incentives, offering technical assistance grants to individual owners to contract with approved organizations like those identified above or directly providing consultations at low or no cost. Utilities could also contribute staff time and expertise to assist small customers with limited resources. This technical assistance would be an essential component of a streamlined or one-stop shop arrangement, supported by the same long-term funding that would create the new administrative arrangement (although increased stand-alone funding, for example to expand the existing LIWP program, could still be beneficial if a complete program overhaul is infeasible). Not only would such a program bring more participants into the efficiency market, but it could significantly increase the state's trove of energy consumption data.

State legislators and energy regulators could restructure the timing of incentives and financing programs to align with planned renovations and refinancing events.

The best opportunities to take on deep, comprehensive retrofit projects often lie at key "trigger points" in the life of a property: purchase and sale, wholesale refinancing, and property-wide renovation.[34] A property undergoing a comprehensive renovation will already take on many of

CASE STUDY: MG PROPERTIES GROUP

Driving a Large-Scale Retrofit through Public-Private Partnership

"Working with the City of San Diego to negotiate a new 40-year term on the existing ground lease created a unique opportunity. The affordable housing units in the community were preserved and the property became eligible to be refinanced, which created the funding to integrate incentivized and non-incentivized energy efficiency measures with a comprehensive renovation plan for the aging buildings."

Lane Jorgensen, MG Properties Group

Property: Stonewood Gardens

An eight-building, mixed-income apartment community in San Diego's Midway District consisting of 51 units set aside for Section 8 voucher recipients and 204 market rate units. MG Properties Group (MGPG) owns and manages the improvements, which were completed in 1979 and are situated on a ground lease from the City of San Diego that was set to expire in 2034. MGPG negotiated a new 40-year ground lease that created the opportunity, in conjunction with growing market rents on 80% of the property, to refinance the property with a Fannie Mae Green Rewards Loan and undertake comprehensive capital improvements including energy efficiency retrofits. As part of the lease renewal, MGPG committed to $7.6 million in total renovations.

Project

MGPG engaged Bright Power, an energy and water management consultancy, for a $15,000 energy audit to identify efficiency retrofits that would meet property needs and qualify for the San Diego Gas & Electric (SDGE) multifamily incentive program: new hot water heaters and LED installations for common area and hallway lighting. MGPG declined window replacements as part of the SDGE program, which can provide long-term energy benefits, since the energy savings in the coastal climate were not great enough to produce an acceptable payback period even with incentives; and new refrigerators, which would have taken longer to install on unit turnover than the SDGE incentive program would permit even though eventually new refrigerators would be part of the renovations occurring at the property. MGPG also installed rooftop solar panels to meet the common area electrical demand and a solar thermal hot water heater system. Subsequent to the SDGE program and refinance, the nearby airport authority provided more substantial incentives for window and patio slider door replacements as a sound abatement measure, which will provide further energy efficiency benefits for residents.

Total estimated savings: 350 therms/month (approx. 20%) and 10,000 kWh/month (approx. 10%).

Programs

Relying on Bright Power's technical and programmatic expertise, MGPG was able to tailor the core project to maximize SDGE multifamily rebate program, which offers direct installation (by SDGE-selected contractors) of certain retrofit measures at little to no cost—in this case, covering over 90 percent of the upgrades. MGPG financed nearly 100 percent of the solar thermal installation under the California Solar Initiative rebate program for affordable housing because of the low-income requirements within the ground lease, which is recorded on title. The rooftop solar installation was financed entirely through the proceeds of the refinancing event, driven by the availability of federal investment tax credits for up to 30 percent of the total installation cost and the Fannie Mae Green Rewards program. Many low-income property owners have no federal tax liability against which to value the investment tax credits. MGPG had owned the property for nearly 14 years as of the installation date and was therefore able to assign value to the tax credits. Under the Green Rewards Program, Fannie Mae offers lower-interest loans—in this case, 10 basis points lower—for projects that would increase building energy or water efficiency by 25 percent through improvements that will be installed within 12 months of loan origination (20 percent at the time of the Stonewood Gardens loan origination).

Total cost: $683,349. Total rebates/incentives: $413,955 (61%).

Increasing Program Access and Efficiency Benefits

MGPG was able to optimize a package of energy efficiency project by accessing the SDGE multifamily rebates and CSI solar thermal affordable housing installation rebates. MGPG did not select measures like window replacements that would have increased the SDGE incentive level because even with the additional incentives they did not provide sufficient pay back. The bulk of the total energy savings of the project were generated by the rooftop solar installation, which was financed not through any state incentive programs but through the low-interest Fannie Mae Green Rewards loan, occasioned by the comprehensive refinancing the property was otherwise undertaking. This event, which arose from the public-private partnership with the City of San Diego's ground lease, drove all the energy efficiency measures selected and allowed MGPG to craft the deepest possible retrofit project. MGPG self-funded the installation costs for the new systems prior to any reimbursement from the incentive program and lender, which could present a barrier for some exclusively low-income developers. Ultimately, aligning the new ground lease term and financing event facilitated integration of utility- and state-led incentives with federal tax benefits and favorable loan terms to generate significant efficiency increases. Such opportunities arise infrequently in the life of a property. In addition, MGPG's willingness and ability to pay for the Bright Power audit before it had completed the refinancing or known what incentives it might qualify for—flexibility many low-income properties may not enjoy—helped ensure the most environmentally and economically beneficial project.

SOLUTIONS:

- **Subsidize low-cost or free whole-property energy audits for owners that cannot afford the upfront costs, to maximize access to state programs and to prepare owners to take advantage of opportunities that arise at refinancing.**
- **Allow participants to use incentive funds to pay directly for retrofits as they are contracted and completed, to remove upfront cost barriers for owners and properties that do not have funds available from cash flow or refinancing events.**
- **Incentivize conversion of market-rate housing to deed-restricted, inclusive mixed-income properties to increase access to energy efficiency retrofit incentives and create new inventories of affordable housing for low-income households.**

the upfront burdens, from opening walls and ducts to relocating tenants, that can otherwise render a deep retrofit project prohibitively expensive—significantly increasing the value proposition of the additional energy elements. Existing financing arrangements and loan agreements, particularly for deed-restricted subsidized properties, may prevent owners from taking on additional debt obligations needed to finance an energy project. But when those agreements are renegotiated according to their terms, owners may have an opportunity to introduce efficiency-related obligations. However, these trigger points occur rarely, often decades apart, and existing incentive programs are not structured to align with them.

Creating a one-stop shop program administrator could facilitate this alignment by integrating data-collection and outreach capacities, increasing the administrator's ability to seek out owners nearing those trigger points. Streamlining program outreach (and allocating more ratepayer and taxpayer dollars) could also free up staff capacity to identify trigger points and create a schedule of target properties. A statewide database of property financing, rehabilitation, and energy statuses (discussed later in this report) could also help inform the legislative and/or program implementation reforms needed to align incentives with trigger points.

The California Public Utilities Commission, California Department of Community Services and Development, and other program administrators could harmonize cost-effectiveness metrics and savings targets across existing programs.

Access to incentives and execution of successful energy efficiency projects relies on accurate measurement of savings relative to baseline energy use to satisfy established program metrics. The Public Utilities Commission requires electric utilities, for example, to rely primarily on the ESA Cost-Effectiveness Test (ESACET) in implementing the ESA program. This test weighs benefits (measured in terms of the avoided cost of energy supplied, non-energy health and safety benefits, and utility administration cost savings) against costs to both the utility and the individual participant, including equipment, installation, operation and maintenance, and administration costs. Non-low-income multifamily efficiency programs must still satisfy the Total Resource Cost (TRC) cost-effectiveness test, which does not account for non-energy benefits and can discourage higher-cost retrofits, across the entire portfolio of programs. While these programs are not specific to the low-income residences discussed in this report, they can still drive developers' broader planning and affect mixed-income projects. By contrast, the LIWP program focuses first on maximizing greenhouse gas emission reduction, then on maximizing environmental and economic co-benefits to disadvantaged communities.[35] At the same time, certain programs require rebate or funding recipients to demonstrate levels of efficiency gains, such as the Tax Credit Allocation Committee program (10 percent) and the Energy Upgrade California Bay Area Multifamily Building Enhancements program (15 percent), that may only be attainable by combining in-unit and common area measures that other programs will not allow.

"As you start to bundle efficiency programs, you need to be sure you have common metrics, common measurements of program success and outcomes in terms of energy savings and greenhouse gas reductions. Standardizing the metrics would facilitate bundling."

Conrad Asper,
PG&E

While efforts to maximize avoided energy supply and emission reduction will typically overlap, participants noted that in practice it can prove challenging to design a comprehensive retrofit project that maximizes emission reduction and co-benefits while satisfying different tests of cost-effectiveness and minimum efficiency requirements. As a result, even a property owner that can manage the administrative challenges of combining incentives under the separate programs may be unable to take full advantage of available resources. The Public Utilities Commission and Department of Community Services and Development operate these programs pursuant to separate statutory mandates, but leaders at each agency could coordinate to explore how much flexibility they have to align metrics and savings targets. As Public Utilities Commission leaders consider updates to the ESACET test, they could seek the greatest integration of quality-of-life benefits and greenhouse gas priorities to maximize owners' opportunities to improve their properties.

State legislators could create incentives for existing programs to increase coordination.

The lack of common metrics across programs not only restricts owners' ability to maximize benefits from multiple programs, it also limits agencies' and administrators' authorities and incentives to coordinate their own implementation. The challenge of supporting projects across the goals of energy savings, greenhouse gas emission reduction, and benefits to disadvantaged communities is compounded by legal mandates and funding that are generally agnostic on cross-agency cooperation. Faced with the difficult and time-consuming task of implementing a program like ESA, agency and utility staff may lack the time and resources to assess how an applicant could access further incentives or better shape its planned retrofit to satisfy multiple requirements.

Participants suggested a new legal mandate for program administrators to take actions that support the success of parallel programs, together with additional funding for program staff focused on coordination and mutual support. The mandate could require program administrators to begin harmonizing eligibility criteria, establishing common metrics to facilitate evaluation across multiple programs, and arranging shared technical assistance that promotes all available incentives. The initiative would be driven by a focus on the end-user experience, identifying customer intake and communication synergies that could increase efficiency for customers and administrators. Preservation of existing mandates would ensure no existing program is required to surrender its current role, while the additional staff would ensure no sacrifice of basic operations. The Public Utilities Commission currently requires investor-owned utilities to coordinate with the Department of Community Services and Development to co-fund water efficiency measures subsidized under multiple programs (including ESA and LIWP) and maximize total funds available.[37] This type of mandated coordination could serve as a building block for a streamlined one-stop shop or clearinghouse.

Energy regulators and utilities could expand outreach to owners and developers about available programs and incentives.

Participants emphasized the extent to which owners and developers of low-income multifamily properties may fail to take advantage of current programs because they are simply not aware of the incentives the state and the utilities can offer. This lack of awareness likely results from a combination of limited or no energy-focused staffing, the priority of other pressing operational needs, and limited marketing and outreach by program administrators. The utilities responsible for implementing the ESA program maintain robust websites with program information and application portals.[38] But owners and developers that aren't actively seeking incentives for projects already in the planning stage may never come across these resources. The utilities, in conjunction with the Energy Commission, Public Utilities Commission, Department of Community Services and Development, and State Treasurer's office could prepare a public messaging campaign that reaches all owners of eligible properties.

For example, these parties could prepare a comprehensive low-income multifamily incentive program guidebook with straightforward descriptions of the programs available, the core types of measures covered and levels of funds offered, basic eligibility criteria, application timelines, and contact information and websites for detailed follow-up. Program administrators could consider adopting the step-by-step, instructional approach of efforts like the Butte County Utility-Scale Solar Guide to provide process diagrams and basic project suggestions to owners with less in-house energy experience.[39] Coordination with city governments and landlords' industry groups could provide ideal distribution networks for these documents and render essential input on how to tailor them to the needs of local audiences. The City Energy Project Resource Library—a catalog of how-to guides, fact sheets, and case studies on efficiency policy program implementation from 20 cities and counties—offers a model for collaboration among governments and advocates to spread knowledge of programs and policies.[40]

Energy Savings Assistance (ESA) Program

The Energy Savings Assistance (ESA) Program offers energy efficiency incentives for both in-unit measures (such as weather stripping, door repairs, and refrigerator replacement) and common-area measures (such as upgrades to shared energy systems) in qualifying low-income multifamily buildings. Tenants with household incomes below 200 percent of the federal poverty guidelines can apply directly for ESA-funded installation of certain in-unit efficiency measures, while owners can access in-unit incentives as well as common-area incentives for deed-restricted properties with at least 65 percent of tenants meeting the income threshold.[36] Incentives from both programs can be combined for whole-building retrofits. The ESA common-area measure program is currently authorized only through 2020. Many of this report's recommendations refer generally to the ESA program, in order to encompass both in-unit and common-area measures. However, many buildings with a number of units that qualify for the ESA in-unit incentives do not qualify for the common-area incentives, although they may still be able to fund whole-building retrofits through combinations with other programs or financing instruments.

Alternatively, or in addition, the responsible agencies and utilities could spearhead a joint, statewide advertising initiative to deepen public understanding of the savings, benefits, and incentives available. By reaching not just property owners but also residents and tenants, the campaign could drive demand for efficiency improvements that landlords may not otherwise perceive. An expansion of the existing Public Utilities Commission-supported Energy Upgrade California advertising campaign, focusing specifically on tenants' and low-income property owners' concerns, could serve this role.[41]

Energy regulators and utilities could optimize deployment of existing funds to meet highest-order energy retrofit needs that entail the most energy-saving benefits.

"We need to make sure that we are using available money optimally. For example, are LEDs still something the state should be prioritizing, or now that costs have come down, should programs focus incentives on more expensive items that require more support?"

Maria Stamas,
Natural Resources Defense Council

State- and utility-led incentive programs provide funding essential to bridge the gap between building owners' resources and the cost of efficiency retrofit labor and components, rendering these projects cost-effective. Participants noted, however, that over time the cost and availability of certain components has dropped to the extent that incentives or rebates may no longer be necessary to ensure cost-effectiveness, and state leaders may not have designed programs to address these shifts. For example, LED lighting, which can reduce energy consumption by up to 75 percent and last years longer compared to incandescent bulbs, has long been considered "low-hanging fruit" that is straightforward to install, requires little maintenance, and is universally useful.[42] As a result, it has been among the top measures eligible for incentives under certain incentive programs' cost-effectiveness requirements. But in recent years, the up-front cost of this technology has dropped so rapidly that new LED bulbs are nearly cost-competitive with traditional bulbs, and owners that install the bulbs in any standard equipment replacement begin generating savings almost immediately.[43] As a result, some programs are beginning to phase out incentives, although this step may not yet be appropriate for low-income properties where existing equipment has not yet failed and owners still need financial incentive to drive proactive replacement.

In light of this evolution, participants suggested that policy makers could give incentive program administrators greater flexibility and tools to prioritize use of funds for items that owners are least likely to finance without support and that could benefit from an expanded initial market to reduce costs over time through greater scale. Underscoring this flexibility would be the more robust "bang for the buck" analysis of efficiency measures' effectiveness outlined in the participants' vision. Participants cited as an example the California Solar Initiative, a state solar panel incentive program that was not renewed after its initial funding expired in 2016, when the market price of the technology had fallen sufficiently to drive continued growth without subsidy.[44] The Low-Income Weatherization Program's flexibility in cost-effectiveness requirements allows administrators to support measures most in need of incentives and most aligned with property needs, helping drive the deepest retrofits. If afforded similar flexibility, administrators of other programs could ensure that funds are directed first to measures that most require support for widespread adoption (administrators could still offer funds for more cost-competitive items when available, or consider requiring those items in order to access full incentives). This prioritization could help ensure continued support for the incentives needed to push projects across the line of viability, while preserving state and ratepayer funds to reach more communities and drive deeper retrofits.

State legislators and energy agency leaders could ensure that programs address—or do not exacerbate—the housing shortage and preservation concerns.

In creating a new comprehensive state incentive program or otherwise updating existing programs and administration, the entities responsible for crafting reforms—lawmakers drafting enabling legislation for a one-stop shop, or Energy and Public Utilities Commission leaders harmonizing eligibility thresholds—should guard against undermining the affordable housing sup-

ply by giving owners an incentive to upgrade their properties and then displace low-income tenants for higher returns. While the state tackles the climate crisis, California residents also face a severe shortage of affordable housing, with new construction falling far below population needs.[45] At the same time, existing affordable housing units are being lost (via conversion to market rates and ongoing gentrification) at nearly the same rate that need for those units is growing.[46] It is not clear that energy efficiency retrofit programs drive or accelerate displacement of low-income residents, but efforts to modify and increase the value of existing structures necessarily implicate affordability questions.

Preserving affordable housing supply and limiting displacement should be top priorities for any new programs. State legislators could direct the energy, utility, and housing agencies to conduct a study to determine the extent to which existing efficiency incentive programs are correlated with gentrification and displacement, if at all. To address any concerns identified, state legislators could consider restricting the ability of owners to convert non-deed-restricted affordable units to market rate rents for a period of time after completing a state-subsidized retrofit project, although this condition could substantially limit willingness to use the state programs. Legislators and administrators could consider using efficiency incentive programs to drive the creation or preservation of affordable units by increasing the level of incentives available for owners that convert market-rate affordable units to deed-restricted units in concert with an efficiency retrofit project. The legislature could also provide small pots of funding for program staff dedicated to coordinating with affordable housing finance and policy organizations such as Enterprise Community Partners, which operates a Small Multifamily Housing program to identify financing opportunities to keep small developments affordable, and California Housing Partnership Corporation, which advises cities on policy measures to preserve affordable supply.[47] Collaboration with these organizations, the California Department of Housing and Community Development, and local housing preservation agencies could yield opportunities to advertise incentives and conduct energy audits at the time of conversion. State legislators could also consider amendments relaxing eligibility requirements (for example, when tenants have not yet been identified) to allow owners of converting units to take on projects at the most efficient junctures.

> "All of the efforts around increasing efficiency cannot impact the availability of affordable housing. We need to remember that the state has to continue to add affordable housing."
>
> **Rich Chien,**
> **San Francisco Department of the Environment**

CHALLENGE 2: LACK OF RELIABLE, LONG-TERM FUNDING INHIBITS MARKET TRANSFORMATION

The short-term nature of the incentives offered under existing state programs can hamper access to this funding. Property owners and developers, especially those with large portfolios, often plan renovations and retrofits in five- and ten-year increments to align with funding and refinancing schedules. But depending on the program, legislative or commission reauthorization is required every few years, limiting property owners' ability to rely on the availability of incentives to plan the deepest retrofit projects. Increased, long-term funding is needed for programs to flourish.

State legislators could create a stable, long-term public fund to support the one-stop shop administrator and subsidize advanced efficiency measures.

Seeding the new one-stop shop with a ten-year block of funds (and/or ten-year authorization cycles for utility ratepayer funding) would secure its ability to streamline access to benefits and maximize use of incentives, helping to drive a true energy savings market transformation. A long-term funding source would allow owner/developers to plan efficiency projects in line with their long-term obligations, minimizing financial risk and maximizing ability to incorporate costlier upgrades. Seeding a new one-stop shop program with this type of fund would help secure

CASE STUDY: EAH HOUSING

Maximizing Incentives with Limited Resources

"Properties like Rodeo Gateway face strict HUD oversight and control of rents and operating budgets. HUD budgeting and replacement reserve policies can leave reserves and operating income insufficient to cover capital improvement costs. As properties age, more building components need to draw on reserves, requiring planning expenditures over multiple years as reserve balances grow to cover cost. This leaves properties in constant need."

Verna Causby-Smith, EAH Housing

Property: Rodeo Gateway

A one-building 2002 development for low-income seniors located in the Bay Area city of Rodeo, consisting of 50 one-bedroom units and amenities such as a community room and kitchen. Built with financing under HUD Section 202, the property is subject to controls on rents and subsidies and has limited ability to pay for capital improvements out of residual cash and reserves.

Project

EAH is procuring new Energy Star refrigerators for all units, integrated over five years. EAH also installed LED lighting in all common areas, exteriors, and interior ceilings. Finally, EAH plans to replace two aging traditional boilers with new heat pump units to cover hot water and heating and cooling needs, each of which represented an approximately three-fold increase in efficiency.

Total estimated savings: 300+ kWh/year per refrigerator; 3x increase in heat pump efficiency.

Programs

EAH designed the retrofit project with the assistance of Marin Clean Energy (MCE), which provided expertise on the project scope and components and access to its MCE rebates. MCE's LIFT program offered a rebate for the full cost of the new hot water heaters, while LIFT and other MCE rebates covered substantial portions of the other project elements. Since the property's total reserves (taking into account other budget needs) were insufficient to cover all of the immediate costs even when rebates were applied, EAH is installing new refrigerators for failing equipment first, with plans to replace 100 percent of the units annually as funds become available.

Total cost: $121,750. Total rebates/incentives: $89,050 (73%).

Increasing Program Access and Efficiency Benefits

By working directly with MCE's technical and financing experts, EAH was able to align its planned retrofit with the optimal set of incentives. EAH in-house staff can work with contractors on the technical aspects of the project and matching the planning, application, and construction schedule to program requirements, but MCE's assistance in suggesting efficient equipment options for EAH to evaluate was essential. Even within the LIFT program, EAH can have difficulty marshalling sufficient funds to meet the required expenditure timeframes.

Utility-led programs have administrative requirements that can be too complex and cumbersome for projects that are smaller than a complete rehabilitation. Additionally, available utility-run programs are restricted to utility-approved contractors. For a property like Rodeo Gateway, which has little room for error within its HUD-controlled operating budget, large projects require a trusted relationship. Working with known contractors, who can satisfy insurance requirements, deliver proven high-quality work, and meet tight budgets, is a high priority. Finally, while HUD will work with EAH to improve resident safety with projects like new exterior lighting, most rebate programs will not allow increases in overall building energy load, limiting EAH's ability to install quality-of-life improvements.

SOLUTIONS:

- **Modify incentive and rebate funding to cover multi-year efficiency projects for cash-restricted owners that can demonstrate structural inability to provide sufficient funding upfront.**
- **Require utility-led programs to allow property owners to propose their own trusted contractors for efficiency projects that receive rebates, subject to utilities' reasonable approval.**
- **Allow utility-led programs to cover smaller projects and equipment purchases with a less cumbersome administrative process.**

buy-in from owner/developers and utilities, driving sustained success through the knowledge that the consolidated entity and programs would be in place for an extended time. It could also have the beneficial effect of driving further investment in technology development, based on the guarantee of a robust statewide market for emerging efficiency technologies over an extended period of time. And ensuring adequate funding could help clear existing program backlogs and waitlists that limit even proactive owners' and residents' access to benefits (such as the estimated 1,000-building waitlist for the Low-Income Weatherization Program that affects approximately 18,000 residents).[48]

The success of the California Solar Initiative offers a potential template for this type of long-term funding. Enabling legislation in 2006 authorized more than two billion dollars (from utility ratepayer charges) over 10 years to fund rebates for residential and commercial customers to install rooftop solar panels.[49] Even prior to expiration, the program had exceeded its core goal of subsidizing 1,750 megawatts of new solar installation, while statewide solar installation (including projects not supported by rebates) more than doubled legislative targets.[50] Over the same period, the average cost of installation dropped by over 50 percent.[51] When incentives began to sunset in 2016 and 2017, solar installations experienced only a minor drop statewide, indicating that state funds were no longer needed to bridge customers to savings. The 10-year incentive program, according to the Public Utilities Commission, played "an indispensable role in transforming the solar PV market in California, especially in creating a long-term policy signal to in-state suppliers" that generated cost-reducing market participation and competition, ultimately leading to a sustainable customer-side market.[52] As a possible reflection that a robust market transformation has occurred, in 2018 the Energy Commission promulgated building energy efficiency standards that require rooftop solar on all new homes built after 2020—a step that demonstrates how precipitously prices have fallen.[53] Important differences remain between the relative simplicity of rooftop solar installation and complexity of customized energy efficiency retrofits, including the wide variability of construction and condition across the existing multifamily housing stock and the need to combine multiple efficiency measures. But the record of a decade of solar funding shows how this support helped drive both technological innovations and new leasing and financing instruments.

"A program similar to the California Solar Initiative—with a secure multi-year funding stream and subsidies for advanced efficiency measures that decline over time as costs come down—could push market transformation."

Sandy Goldberg, California Public Utilities Commission

Providing similarly reliable, long-term funding for energy efficiency incentives could help facilitate an analogous market transformation. While international markets and developments were responsible for a portion of the solar installation price drop, the California Solar Initiative provided substantial support for many in-state solar companies as well as large-scale commercial and residential property owners planning upgrades across multiple properties. And while a long-term energy efficiency incentive program would focus on many technologies rather than one, it could still spur cost decreases in some of those technologies and increased investment in large-scale bundles of services and measures. Legislators could provide regulators the flexibility to redirect funds to technologies most in need of subsidy support as market prices shift over time. The appropriate level of funding would be the subject of a cross-agency analysis, as noted in the Executive Summary. But as a reference point, a recent scenario analysis for the California Public Utilities Commission projected statewide spending of between $600 million and $1 billion per year on all utility incentive programs between 2020 and 2030.[54] By adopting the California Solar Initiative model for efficiency incentives—whether for a new comprehensive program or for existing programs—the legislature could provide the spark needed for market transformation.

State legislators could fund existing programs on longer timelines and with fixed eligibility requirements.

Participants emphasized that even if a one-stop shop or new administrator is infeasible, replacing the current short-term funding for LIWP and other programs with guaranteed long-term funds could significantly increase uptake of incentives. Buttressed by a guarantee of long-term funding, owner/developers could craft long-term renovation and refinancing strategies across

their entire portfolios that incorporate firm energy efficiency retrofit plans. They would also be more willing to procure energy audits in advance, based on the certainty that program funding would be available when a property hits a trigger point. Ensuring that eligibility requirements are stable for the duration of that funding would further strengthen the ability to devote staff time and funds to planning retrofit projects for properties of varying types. Each of these developments would increase buy-in and use of the existing programs and advance the state's efficiency goals. In addition, this extended funding could work in concert with the financing initiatives being piloted under the CHEEF program, building a robust public-private market.

State legislators and utilities could promote pilot programs to facilitate financing mechanisms that leverage public and private funds and aggregation.

Participants agreed that while increased and longer-term state funding will be essential to drive uptake of efficiency programs, significant growth in public and private financing for energy efficiency projects is necessary to drive a real market transformation. While private banks and lenders are always available to finance energy efficiency projects, the savings those projects generate are often not significant or reliable enough to satisfy traditional repayment and interest arrangements, and low-income housing owners often lack sufficient access to traditional capital markets.[55] However, a group of innovative new financing arrangements may offer private parties the secure revenue streams they need to finance efficiency projects. Proper policy support could potentially help these mechanisms spread statewide and adapt to serve the low-income multifamily residential market.

> "Planning timelines are a challenge. If a rehabilitation is planned for year 15 of a property's life, one needs to know in year 12 what incentives will be available to be able to plan ahead and incorporate energy efficiency into project."
>
> **Amy Dryden,**
> **Build it Green**

MEETS

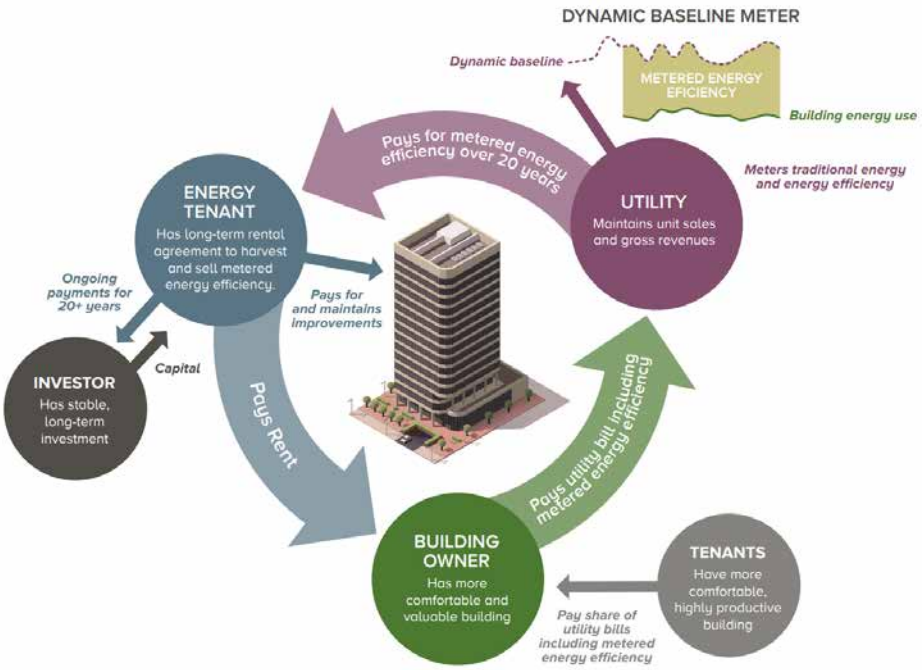
The Metered Energy Efficiency Transaction Structure (MEETS) is a financing arrangement by which a third-party energy efficiency investor contracts with a building owner to install efficiency improvements. The investor sells the metered energy efficiency (the difference between baseline and actual consumption) to the utility under a long-term power purchase agreement. The utility then bills the building owner and/or tenants for energy consumed plus the metered energy efficiency, just as it bills all energy, ensuring it maintains revenue. The building owner receives a share of the savings through "rent" paid by the third party (also known as the "energy tenant"), while building tenants benefit from improved performance at no cost, and overall building energy use is reduced. Notably, a MEETS transaction requires the installation of a dynamic metering system that collects and normalizes building energy consumption, which allows the savings achieved by the efficiency installations to be measured against consumption that would have occurred absent the installations.[56]

MEETS is still in the early stages of development and refinement. After a successful initial pilot project at one commercial property, the mayor and city council of Seattle and the city's electric utility expanded the program (which the utility calls "Energy Efficiency as a Service") to a pilot group of up to 30 commercial properties.[57]

Energy Services Agreements and ESCOs

An energy services agreement is a contract between a building owner and energy retrofit project developer, known as an energy service company (ESCO), in which the ESCO guarantees a minimum level of energy savings to the building owner. The owner pays a portion of the savings (either actual savings generated or a preset payment) to a third-party energy investor, which finances the retrofit project.[58] Similar to MEETS, the energy services agreement entails no upfront cost to the building owner and relies on dynamic baseline metering, which determines

MEETS Transaction Structure



Source: MEETS Accelerator Coalition.

the level of energy the building would have consumed but for the retrofit, in order to assess savings. The arrangement also facilitates cash-flow aggregation by the investor, supported by the owner's commitment to share the savings and the ESCO's performance guarantee.

MESA

Under a Managed Energy Services Agreement (MESA), an efficiency contractor finances and carries out a retrofit project and assumes full responsibility for the owner's relationship with the utility, including bill payment and any incentives available. The owner pays the contractor a fixed monthly fee based on historical energy bills, allowing the contractor to pocket the energy savings as revenue.[59] Unlike MEETS and energy services agreements, this structure does not necessarily rely on a third-party investor, but it still allows aggregation of agreements with multiple building owners to create steady and substantial cash flow.

These financing structures are primarily designed for the commercial sector, which offer larger buildings with higher electrical loads (and thus more significant savings) as well as greater energy-focused staff capacity than low-income multifamily residential (and are the subject of a report in this series entitled *Powering the Savings*).[60] But by linking building-wide energy efficiency upgrades with secure long-term savings, they provide a potential model for the low-income multifamily sector, generating financial benefits for owners and investors and grid benefits for utilities, at no cost for tenants (though the tenants also do not receive near-term savings, which go to the third party investors and contractors). While they are designed

to function without incentives by monetizing the savings value of efficiency upgrades, they could be combined with incentives in the low-income multifamily context to maximize financial viability. The ability to aggregate reliable cash flows across multiple investments also allows investors and contractors to group together smaller residential owners whose buildings would not individually support an investment. This aggregation in turn presents an attractive opportunity for financial institutions to invest in these projects via standardized, aggregated products that generate sufficiently high margins.[61] With sufficient standardization and scale, these mechanisms could also support the issuance of green bonds and further accelerate uptake.

To identify opportunities for these financing structures to function in the low-income multifamily sector, the state legislature could consider partnering with a willing city government, the applicable utility or community choice aggregator, and/or a community development financial institution to create a pilot project for a set of buildings. With a sufficient allocation of ratepayer funds to administer it and backstop losses, the pilot could attract energy investors and contractors willing to adapt these models to a different context. A pilot project could afford these investors and contractors an opportunity to identify the scale and scope of a project needed to generate financeable savings, as well as any arrangements needed to guarantee payment in the residential tenant context. If successful, the pilot could inform further municipal and utility adoption of the program and facilitate increased private investment in efficiency projects.

The California Public Utilities Commission and utilities could propose and institute utility tariffed on-bill programs that capitalize energy efficiency retrofits without making loans.

Another innovative financing mechanism to increase low-income owners' and tenants' access to efficiency upgrades is tariffed on-bill financing, illustrated by a program initiated by the Ouachita rural electric cooperative in southern Arkansas, which serves an economically distressed part of the state. The program, known as HELP PAYS (for "Pay as You Save"), uses a voluntary charge on utility bills to invest directly in efficiency upgrades for individual customers. The introduction of the program was linked with a three-fold increase in participation in efficiency programs compared to the predecessor on-bill loan program, driven almost entirely by multifamily units in one of the most difficult areas of the state in terms of encouraging uptake.[65] One hundred percent of multifamily units that received offers under the program accepted them.

This model is similar to on-bill financing (described earlier), in that the utility bears the upfront cost of efficiency measures and recoups that cost via a cost recovery charge (known as the "tariffed charge") on the customer's monthly bill that is "tied to the meter" (i.e., is passed on to subsequent occupants). The significant difference is that the utility makes an investment rather than a loan. As a result, there are no limitations to eligibility related to income or credit history. The implementer for the Arkansas program, EEtility, provides no-cost home energy assessments to intended customers, coordinates third-party service providers and installation, and follows up with a report recommending improvements—including non-master-metered in-unit measures—that the utility will capitalize. The assessment is based on direct on-site measurements, engineering modeling, and a multi-year energy

Energiesprong

The Netherlands-based model Energiesprong leverages private funds via two separate contractual arrangements:

A property owner/developer enters an agreement with a contractor to perform an energy efficiency retrofit, which is designed to achieve zero net energy via the installation of rooftop solar panels and battery storage, prefabricated exterior insulation (wrapped around existing exteriors), efficient HVAC and heat pumps, and new electrified mechanical systems and appliances. The contractor guarantees minimum performance over 30 years, which is the anticipated payback period for the owner/developer.

The owner/developer also contracts with tenants for an "annual energy budget." Tenants pay a set fee for a specified quantity of hot water, kilowatt-hours of electricity, and interior temperature range. Additional fees apply for consumption beyond the budget.[62] This energy budget distinguishes the model from the MESA structure and facilitates application to the residential context.

The tenants' annual energy budget payments provide the owner/developer a steady cash flow with which to obtain financing to cover the upfront cost of the retrofit project, solving the split incentive problem in non-master-metered properties. The contractor's performance guarantee helps ensure favorable financing terms, including long-term loans that are more affordable. Tenants benefit from the certainty of monthly bills under the contractual arrangement with the landlord, while the landlord can benefit from the improved condition of the building.

The Energiesprong model has supported over 4,000 retrofit projects in the Netherlands and dozens in other European countries. New York State has initiated a pilot program based on the model focusing on low-income housing.[63] Introducing the model to California could yield gains in the market for private financing of efficiency projects, particularly if existing incentives could be accessed simultaneously. (The Energy Commission has entered a pilot partnership, known as REALIZE, to initiate demonstration projects and a market facilitation program).[64] However, the "annual energy budget" arrangement—which essentially converts the monthly energy payment between customer and utility into a fixed contract between tenant and landlord—might require enabling legislation, as it disrupts existing arrangements between tenants and utilities for non-master-metered buildings—specifically the utility allowance structure in affordable housing. Similarly, while prefabricated exterior insulation panels can be highly cost- and time-efficient to install for uniform multifamily construction types, they may be more challenging for non-uniform buildings. In some US jurisdictions, local building regulations may limit the installation or thickness of exterior panels, which could necessitate amendments or limited exemptions. State legislators and the Public Utilities Commission could consider funding further research and development of prefabricated zero-emissions retrofit systems—including potentially necessary regulatory reforms—to test the capacity of the Energiesprong model to drive market-based solutions in California.

use history that the utility generates, which helps ensure that projected savings are true to building fundamentals rather than resident use patterns. The cost recovery charge on the utility bill is capped at 80 percent of the estimated savings from the project and 80 percent of the useful life of the installations, so residents are guaranteed to share in the savings if a project performs as expected and insulated from losses if it underperforms and can benefit substantially if it exceeds expectations.[66] Further, EEtility has an affirmative obligation to investigate any under-performing measures to identify whether the cause is due to equipment, maintenance, or customer action and offer education or correction as needed.

The Pay as You Save tariffed on-bill model classifies energy efficiency upgrades as an "essential utility service" rather than a loan to the customer, so consumer lending regulatory oversight does not apply. Instead, utility regulators review and approve the terms of the tariff, which include multiple consumer protections. Because the cost recovery for energy efficiency as an essential utility service is treated the same as other utility services, the same protocols for billing and payment apply. This process includes the utility's ability to shut off a resident's service for failure to pay, an integral part of the program design though one that that the utilities with PAYS experience have not reported having to use. However, the consumer protections just described—the 80 percent caps on the tariff and the obligation to investigate any underperformance—combined with the multi-year energy use history virtually guarantee that customer bills will not exceed their pre-retrofit levels and in most cases will be lower. As a result, there is no increased risk of default compared to baseline conditions, and in practice the Arkansas program has experienced a near-zero loss rate. Moreover, the success of the Arkansas program—with estimated average savings of over 35 percent for multifamily participants, limited instance of loss for the utility, and substantially increased uptake in an area characterized by persistent poverty—indicates that the benefits may significantly outweigh any potential risks.[67] The Public Utilities Commission and the major investor-owned utilities, the municipal utilities, or one of the rural electric cooperatives with a footprint similar to Ouachita's could initiate a tariffed on-bill program based on the Arkansas model and potentially capture similar gains. Legislative changes could be needed to grant the express authorization to do this, and to allow community choice aggregators to initiate their own similar programs. Together with the utility incentive and rebate programs and measures to increase private financing discussed elsewhere in this report, the effort could ensure that all areas of the state maximize their ability to invest in efficiency.

Electric utilities and state energy regulators could enable greater access to on-bill financing and on-bill repayment arrangements.

On-bill financing programs are energy efficiency loans that use the customer's utility bill as a repayment mechanism for the debt. In exchange for the installation of efficiency upgrades, a utility customer agrees to repay the upfront cost via a recurring charge on the monthly bill, often in the form of a loan originated by the utility (or, in the case of the related on-bill repayment structure, by a third-party lender). The arrangement allows utility or financial entities to pay the immediate costs of new equipment and work that a customer may not be able to afford and recoup those costs over a timeline that works with the customer's budget.[68]

On-bill financing offers many advantages over traditional loan arrangements, including:

- Simplicity for customers, who may not have the time, interest, or savvy to obtain a bank loan for an efficiency installation;
- Security for utilities and financial institutions, who can rely on the fact that the customer's utility service is tied to repayment;
- Reduced burdens for customers, who do not have to provide any additional form of security such as a lien or mortgage; and

- The potential for bill neutrality, which ensures that on-bill payments do not exceed the energy savings estimated to be realized by the customer (but may limit the scope of measures undertaken).

This combination of factors renders on-bill financing a potentially ideal mechanism to increase uptake of efficiency measures in low-income properties: ease of use and long repayment timelines minimize costs to residents, while the tie to the utility service ensures repayment for the lender. However, participants noted that while on-bill financing is available in limited form for multifamily properties in California, uptake has been minimal (although the utilities' commercial programs have seen greater utilization). Expanding access to on-bill financing options through utilities could increase the uptake of efficiency measures for low-income customers that are willing and able to take on debt or low-cash flow properties where the owner is responsible for the energy bill. Program design must account for concerns such as the potential for repayment costs to exceed energy savings, the harm of utility shutoff for vulnerable residents, and questions regarding the assumption of obligations when a property is sold.[69] (New York, for example, has addressed some of these questions in the Power NY Act of 2011 [A. 8510/S. 5844].)

California utilities have recently begun to implement on-bill financing for owners of multifamily properties. For example, in September 2017, PG&E opened an energy efficiency on-bill financing program for owners of multifamily properties that meet certain eligibility requirements, including five or more units, a history of on-time payment of PG&E bills, and a retrofit plan that exceeds Title 24 requirements. The program, administered by TRC Companies, offers on-bill arrangements of up to $2,000,000 with repayment periods of up to 10 years, with no upfront costs and monthly payments designed to match estimated savings.[70] The program offers financing for retrofits involving equipment in common areas or served by master meters only and does not cover in-unit measures for tenants who pay their bills directly. The 10-year extended repayment window in particular could hold significant value for customers, as it allows greater amortization of savings than a traditional five-year period, which may limit participation. PG&E is still in the early stages of developing the standard loan documents for the program but has enjoyed limited uptake, suggesting that greater promotion may be necessary. The electric utilities could expand these programs and increase outreach to grow customer awareness of their availability and benefits. Energy regulators could also consider specifically authorizing more pilot programs that can demonstrate the viability of on-bill financing while determining the necessary consumer protections, affordable and realistic repayment periods, and desirable legislative reforms.

The California Public Utilities Commission could review the utility-based efficiency programs to ensure they provide deep savings and non-energy benefits to buildings.

Participants expressed frustration that the Public Utilities Commission's program requirements for utility efficiency programs have limited the ability of these programs to fund deep retrofit projects. State law requires the Public Utilities Commission to set cost-effectiveness mandates for these ratepayer-funded programs, although the exact measure is left largely to the agency's discretion.[72] General multifamily energy efficiency programs

California Housing Partnership Corporation Santa Monica OBF pilot

In 2016, California Housing Partnership Corporation (CHPC), a state-chartered affordable housing finance and policy organization, conducted a test of on-bill repayment at five properties in Santa Monica, ranging from a 15-unit 1920s building to a 40-unit complex built in 2006.[71] CHPC served as program administrator, providing technical assistance and management to Community Corp, the owner of the properties. The improvements were financed via an energy services agreement, an arrangement in which an energy services company (ESCO) installs efficiency improvements in exchange for the property owner's payments based on amounts saved. (For purposes of the pilot, Community Corp acted as ESCO, but a third party would normally fill the role). Importantly, the agreement ensured that the owner's annual payments to the ESCO would not exceed the savings actually achieved. The final scope of work included a range of common-area and in-unit energy and gas measures including lighting retrofits, washing machine replacements, new insulation, and efficient hot water heat pumps.

After conducting energy use audits for the five properties, energy savings of between 10 percent and 35 percent were estimated for the five properties. On-bill repayment and utility incentives each funded approximately one quarter of the total energy retrofit costs, which ranged between $3,000 and $8,000 per unit. Only one individual building achieved savings greater than costs, but the portfolio of five projects generated net positive savings overall because the underperformance at the other four buildings was less significant. This measure does not account for the 50 percent of project costs that were funded via owner and property reserves, which is a higher amount than most low-income multifamily owners will be able to devote to a retrofit project. These results demonstrate the need for increases in dedicated state funding and incentives to bridge the gap between owner financial capacity and the savings potential of efficiency savings (together with clearer understanding of the most cost- effective targets for those funds). They also indicate that achieving California's energy efficiency goals may not always be cost-effective on an individual building basis even if it can be statewide. While the pilot served as a promising test for on-bill repayment structuring and coordination, CHPC concluded that it primarily highlighted two other key needs for statewide implementation: increased funding for technical assistance to ensure accurate estimates of savings and performance guarantees to minimize risk to owners.

must satisfy portfolio-wide cost-effectiveness based on the Total Resource Cost test which, as described above, may not fully incorporate non-energy benefits relating to quality-of-life improvement and environmental protection. Commission staff use the ESACET test to account for non-energy benefits in tracking cost-effectiveness for the low-income ESA program, although they have not yet formally adopted this measure, potentially causing uncertainty for long-term planning. An "adjusted" ESACET would further integrate non-energy benefits by excluding their associated costs from the calculation.[73] This approach, which a number of advocacy groups support, is currently under consideration for formal adoption. Further, recently proposed legislation, AB 961 (Reyes, 2019) would require the commission to establish common definitions of non-energy benefits, and prioritize them in efficiency programs.[74] Adopting uniform non-energy benefit measures and requiring prioritization could help promote the deepest possible retrofit projects. In addition, legislation modifying the approach to non-energy benefits could incorporate other measures to help the Public Utilities Commission, utilities, and service providers to achieve this prioritization effectively: increased funding for technical assistance on non-energy benefits, mandatory consultation with local building departments and the Department of Housing and Community Development to identify non-energy priorities, and increased flexibility to prioritize deep retrofits over reaching more properties in a given budget year.

"The challenge for on-bill financing isn't a lack of money. There is plenty of money sitting on the sidelines that is interested. But the complexity of programs, the definition of on-bill financing as debt, and the timing of investments and required consents are a funnel that limits funding."
Matthew Brown,
Harcourt Brown & Carey

State legislators and energy regulators could collaborate with housing regulators and owner/developers to create a statewide database that combines financing, general rehabilitation, energy needs, eligibility, and other key data to identify trigger points that can inform consumers and target high-priority projects and owners.

The lack of long-term funding sufficient to drive an efficiency market transformation is amplified by a lack of comprehensive information on the low-income multifamily housing stock potentially eligible for efficiency incentives. Program administrators may be unaware of the properties best suited to maximize incentives in terms of building age, energy performance, financing status, and tenant population. As a result, they are unable to conduct targeted outreach or build timelines of anticipated projects.

A statewide database incorporating key energy, financing, and eligibility data into a GIS-style interface could significantly improve the effectiveness of incentive programs. The database would include information on building history, renovation and refinancing timelines, energy usage, income levels, and applicable incentives, with staff analysts to identify when individual properties are best suited to take on energy retrofit projects and prepare a long-term timeline to help the state achieve its SB 350 goals. The database would also draw on and support Energy Commission energy data benchmarking and analysis efforts under AB 802. An initial phase of the effort could cover one or more of the urban counties in the Los Angeles, San Diego, and San Francisco Bay areas, which house the bulk of the state's low-income multifamily units.

One model for a comprehensive data collection and management program is the California Housing Partnership Corporation's Preservation Clearinghouse.[75] The clearinghouse collects property-level data on the status of regulatory restrictions, subsidies, and renovation projects to assess the risk that deed-restricted, subsidized affordable housing properties might lose their affordable status and convert to market-rate housing. The assessments are based on data collected from the US Department of Housing and Urban Development's subsidy programs, the US Department of Agriculture's rural and farm labor housing assistance programs, and the federal Low-Income Housing Tax Credit program, with plans to integrate further data to build a truly comprehensive database and integrate it with mapping tools. A dedicated staff analyst manages the clearinghouse and provides data sets on request to government agencies and housing nonprofits that are seeking to monitor and protect the availability of affordable housing over time.

A similar database structure could provide equally valuable support for state and local agencies and environmental and housing groups seeking to advance energy efficiency goals in the low-income multifamily sector. Such a database could also integrate with other resources, such as the preservation clearinghouse, to support the state's long-term housing supply and affordability efforts. Combining information on renovation and refinancing timelines, energy usage, income levels and applicable incentives, with full-time staff analysts, could help the Energy Commission and other actors identify when individual properties are best suited to take on energy retrofit projects and prepare a long-term timeline to help the state achieve its SB 350 goals.

State energy and tax agencies and owner/developers could leverage the welfare exemption from local property taxes for deed-restricted properties to encourage building owners to undertake efficiency projects.

California law exempts from taxation property that is "used exclusively for…charitable purposes" and owned by a foundation or corporation organized and operated for charitable purposes.[76] Dedicated low-income housing can qualify for the "welfare" exemption, so long as it is deed restricted and rents do not exceed 30 percent of area median income (or 30, 50, or 60 percent thereof for lower-income households).[77] Properties that qualify for federal Low-Income Housing Tax Credits likely qualify for the exemption, and properties may qualify partially based on the deed restriction of some, but not all, units.

Owner/developers of naturally occurring low-income housing could consider deed-restricting their properties to meet the requirements of the charitable purposes welfare exemption and using the tax savings they generate to finance efficiency projects. The Energy Commission and Public Utilities Commission could work with the State Board of Equalization, which administers the exemption, to advertise the availability of the exemption and integrate efficiency incentive program information into the welfare exemption application process (and vice-versa).[78] The state legislature could also consider amending the Tax and Revenue Code to create a time-limited welfare property tax exemption for low-income units (based on county-specific household income and rent levels) that are not deed restricted but whose owners commit to aggressive efficiency retrofits and a set period of rent control. These initiatives could both increase the ability to finance efficiency measures and to preserve low-income housing supply during the state's affordable housing crisis.

The State Board of Equalization and California Energy Commission could harmonize Tax Credit Allocation Committee (TCAC) requirements to better incentivize efficiency projects.

The State Board of Equalization's Tax Credit Allocation Committee (TCAC), which administers the federal Low-Income Housing Tax Credit (LIHTC) program in California, employs a rigorous set of scoring criteria when evaluating projects applying for tax credits.[85] These criteria include a requirement that developers with rehabilitation projects seeking tax credits must generate a 10 percent improvement in energy efficiency compared to pre-retrofit conditions, while projects that achieve industry-standard efficiency criteria (such as LEED certification) or achieve even greater improvements receive additional evaluation points.[86] An early analysis of these measures found that, as applied to retrofit projects, they created annual statewide savings equivalent to the total energy use of nearly 2,000 apartments.[87]

Low-Income Housing Tax Credits and the Tax Credit Allocation Committee

The federal Low-Income Housing Tax Credit (LIHTC) program offers tax credits to owners and developers of deed-restricted low-income rental housing as a means to incentivize construction of new units and rehabilitation of existing units.[79] The program offers tax credit subsidies of 70 or 30 percent of the value of a project, typically for new construction and rehabilitation, respectively. (These subsidies are often referred to as the "9 percent" and "4 percent" credits, based on their discounted annual rates over 10 years.) Housing developers typically sell the credits to investors in exchange for equity in a project, allowing the developer to carry out the development or renovation and the investor to claim the value of the credits once completed.[80] The Low-Income Housing Tax Credit program has subsidized nearly three million housing units in its 30-year history, and a high proportion of low-income housing developments have been built or rehabilitated with Low-Income Housing Tax Credit-supported investment.[81]

To qualify for credits, a development must satisfy a "20/50" income test (i.e., 20 percent of units are occupied by individuals with income of 50 percent or less of area median income) or a "40/60" test. In addition, rents may not exceed 30 percent of whichever income level the developer elects to meet (i.e., 50 or 60 percent of area median income). These requirements apply for 30 years.[82] Since the program is instrumental in financing many low-income developments and rehabilitations, and since many properties rehabilitate in 15-year intervals based on credit availability, a significant number of California's low-income multifamily units (the minority that are deed-restricted rather than market rate) are subject to the income and rent limitations.[83]

In California, the Tax Credit Allocation Committee (TCAC) of the State Treasurer's Office administers the federal tax credit program. The Tax Credit Allocation Committee has established minimum energy efficiency requirements and awards extra competitive points for efficiency measures when allocating credits for new developments and rehabilitations. But convening participants and other advocates have argued that the Tax Credit Allocation Committee should increase prioritization of efficient renovation projects in their program guidelines to further incentivize deep retrofits.[84]

CASE STUDY: WAKELAND HOUSING & DEVELOPMENT CORPORATION

Incorporating Efficiency Priorities through Full Property Rehabilitation

"We're trying to solve for multiple policy objectives: operational feasibility, new community spaces, robust social services, affordable rents. Energy efficiency is an important goal, but it's one of many."
Peter Armstrong, Wakeland Housing & Development Corporation

Property: Reverend Glenn Allison Apartments

A 58-unit, two-story 1976 building in central San Diego. The majority of the studio to two-bedroom units are reserved for disabled and/or formerly homeless residents, earning between zero and 15 percent of area median income. In 2006 the development adopted the Permanent Supportive Housing model, which provides dedicated medical and social support services for residents, leading to some neighborhood opposition and a pullback of local funding.

Project

Wakeland undertook the efficiency retrofit in the process of a whole-property rehabilitation. This facilitated measures such as water-efficient roofing and landscaping and an 87 kW rooftop solar installation, in addition to in-unit LED lighting and Energy Star appliances and efficient heat pumps. The newly efficient fixtures allowed the rooftop solar installation to provide 100 percent of common area electrical needs and the majority of tenant electrical needs. Of the total energy savings achieved, 95 percent accrued to tenants in the form of reduced utility bills.

Total estimated savings: 35 metric tons CO_2/year, 107,000 kWh/year, 36 percent of total building energy use.

Programs

Of the $7.6 million total cost of the project (including non-energy measures), approximately $6.5 million was tax credit equity from the federal nine percent tax credit obtained under the TCAC program. The SDG&E Energy Upgrade California Program provided approximately $45,000 for some of the efficiency measures, while the Low Income Weatherization Program provided the largest pot of efficiency incentives: $150,000 for retrofit measures and $200,000 to cover almost the entire rooftop solar installation. Wakeland worked with AEA, the LIWP administrator, to craft a set of retrofits that met program requirements and audit tenant energy use to determine the appropriate size for the solar installation. The availability of LIWP covering the rooftop solar cost allowed Wakeland to add electric heat pumps, rather than less-efficient electric water heaters. Incentives did not cover the cost of a new cool roof that Wakeland installed as part of the project as required by TCAC and private lenders. When Wakeland initiated the project, Reverend Glenn Allison was located in a disadvantaged community under SB 535 and thus eligible for LIWP incentives; however, following an update to the CalEnviroScreen rankings, the neighborhood now falls outside the top 25 percent of impacted communities and is thus no longer eligible for LIWP. Had Wakefield failed to finalize its application prior to the update, it would have invested significant staff and planning capacity in energy efficiency measures it ultimately could not pursue.

Total cost: $820,027. Total rebates/incentives: $395,277 (48%).

Increasing Program Access and Efficiency Benefits

With the assistance of AEA's energy audit, Wakeland was able to access a robust combination of incentives to drive a substantial efficiency gain. However, in the context of a full building rehabilitation, energy-related incentives constituted only six percent of total project funding. The timing and terms of the TCAC credits—unrelated to energy efficiency needs—determined the scope of the efficiency project. Wakeland staff were fully occupied with the demands of satisfying TCAC requirements in order to maintain baseline tax equity funding, and meeting the separate deadlines for the LIWP program presented a major challenge. The SDG&E program incentives, while valuable, ultimately constituted a minimal amount of the total project cost—rendering its third set of distinct timelines and qualification requirements an even greater burden for Wakeland's team.

SOLUTIONS:

- **Create a process for TCAC applicants to simultaneously and automatically identify and apply for all available efficiency incentives.**
- **Integrate more efficiency-related criteria into the TCAC evaluation process to increase incentives for owner/developers to design sustainable projects.**
- **Provide free technical assistance to help resource-limited owner/developers pursue efficiency measures while keeping focus on core operational and affordability priorities.**

Participants argued that while these standards set an effective baseline for rehabilitation projects seeking tax credits, state regulators could enhance the TCAC program to improve low-income owner/developers' ability to afford deep retrofits and achieve statewide efficiency goals. The centrality of the Low-Income Housing Tax Credit to many projects means that compliance with TCAC requirements often drives project timing and structure, drawing staff time and resources away from applying for and meeting deadlines for LIWP, ESA, and other incentive programs. In addition, compliance with TCAC's strict 10 percent efficiency improvement requirement can sometimes restrict owner/developers' ability to install new, efficient electric appliances that increase overall electricity load by switching from more polluting natural gas versions.

"TCAC and the big tax credits drive our projects. We need a way to align the housing programs and the energy programs so developers can apply for all at the same time."

Peter Armstrong, Wakeland Housing and Development Corporation

To address these conflicts, leaders at the Energy Commission and the Public Utilities Commission could form a working group with TCAC members to identify and implement measures to integrate the programs. TCAC could update its Sustainable Building Method and Energy Efficiency Requirements Workbook and other application materials with explicit links to and descriptions of the available incentive programs. TCAC could also consider amending the regulations requiring a 10 percent efficiency increase to permit projects that may increase overall electrical load but reduce natural gas consumption and improve quality of life; or to allow qualifying projects to employ a greenhouse gas emission-based metric as an alternative to the existing efficiency gain requirement; or to offer additional application-scoring credits for projects that build in long-term energy use monitoring measures. Finally, TCAC leaders could consider setting aside a portion of available tax credits exclusively for qualifying deep retrofit projects that meet minimum income criteria. Meanwhile, the state legislature could authorize the Energy Commission to offer a matching bonus for projects that receive tax credits and achieve heightened efficiency goals, as an advance incentive to drive gains beyond the required 10 percent. And the agencies could work together to identify methods to automatically link TCAC application and qualification with the efficiency programs, a task that could be accomplished by an alignment of resources under the creation of a one-stop shop administrator.

Program administrators could reduce administrative costs and redirect the savings to project expenses.

California's past efforts to increase energy efficiency in existing homes have sometimes entailed significant administrative and marketing costs, potentially consuming funds that could otherwise be available for retrofit projects. Early analyses of Energy Upgrade California, a state-utility collaboration that offers efficiency rebates across residential sectors, indicated that administrative, marketing, and training costs exceeded project costs over the first three years of the program.[88] The Public Utilities Commission suspended an early general statewide marketing campaign, Engage 360, after finding that its costs did not produce enough ratepayer benefit to justify further investment.[89] By some estimates, efficiency programs devote up to or over half of their budgets on administrative costs (i.e., non-rebate costs), limiting total energy savings achieved.[90]

While customer outreach efforts are essential, participants emphasized the importance of committing as much of available funding as possible to project expenses. Consolidating existing efficiency programs could aid this effort by reducing duplicative administrative needs and marketing initiatives across agencies, utilities, and regions. For example , the California Public Utilities Commission has already begun to streamline marketing under the Energy Upgrade California program, which is run by a single marketing firm and has a three-year budget of over $70 million (and covers a wide range of energy measures in addition to retrofits).[91] If low-income multifamily incentives are combined under a single administering entity, outreach and education could be further streamlined as they become more comprehensive. The administrator could thus ensure that increases in project spending outpace increases in administrative and marketing spending, and any savings generated by eliminating duplicative efforts could be directed to further project spending.

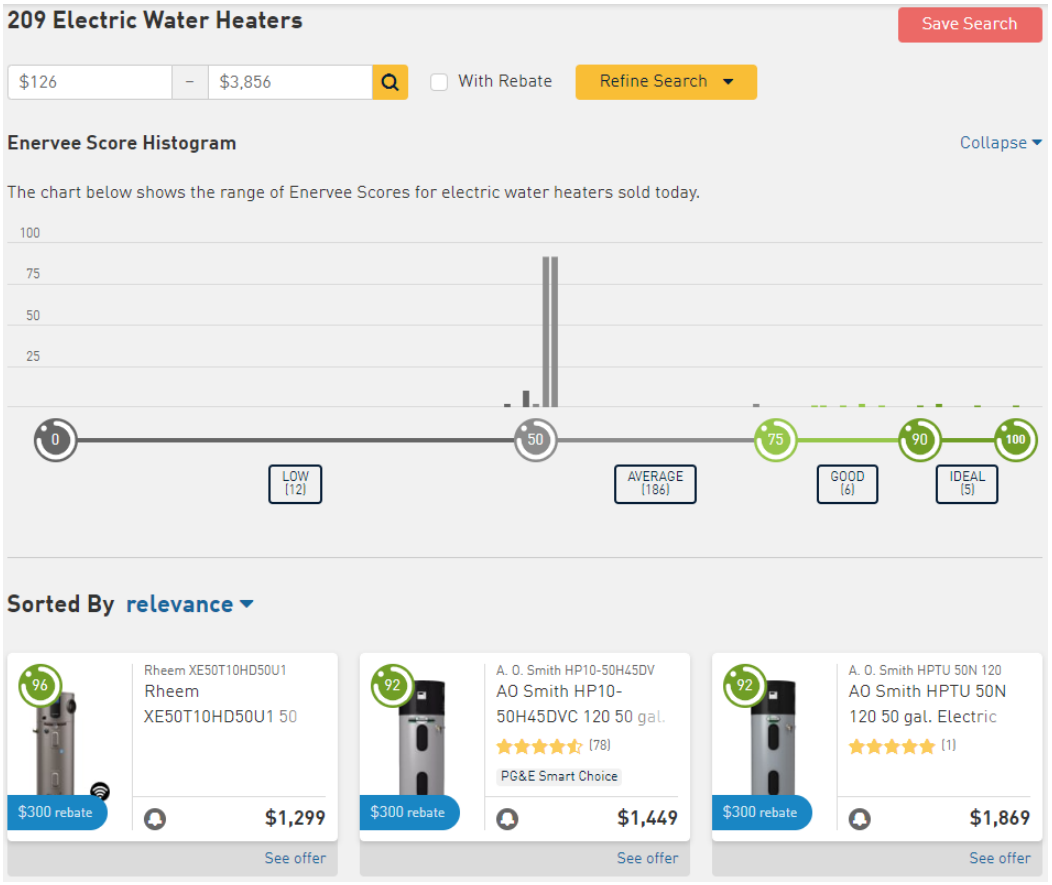
CHALLENGE 3:
LACK OF DATA AND CONFIDENCE IN SAVINGS AND NON-ENERGY BENEFITS LIMITS INVESTMENT

Low-income multifamily property owners often lack sufficient data on building energy use and needs to determine the savings they can generate through an efficiency retrofit. They can also lack the equipment and staff time to monitor energy use on an ongoing basis after project completion, reducing confidence in the long-term savings they need to generate and track. Utilities and state program administrators in turn may have minimal insight into individual properties, limiting their ability to target resources most effectively. Moreover, as discussed earlier, efficiency programs may not count quality-of-life and environmental improvements as benefits in their cost-effectiveness evaluations, and may not fund measures that improve quality of life but also increase electrical load. The result is under-implementation of efficiency measures at the programmatic level and reduced ability of owner/developers to craft projects that satisfy tenant needs and program criteria.

The state legislature, California Energy Commission, California Public Utilities Commission, and the electric and gas utilities could expand public and program implementer access to building energy data, through customer opt-out programs to address privacy concerns.

The electric and gas utilities that are responsible for delivering those services to customers control the meters that measure usage. As a result, they control the energy usage data that each meter generates. California's utilities generally provide aggregated data to local governments and researchers and allow customers to access their own data.[92] But under current state law, utilities typically are barred from sharing data for individual units or buildings with efficiency program implementers or energy regulators, limiting their ability to identify worst-performing units and buildings for targeted incentives.[93] Participants suggested that making unit- and building-level energy data available to program implementers and the public could greatly increase the efficacy of existing incentives. The state legislature could amend the Public Utilities Code to permit sharing of this granular historical and current data on an opt-out basis, rather than requiring express customer permission (or requiring aggregation and scrubbing of identifying information). Public Utilities Commission regulations implementing the new law could make complete data available to program implementers, who would sign non-disclosure agreements to protect customer identities and make identity-scrubbed data available publicly. The Public Utilities Commission could consult with the utilities and consumer advocates to determine the extent to which this information could be used for targeted marketing or direct customer contact. To help owners and tenants reduce plug-load energy use, as suggested by the Energy Commission in the SB 350 Barriers Study, regulators and utilities could also link these outreach efforts to efficiency-oriented appliance purchasing platforms like the PG&E, SCE, and SDGE Marketplaces.[94] These choice engines aggregate offers for appliances such as hot water heaters and refrigerators, rank them by price and energy efficiency score (as calculated by third-party data analyst Enervee), and direct users to retailers and to available utility rebates, potentially allowing program administrators to leverage the new data into near-term appliance upgrades.[95] And as the Energy Commission begins to implement and share data generated by the AB 802 benchmarking and disclosure process, these data sets could be compared to identify best practices and potentially inform the creation of a statewide database.

Sample PG&E Marketplace Analysis



Source: PG&E.

The California Energy Commission could update Title 24 building energy metrics to permit quality-of-life improvements that may increase electricity consumption.

California's Title 24 building energy efficiency standards can prevent owners from adding new electrical capacity to an existing building as part of a retrofit, even when it replaces more carbon-intensive natural gas systems or tenants' inefficient plug-in heating and cooling units. Owners may also be unable to implement essential health- and safety-related measures that do not directly reduce energy use but should be bundled in larger projects to benefit low-income tenants, such as newly installed exterior lighting or heating and cooling systems.[96] Even for owners who value energy savings, these quality-of-life improvements can take top priority for vulnerable tenant populations and older building stock. And as the state moves toward an increasingly clean electrical grid, the carbon impact of efficient new installations may be minimal. Participants emphasized that while the Title 24 standards generally ensure increasing building efficiency over time, they do not reflect the fuel- and carbon-neutrality necessary to achieve state climate goals in the long term.

The Energy Commission, which implements and periodically updates the Title 24 standards, could craft amendments to reflect these goals and promote tenant benefits in the next sched-

uled update. The standards could allow projects that reduce overall carbon emissions through fuel-switching from gas to electricity, and/or projects that improve health and quality of life for residents, even if they increase total electricity use, provided that advanced efficient technologies are employed. (For the Energy Commission to develop standards that facilitate increased electrification and fuel-switching, commissioners and staff may need to work with industry leaders to set energy use modeling standards that can properly measure across electric and gas uses in the whole-building context.) These amendments would align with the Energy Commission's policy goal of decarbonizing buildings by facilitating the transition from natural gas use to complete electrification to take advantage of the increasingly renewable electricity grid and reduce overall building energy consumption and emissions.[97] In addition, they would help owners and developers statewide prepare for the limitations on building use of natural gas that some localities are considering. While such changes could lead to short-term increases in electricity consumption for certain buildings, participants felt that the increased flexibility would greatly increase building owners' ability to take on retrofit projects. As a result, the Energy Commission could unlock many efficiency improvements that owners would otherwise defer.

> "There is a fundamental barrier in the energy efficiency realm, which is that cost-effectiveness requirements are quite tight. We may need to consider stepping back from rules around ratepayer benefits, or change how we measure cost effectiveness to incorporate non-financial benefits, in order to open up access."
> **Andrew McAllister, California Energy Commission**

State legislators and state agency leaders could increase funding and support for long-term energy use monitoring, maintenance, and training to help owner/developers ensure consistent savings.

Participants representing property owner/developers stressed the need for new technology, technical assistance, and training to conduct long-term building energy use monitoring in order to ensure performance and savings. While some programs (such as AEA's implementation of the Low-Income Weatherization Program) offer energy audits and technical assistance that include both initial assessments to determine the proper scope of a retrofit project and post-retrofit monitoring and maintenance, not all building owners have affordable access to the ongoing services they may need. This limitation can raise a significant barrier for low-income multifamily owner/developers who do not have funds or staff capacity for maintenance of new equipment and monitoring of energy use. Savings often rely on continued observation, maintenance, and adjustment of high-performing new technologies to adapt to changing environmental and use scenarios. Without ongoing support in the form of technical assistance or funds for new ancillary equipment, a retrofit may not achieve the level of performance needed to generate savings. Moreover, even when a project does include necessary monitoring equipment, incentive programs may not fund the high-voltage outlets, electrical conduit, and other infrastructure necessary for older building stock to support it. These projects will be less appealing and affordable as a result.

A number of legislative and regulatory measures could increase support for ongoing monitoring and maintenance. The state legislature could authorize increased funding to provide participants in those programs with access to subsidies for essential monitoring equipment and the electrical infrastructure necessary to support it, as well as free staff training in maintenance of newly installed appliances and electrical, heating, and cooling systems, modeled on existing LIWP services. This fund could accompany the ESA and LIWP programs or be integrated into the mandate of a new one-stop shop program administrator. The Energy Commission could include requirements for this electrical support infrastructure in its next update of the Title 24 building standards. The Public Utilities Commission, in its next approval of ratepayer charges for the utility-administered ESA program, could require utilities to reserve a greater portion of funds for maintenance and monitoring training and support (to be provided by existing program implementers). And TCAC members could revise the LIHTC application regulations to offer extra credits for ongoing monitoring and maintenance efforts, increasing developers' financial incentives to include them.

CASE STUDY: EDEN HOUSING

Prioritizing Carbon Savings and Supporting Ongoing Maintenance

"If our goal is to lower carbon emissions, that's what we should focus on in our property improvements. But owners need the right incentives, expertise, and data to implement those reductions and optimize them in the long term."

Tom White, Eden Housing

Property: Las Palmas Apartments

A two-building, 190-resident San Leandro complex constructed as a hotel in 1962, later converted into apartments, and acquired by Eden in 2011. Of the development's 91 one-, two-, and three-bedroom units, one third are deed-restricted affordable at 50 percent of area median income, and two thirds at 60 percent. Since 1968, Hayward-based nonprofit Eden Housing has been building and maintaining high-quality, service-enhanced affordable housing communities that meet the needs of lower income families, seniors, and persons with disabilities.

Project

Eden undertook a complete building retrofit initiated by the organization's development team, rather than an energy-focused team. Improvements to the building envelope included new roofs, stanchions to support rooftop solar electric and thermal arrays, and reskinning exterior stucco. Efficiency-focused improvements included rooftop solar installations to support common area electrical load, deep water conservation retrofits, and interior upgrades including permanent terminal AC wall units, new windows and insulation, efficient lighting fixtures, Energy Star refrigerators, and efficient exhaust fans for all 91 units.

Total estimated savings: 636,025 kBtus/year, 71 metric tons CO_2/year, $2,425/year.

Programs

PG&E's Multifamily Upgrade Program, which offers up to $3,000 per unit for qualifying energy and water efficiency improvements at multifamily buildings in the PG&E service area regardless of resident income (with a 10 percent efficiency improvement requirement and pre-approved assessors and contractors), covered $273,000 of costs for window, insulation, water heater, lighting, and refrigerator installation. (Eden also obtained a no-interest loan from BayREN's Bay Area Multifamily Capital Advance Program which further supported roof insulation and efficient lighting installation measures.)The CSI Thermal Program, administered by PG&E in its service area, provided over $100,000 of rebates for a solar thermal installation to offset up to 75 percent of hot water demand, reducing Eden's net cost to $175,000 (incentives for the rooftop solar PV system were much smaller). However, since the incentive programs and Title 24 requirements would not support measures that increase electricity use by replacing natural gas—even when these projects can increase efficiency—the installation of electric space heating systems, which reduced fossil fuel consumption by almost 60 percent, did not benefit from incentives. Eden was unable to switch from gas to electric water heaters and stoves due to the required electrical service upgrades and the lack of incentives.

Total cost: $1.36 million. Total rebates/incentives: $390,666 (29%) plus $455,000 no-interest BAMCAP loan.

Increasing Program Access and Efficiency Benefits

Eden was able to generate substantial savings through the PG&E Multifamily and CSI Thermal programs, covering significant portions of the project. Las Palmas was not within a CalEPA Disadvantaged Community and hence was unable to take advantage of LIWP funding for additional deep energy retrofits. Eden retained Peralta Energy to conduct an energy benchmark and determine which qualifying elements would be economically and environmentally beneficial. The inability to qualify for incentives for gas-to-electric conversions hurt Eden's bottom line, although it did not prevent it from undertaking the retrofit project. However, a lack of proper wiring and electrical panels prevented Eden from installing highly efficient central electric water heating infrastructure, and a lack of maintenance crew expertise and monitoring equipment has limited the ability to quantify the savings achieved, in particular from solar thermal and solar PV installations. While this did not prevent Eden from installing the equipment, the age and inefficiency of the 1962 structures almost guaranteed that significant improvements could be achieved. Without reliable technology and knowledge to confirm ongoing savings, such projects may not be worthwhile at newer properties.

SOLUTIONS:

- **Expand qualifying retrofits to include installation of modern monitoring, maintenance, and other support equipment necessary to properly implement efficiency measures.**
- **Offer subsidized training for existing building staff to gain expertise in new efficiency equipment.**
- **Revise Title 24 requirements to cover overall carbon reductions, including gas-to-electric conversions that increase total electrical loads.**

The California Energy Commission, California Public Utilities Commission, and electric and gas utilities could create a pilot project to measure non-energy benefits and co-benefits and identify third-party beneficiaries like public health agencies.

"Program success is usually measured by how much work is completed in a given year. But state policy makers need to recognize successful program implementation as including committed work that may be completed in years two or three."

Nick Dirr, Association for Energy Affordability

Policy makers could increase program uptake and improve tenant quality of life if they allowed retrofit projects to count health and safety and environmental benefits toward their qualification for energy efficiency incentives, tax credits, and updated building standards.[98] However, they will first need to develop rigorous measurement and standard criteria for evaluation in order to include these benefits into cost-effectiveness calculations and TCAC points allocations. While traditional and dynamic metering can measure energy savings straightforwardly, these meters cannot assess disparate non-energy benefits. For example, respiratory improvements related to new HVAC systems, increased safety due to the installation of new exterior lighting, and improved quality of life from better climate control, modern appliances, and other efficiency-adjacent installations each accrue in different, non-monetary forms. Regulators and owner/developers therefore will need greater capacity to track these benefits and to quantify them for cost-effectiveness assessments.

As the Energy Commission, Public Utilities Commission, and Board of Equalization consider revisions to building energy standards, incentive program requirements, and tax credit allocation, they could initiate a joint pilot program to develop agreed-upon standards for measuring non-energy benefits and best practices for collecting and reporting data. As a first step, pilot developers would consult with public health and housing organizations to create a uniform template for non-energy benefit metrics that all program administrators can use as a level basis for evaluation. The pilot staff could work through the electric and gas utilities to reach appropriate customer groups and anonymize their personal data. The project leaders could then identify third parties that also benefit from these measures—such as hospitals that would receive fewer asthma patients or businesses that would face fewer lost workdays—and work to estimate their cost savings. By partnering with environmental justice-oriented causes such as the Green Zones Initiative, the project could ensure accurate evaluation of quality-of-life benefits in different parts of the state, while linking efficiency incentive programs with existing community networks.[99] The results of the pilot could also inform a template for how to better assess these benefits and incorporate them into program implementation. AB 961 (Reyes, 2019) would also advance this effort by requiring the Public Utilities Commission to track non-energy benefits during program evaluations.

State legislators could establish and fund loss reserves for any projects that do not generate savings as predicted, in order to encourage more participation from risk-averse developers and owners.

"There is a lack of articulated support for ongoing monitoring, maintenance, training for property staff to meet efficiency goals. We will have a hard time making policy progress unless we can help owners continue to show savings over time."

Sasha Wisotsky, California Department of Housing and Community Development

While more robust accounting of non-energy benefits and greater access to data would improve access to and targeting of incentive funds, participants emphasized that low-income multifamily owner/developers managing projects with slim margins are especially hesitant to devote capital to efficiency projects when projected savings may not materialize. Measures such as capped on-bill financing charges and support for ongoing maintenance (and the monitoring necessary to support it) can help mitigate this risk, but the possibility that savings might not exceed up-front costs will prevent some owners from undertaking a retrofit.

For these cases, a state loss reserve—a small fund to help mitigate financial risk for owners and developers whose projects do not generate sufficient savings—could encourage more participation. The legislature could authorize a small portion of proceeds generated by the greenhouse gas cap-and-trade program to be distributed to this fund, to be administered by the one-stop shop administrator to owners who qualify via the applicable utility. Alternatively, the Public Utilities Commission could seed the fund via a new ratepayer surcharge. The fund would include rigorous application criteria and submission of supporting data to demonstrate the fail-

ure of upgrades to perform, including information clearly tying the lack of expected savings to equipment failure rather than operational error or broader building issues. Payouts could be capped to ensure that only smaller, more financially vulnerable entities are able to draw from it. The fund could also include mechanisms to track the program implementers and contractors that were involved in these projects, to determine if they need to improve project evaluation or enhance service. Such tracking, combined with the application process, could protect against the moral hazard that the fund's backstop could potentially create. Finally, policy makers could place time limits on the fund, phasing out eligibility as the market for efficiency installations transforms to self-sufficiency. The CHEEF Affordable Multifamily Financing Pilot Project may offer its credit enhancement in the form of a loss reserve, providing a potential test case for its effectiveness in drawing more risk-averse participants to efficiency projects.[100]Program implementers, efficiency contractors, and financial entities could create and offer innovative instruments such as efficiency performance guarantees or insurance.

As an alternative to a loss reserve, program implementers and contractors could offer efficiency performance guarantees or insurance to backstop owner/developers' investments and decrease their risk to acceptable levels. An efficiency performance guarantee, also known as an "efficiency savings performance contract," is an agreement between an efficiency contractor and a property owner (and, if applicable, a third-party financing entity) whereby the contractor promises an annual energy performance level and agrees to make up the cost difference if the project does not meet expectations.[101] This guarantee allows the owner/developer or third-party financing entity to invest in the retrofit project, knowing that it will be able to recoup its investment as anticipated even if performance falls short. The guarantee may be incorporated into an ESCO's energy services agreement or offered directly by a contractor in a standard installation arrangement.

Performance insurance would involve an insurance policy, purchased from a third-party insurer, that compensates a property owner/developer if efficiency installations do not deliver the energy savings estimated by the contractor. Solar shortfall insurance, which insurers like Munich RE are beginning to offer to support the solar photovoltaic market, is a potential model.[102] While retrofit performance insurance is not generally available, innovative insurers seeking to grow green and resiliency-focused products could partner with incentive program implementers to pilot a product on a regional basis.

In either context, the entity offering the guarantee or insurance—which is contracting to mitigate the owner/developer's risk in taking on a project—has to take careful assessment and verification measures to ensure that its own risk is not too great. These guarantors and insurers may need a multi-year record of energy use at the building or relevant units to understand baseline trends independent of tenant behaviors or abnormal periods. They may also require detailed equipment specifications to limit the potential for underperformance, as well as thorough training and monitoring to ensure proper maintenance and operation of equipment.[103] Implementing these strict controls would require significant diligence by the insurer or guarantor, but contractors and program administrators may already conduct much of it under current best practices. If guarantee or insurance products can gain a market foothold, they could substantially increase customer interest in efficiency incentive programs.

"It's impossible to talk just about energy efficiency. We need to talk about quality of life more broadly."

Candis Mary-Dauphin, StopWaste

"Some investors may demand to receive the total amount of projected savings. Others may just demand full installation of efficiency measures and not worry about 100% payback. As an owner, all I need to know is that if there is a glitch, it's not going to hurt my operation or residents."

Mary Dorst, Resources for Community Development

CONCLUSION

Achieving California's ambitious climate change and energy efficiency targets will require a significant effort to increase the efficiency of existing low-income multifamily buildings by 2030—a market transformation based on improving and expanding state incentives to attract private capital and align efficiency and economic goals. In addition to the one-stop-shop program administrator this report highlights, California policy makers can facilitate this market transformation by creating new long-term funding sources, facilitating innovative transaction structures, and assembling and disseminating comprehensive energy and financing data.

California policy, utility, and energy efficiency leaders have already taken some steps toward these goals, such as the CHEEF affordable multifamily pilot program, utility on-bill loan pilot programs, the data collection mandate of AB 802, and the consolidation measures of proposals like AB 383. But California leaders can also look to the efforts made in other jurisdictions, such as streamlined administration programs in Oregon and Massachusetts and innovative financing mechanisms from Arkansas and the Netherlands, for examples of further pilots and reforms. To support and inform these efforts, California policy makers should also consider ongoing information-gathering and coalition-building efforts such as:

- **Analysis across energy, utility, and housing agencies of the ideal role (and level of public funding) for low-income multifamily retrofit programs in the context of statewide climate and environmental goals, equity considerations, and cost-effectiveness.**
- **Assessment of the evolving dollars-to-efficiency performance of individual and bundled retrofit measures to inform funding and program priorities on an ongoing basis.**
- **Determination of a set of principles for cost- and risk-sharing among public funds, ratepayers, building owners, program implementers, contractors, and private capital.**
- **Discussion with private lenders, contractors, and energy management companies to identify what, if any, incentives or pilot programs would generate the most immediate market penetration.**

These policies and areas of further inquiry represent only a portion of the developments needed to deliver on the goals of SB 350. But each has the capacity to bring state efficiency goals closer to the needs of low-income multifamily residents, owners and developers, and private financiers. Together with the other proposals described in this report, they could lay the groundwork for an energy efficiency market transformation.

Participant Biographies

Tammy Agard—EEtility

After spending 5 years implementing the Clinton Climate Initiative's HEAL program in Arkansas, Tammy Agard co-founded EEtility in late 2014 determined to help low to moderate income families access the resources they need to make their homes energy efficient. Tammy specializes in utility relations and program management, collaborating with state energy offices, public service commissions, rural cooperatives and utilities to scale on bill financed energy efficiency program efforts, with a particular focus on the Southeast. Prior to her work at the Clinton Foundation, Tammy was involved in multiple nonprofit efforts to rebuild in New Orleans and the Mississippi Gulf Coast after Hurricane Katrina.

Peter Armstrong—Wakeland Housing and Development Corporation

Peter Armstrong has two decades of experience in the field of community development and affordable housing. As Wakeland's Vice President of Real Estate Development, he oversees all aspect of financing and construction of low-income rental housing developments. Prior to joining Wakeland, Mr. Armstrong worked for the San Diego Housing Commission, EAH Housing and the cities of Berkeley and San Diego. A HOME Certified Specialist in Rental Housing Compliance, he is also a frequent speaker at industry conferences and trainings such as the San Diego Housing Federation's Affordable Housing Institute and the Local Initiatives Support Corporation's Housing Development Training Institute. Mr. Armstrong received a Master of Planning degree from the University of Minnesota and a Bachelor of Arts from Pomona College.

Conrad Asper—PG&E

Conrad Asper is Program Manager for the Pacific Gas & Electric (PG&E) Residential New Homes Program, which highlights best practices in energy efficiency, green building and sustainability, and offers generous financial incentives to help builders and architects create environmentally friendly, energy-efficient communities for potential homebuyers. He previously served as Executive Director of Efficiency First California, an organization devoted to promoting and training contractors and the public in home energy efficiency strategies that combat global warming and climate change, and as an analyst and manager at major financial institutions. He holds a BA from UC San Diego and an MBA from the John F. Kennedy School of Management.

Matthew Brown—Harcourt, Brown & Carey

Matthew Brown is a Founder and Principal and Harcourt, Brown & Carey, a national clean energy marketplace consultant, Matthew has led HB&C's engagement with the four California investor owned utilities to develop and implement energy efficiency financing programs as well as a similar engagement to develop a third-party financing program with utility bill collections in for the Hawaii Public Utilities Commission. Additionally, he leads the firm's engagement with Xcel Energy advising on financing. Matthew has worked extensively with a number of financial institutions to advise on deployment of capital through loans and leases for clean energy in the western United States as well as nationally. Finally, Matthew possesses unique expertise in advising governments that are looking to support financing program development. Matthew has developed multiple public-private partnerships between state governments and private capital providers and lenders. Prior to founding HB&C, Matthew worked in energy finance and policy with the accounting and consulting firm KPMG, the City of New York, the National Conference of State Legislatures, and the International Energy Agency in Paris. Matthew received a BA from Brown University, and an MBA from New York University.

Martha Campbell—Rocky Mountain Institute

Martha Campbell is part of the Residential Energy+ (RE+) team in RMI's Buildings Practice and leads the REALIZE initiative. REALIZE is focused on transferring a model developed in the Netherlands, known as Energiesprong, to the U.S., to make net-zero home retrofits affordable, accessible, convenient, and attractive. Through Energiesprong, retrofits are financed through energy savings, include a performance guarantee, and are delivered using semi-industrial approaches that allow for scale and simultaneous mass customization, with installations taking under two weeks. Martha also developed and supports RE+'s Finance the Future initiative that is focused on increasing access to capital for home energy improvements in the U.S. market. Prior to joining RMI, Martha attended the University of Michigan where she earned a dual master's degree in environmental science and business administration. During her time in graduate school she focused on conservation finance and social entrepreneurship. Prior to graduate school, Martha worked for the Alliance for Climate Protection in Taos, New Mexico. Martha is originally from El Paso, Texas, with professional experiences as varied as learning green building techniques as a construction intern from renegade eco architect Mike Reynolds, working for Rio Tinto's Sustainable Development team, field organizing in northern New Mexico, and program trading in the equities division of Goldman Sachs.

Deana Carrillo—California Alternative Energy and Advanced Transportation Financing Authority

Deana Carrillo is the Executive Director of the California Alternative Energy & Advanced Transportation Financing Authority (CAEATFA), which provides financial assistance for projects that develop and commercialize advanced transportation and alternative energy technologies, conserve energy, reduce air pollution, and promote economic development, job creation and advanced manufacturing. Today, CAEATFA oversees over $500 MM of financial assistance annually, leveraging private capital; and its incentives range from tax benefits for certain types of green manufacturers, to a reserve to support the expansion of residential PACE, to the current development of the first open-market on-bill-repayment program for energy efficiency retrofits, developed in collab-

oration with the CA Public Utilities Commission. Deana has over 18 years' experience working on California policy and fiscal issues, and over ten years working under the CA State Treasurer's Office at the nexus of economic and public policy. Prior to joining CA-EATFA, Deana oversaw a brownfield cleanup financing program and a sustainable communities grant and loan program for the State; and spent several years working on California policy issues as Director of Outreach and Special Initiatives for State Treasurer Phil Angelides. She earned her Master's degree in Public Policy at UCLA, where she concentrated on regional economic development and urban poverty issues, and her Bachelor's degree in Political Science at UC Santa Cruz.

Verna Causby-Smith—EAH Housing

Verna Causby-Smith joined EAH Housing as a Development Asset Manager in December 2014. Her current responsibilities include managing limited partner buyouts, refinancing and restructuring for the organization's maturing portfolio. Ms. Causby-Smith reviews limited partnership agreements and financing documents for new developments. Verna assists in developing 15-year operating budgets, and evaluates marketability and rental rate structures prescribed by financing and other restrictions for new properties. Verna continually seeks additional financial resources to support the operating portfolio. Prior to working at EAH, Ms. Causby-Smith established an asset management program for Community Housing Development Corporation in Richmond, CA. She also worked as an asset manager for GMAC Commercial Mortgage in San Francisco, managing a nationwide portfolio of distressed debt and underperforming properties. Ms. Causby-Smith earned a Bachelor of Science in Environmental Planning and Management from University of California, Davis and a Master of Science in Business Administration with a focus in Real Estate from the University of Wisconsin. She is a California licensed real estate broker and is pursuing the Certified Housing Asset Manager designation.

Shamir Chauhan—GRID Alternatives

Shamir Chauhan is Program Manager for Multifamily Housing at GRID Alternatives, a non-profit that brings low- to no-cost solar installations to low-income communities, providing hands-on installation experience for job seekers and working with cooperative, municipal and investor-owned utilities to develop the first community solar projects in the country dedicated to low-income communities. In heading the Multifamily program, Shamir leads efforts to provide technical assistance and turnkey installation services to multifamily affordable housing developers. Shamir joined GRID Alternatives in 2008 as the Bay Area Project Manager. Prior to GRID Alternatives, Shamir had a career in affordable housing development where he helped develop affordable housing for diverse populations including low-income seniors, farm workers in the Central Coast, adults with developmental disabilities and individuals at-risk of homelessness. Shamir holds a BA from UC Santa Cruz.

Rich Chien—San Francisco Department of the Environment

Rich Chien is a Senior Program Specialist with the San Francisco Department of the Environment, where he currently manages all aspects of the city's PACE program and related clean energy financing efforts, and serves as the lead for Bay Area Regional Energy Network's (BayREN) commercial sector initiative. Mr. Chien was instrumental in creating the city's existing building benchmarking and audit ordinance, monitors implementation of the green building code for new construction, and supports a range of district and neighborhood-scale sustainability projects in San Francisco. Prior to joining the city, Rich worked as a city planner and practiced architecture, construction management, and sustainability consulting at a number of Bay Area design firms. He holds a B.A. in Urban Studies and Planning from UC San Diego, and an M. Arch. from the SF Institute of Architecture.

Jeanne Clinton—Efficiency and Sustainability Consultant

Jeanne Clinton's career in government policy and strategy positions, has spanned energy efficiency, distributed clean energy solutions including solar PV, community sustainability and housing rehabilitation, energy/water utility resource planning, and climate action mitigation. Until April 2017 Jeanne served for 5+ years as California's Special Advisor for Efficiency, based at the California Public Utilities Commission and advising the Governor's Office. She now does freelance consulting with a focus on mobilizing state and utility policies to drive scaled markets for efficiency, with considerable attention to investment capital structures and special finance solutions needed to engage low income communities and multi-family buildings in clean energy and GHG reduction solutions. She previously served 3 years as Governor Schwarzenegger's Clean Energy Advisor at the PUC (leading the Calif. Solar Initiative and Energy Efficiency Strategic Plan) and was the consultant on the development of his 2004 Green Building policy initiative. Jeanne's prior experience includes employment with the State of California (CEC, CPUC, CA Power Authority), cities (New York, Palo Alto Utilities [a public utility], Oakland), consulting firms (Barakat & Chamberlin and Hagler Bailly/PA Consulting/TetraTech), as well as independent consulting. Her international experience was performed for clients at USAID, World Bank, UN Development Program, Inter- American Development Bank, as well as directly for the Thailand National Energy Policy Office and the Electricity Generating Authority of Thailand. She has an undergraduate degree from Dartmouth College and a master's degree in City & Regional Planning from UC Berkeley.

Nick Dirr—Association for Energy Affordability

Nick Dirr is the Director of Technical Services at the Association for Energy Affordability (AEA). He conducts energy audits, analysis, and research on multifamily buildings, develops energy efficiency retrofit specifications, trains industry stakeholders, and designs, manages, and implements energy efficiency and renewable energy programs. Nick facilitates collaboration among the disparate stakeholders involved in whole building comprehensive retrofits, acting as a single point of contact for building owners, utilities,

government, program managers, property managers, building operators, engineers, developers, architects, and contractors. During his ten years at AEA, Nick has performed hundreds of energy audits and managed the development and execution of work scopes for low- and high-rise multifamily buildings. He oversees AEA's implementation of the statewide Multifamily Low Income Weatherization Program, the BayREN Bay Area Multifamily Building Enhancements Program, and the MCE Multifamily Energy Efficiency Programs, as well as AEA's TCAC, Title 24, and GreenPoint Rated consulting services. He holds a Masters in Physics and Energy Studies from Otago University.

Mary Dorst—Resources for Community Development

Mary Dorst joined Resources for Community Development in Berkeley in 2015 as an asset manager and moved to the position of portfolio manager in 2017 to focus on needs within the broader portfolio of over 2,100 rental homes in 56 properties. Mary leads the new subsidy layering and financing, refinancing, and loan modifications at existing properties. She develops the strategy and planning for tax credit limited partner investor exits and oversees the capital account management. Mary also leads sustainability initiatives to improve resource and energy efficiency through physical improvements and upgrades at existing properties. This includes collaboration with other organizations to reduce waste and increase food scrap recycling. She develops the scope of the retrofit work and coordinates the implementation with asset managers and property managers. Mary was previously Associate Director of Asset Management for Eden Housing in Hayward, where she was responsible for nearly 8,000 units of affordable housing. She led the acquisition and transfer of 40 multifamily properties to Eden's portfolio from another developer winding down their activities. She was primary asset manager for 12 properties and worked collaboratively to implement Eden's Green Strategies program. Mary was Director of Asset Management for East Bay Asian Local Development Corporation in Oakland for almost eight years, where she was responsible for a 17-property portfolio and also managed rehabilitations, energy efficiency improvements, and installation of solar systems at occupied properties. As a Berkeley native with clear memories of the water crisis in the mid-1970s, Mary is especially concerned with conserving water at multifamily properties and the embedded energy that water consumes in California.

Amy Dryden—Build it Green

As Director of Policy and Technical Innovation, Amy Dryden advances Build It Green's strategic vision by designing market-friendly programs and developing policies and standards to support state and national goals. She also serves as BIG's chief building scientist and researcher. As a nationally recognized thought leader on green and low-carbon building, Amy brings more than 18 years of leadership experience in the industry. At BIG, Amy has led the development of GreenPoint Rated for existing homes and multifamily energy efficiency program and is currently leading a multifamily net zero energy project and a net zero energy block project. Before joining BIG in 1997, Amy worked for a community planning firm where she managed community/watershed level planning efforts nationally to comprehensively address development, green infrastructure, climate mitigation and cultural preservation. Amy has extensive experience as a consultant in the building industry, and also worked as a builder/contractor. In the late 1990s, Amy initiated green building standards for two affordable housing developers, changing the way they built homes. Amy holds a Masters in City Planning and a Masters in Landscape Architecture/Environmental Planning from UC Berkeley College of Environmental Design.

Sandy Goldberg—California Public Utilities Commission

Sandy Goldberg is an Advisor to Commissioner Cliff Rechtschaffen at the CA Public Utilities Commission. Before joining the PUC, Sandy was Senior Counsel at the Governor's Office of Planning and Research, working on energy and climate change laws and policies, and implementing energy and water conservation projects at state facilities. She was previously a Deputy Attorney General at the California Attorney General's Office, working on litigation seeking penalties for violations of hazardous waste laws and cleanup of contaminated soil and groundwater, and was a Staff Counsel at the California Coastal Commission, working on coastal planning and enforcement.

Sophia Hartkopf—TRC Companies

Sophia Hartkopf is a Program Manager at TRC with a strong background in residential program design, implementation, and evaluation. Over the past 11 years, she has managed and assisted in the design, implementation, and evaluation of a number of market transformation programs, in California, the Midwest, and the Northwest. Her project management experience includes marketing strategy development and implementation, and program management for multifamily energy efficiency programs. She also applies her practical implementation experience in a number of program evaluations, in collaboration with TRC's Evaluation Practice. She has a particular passion for serving the affordable multifamily sector. In addition to her professional activities, she serves as an active member of the Urban Land Institute and the Northern California Chapter of the United States Green Building Council. She holds a BS from Georgetown University.

Holmes Hummel—Clean Energy Works

Dr. Hummel is the founder of Clean Energy Works, which connects champions of energy efficiency and renewable energy with resources that accelerate investment in the deployment of clean energy solutions. In addition, Dr. Hummel is on the Global Advisory Committee of Cornerstone Capital Group, which is among the world's leading voices in the field of sustainable investment and finance. Dr. Hummel also serves on the board of Cleantech Open, the world's largest accelerator built to find, fund, and foster the most promising cleantech startups. In 2009, Dr. Hummel was appointed as the Senior Policy Advisor in the U.S. Department of Energy's Office of Policy & International Affairs, serving through

2013. In that capacity, Dr. Hummel engaged a wide range of industry and public interest stakeholders to inform energy policy deliberations on such topics as energy efficiency finance, electric vehicle deployment, natural gas resource development, trade policy, environmental regulation and grid reliability. In addition to stewarding agency work on energy and climate policy development, Dr. Hummel founded the Water-Energy Technology Team within DOE and also led the DOE Energy Finance Working Group. Dr. Hummel was also instrumental in the development of the first Quadrennial Technology Review for DOE as well as the landmark Energy Efficiency & Conservation Loan Program launched by the USDA's Rural Utilities Service. In earlier public service, Dr. Hummel served as a Congressional Science Fellow focused on energy and climate policy. Dr. Hummel received BS, MSE and PhD degrees from Stanford University.

Lane Jorgensen—MG Properties

Lane Jorgensen has 20 years of multi-family real estate investment experience representing over $3.5 billion in multi-family investment and financing transactions as a leading member of the investments team at MG Properties Group ("MGPG") and multi-family investment brokerage teams at CB Richard Ellis ("CBRE"). Lane joined MGPG in August 2005 and today is responsible for the integration of property acquisition debt and equity, directing dispositions and leading the company's commitment to its investors through excellence in Investment Management, which applies investment performance analysis to strategic investment decisions across the company's owned portfolio. Prior to joining MGPG, he was a multi-family investment associate at CBRE for seven years. Lane completed the Real Estate Management: Finance, Design and Leadership executive education course at Harvard Business School. He is a Beta Gamma Sigma graduate of the Bloch School of Management at the University of Missouri-Kansas City with an MBA in Finance. He holds a bachelor degree with Phi Beta Kappa honors in Geography from the University of Kansas.

Shanon Lampkins—BRIDGE Housing

Shanon Lampkins is the Director of Portfolio for BRIDGE Housing Corporation. As Director, Shanon oversees BRIDGE's Portfolio Greening activities working towards fulfilling our commitments to the Big Reach and Better Buildings Challenge. She also works on Year 15 investor buyouts, refinancings, and other Portfolio activities. Shanon came to BRIDGE after serving as the Director of Asset Management at West Hollywood Community Development Corporation, where she worked from 2009-2017. While at West Hollywood CDC, she oversaw solar installations and implemented a greening program across her portfolio, raised funds to fund property capital improvements, and completed several investor buyouts. Prior to that, Shanon was an Asset Manager for Jamboree Housing and A Community of Friends. Shanon holds a BA from the University of Southern California and a MBA from University of Redlands.

Sarah Lerhaupt—California Public Utilities Commission

Sarah Lerhaupt is an Analyst with the Residential Programs and Portfolio Oversight team, part of the Energy Efficiency Branch of Energy Division at the California Public Utilities Commission. For the Commission, Sarah oversees existing residential and low-income multifamily retrofit programs. Prior to this, at the Energy Foundation Buildings Program, she helped to direct funds to strengthen building energy codes, appliance standards, and improve efficiency in existing buildings, including the City Energy Project and Energy Efficiency For All. Sarah has collaborated on initiatives that link governments, businesses, and utilities to develop energy efficiency and climate policies and programs. She got her start as an Architectural Designer and LEED AP remodeling and designing homes, multifamily properties, and small businesses. Sarah has an MBA, with a concentration in Sustainable Energy, from Presidio Graduate School and a BA in Architecture from UC Berkeley.

Mike Maroney—TRC Companies

Mr. Maroney is a chemical engineer with 10 years' experience in program design, management, energy efficiency research, benchmarking, and database administration. As program oversight of the Pacific Gas & Electric (PG&E) Multifamily Upgrade Program (MUP), Mr. Maroney ensures participating customers maximize energy savings through benchmarking and technical assistance. Mr. Maroney also leads the PG&E Single Point of Contact initiative to help multifamily building owners identify programs and financing services that empower customers to save energy and decarbonize buildings. As a creative engineer, Mr. Maroney helps customers identify new strategies, approaches and techniques to support the de-carbonization of energy use in buildings.

Candis Mary-Dauphin—StopWaste

Candis Mary-Dauphin is a Program Manager at StopWaste, a public agency that helps Alameda County's businesses, residents and schools waste less, recycle more and use water, energy and other resources efficiently. She manages the Bay Area Regional Energy Network's multifamily rebate and finance programs. In this capacity, she has had the opportunity to work alongside government agency staff to continuously improve programs, so that they reflect the needs of the Bay Area's local communities. Prior to working at StopWaste, Candis implemented energy efficiency programs in the non-profit and education sectors, and worked as a policy writer. She holds a BS in Economics from Kent State University and a Master's in Energy and Environmental Policy from the University of Delaware.

Andrew McAllister—California Energy Commission

Andrew McAllister was appointed to the California Energy Commission by Governor Edmund G. Brown Jr. in May 2012, and re-appointed in January 2017. Beginning in the early 1990s, Commissioner McAllister has been working on clean energy deployment and policy for his entire 25-year career. He has worked across the world to develop renewable energy generation, energy efficien-

cy investments, and energy management systems, with counterparts ranging from tiny remote communities to the largest of utilities. Commissioner McAllister administered two of California's signature renewable energy programs (California Solar Initiative and Self-Generation Incentive Program), developed and operated energy efficiency programs for utilities, and performed a broad range of policy-related research for California and the U.S. Federal government. He currently serves on the board of directors of the National Association of State Energy Officials (NASEO) and the Alliance to Save Energy. Commissioner McAllister's deep grounding in technology, policy and marketplace provides him with uncommon insight on the accelerating changes taking place in the electric power sector. Before joining the Energy Commission, Commissioner McAllister was managing director at the California Center for Sustainable Energy, where he worked for six years. Previously, he worked with National Rural Electric Cooperative Association (NRECA) International, Ltd. in the electric sectors of countries in Central and South America, Southeast Asia and Africa on a variety of renewable generation, load management, utility planning and remote power projects. He was a project manager at an energy consulting firm and worked as an energy efficiency analyst at Lawrence Berkeley National Laboratory. Commissioner McAllister holds M.S. and PhD degrees from the Energy and Resources Group at the University of California, Berkeley.

Carmelita Miller—Greenlining Institute

Carmelita Miller was born in the Philippines and grew up in South San Francisco, California. She graduated from Sacramento State University where she became a Ronald E. McNair Scholar and earned a B.A. in History with a minor in Greek studies. After a graduating from UC Hastings College of the Law, she became a Greenlining Legal Fellow in 2013-14, focusing on telecommunications policy. While at UC Hastings, she served as the President of the Pilipino American Law Society and Co-Editor-in-Chief of the Hastings Race and Poverty Law Journal. Inspired by her personal experiences living in low-income, immigrant, and working-class communities, she dedicated her free time in law school to providing legal assistance to the low-income population by interning and volunteering at various pro bono organizations such as Legal Aid Society of San Mateo County, UC Hastings Civil Justice Clinic, Legal Aid of San Francisco's Workers Rights Clinic, the Veterans Equity Center, and the Filipino Community Center.

Susan Mills—California Alternative Energy and Advanced Transportation Financing Authority

Susan Mills is a program specialist at the California Alternative Energy and Advanced Transportation Financing Authority (CAEATFA) within the California State Treasurer's Office. She joined CAEATFA in January 2018 and is leading the development and implementation of the affordable multifamily energy efficiency financing pilot program. The pilot is one of four financing pilots under the California Hub for Energy Efficiency Financing, authorized by the California Public Utilities Commission and supported by the investor-owned utilities. Susan has been with the State Treasurer's Office for six years. Prior to her position at CAEATFA, she developed informational and skill based curriculum, and coordinated continuing education seminars, workshops and online trainings for local governments on public investment and municipal debt. Susan earned a bachelor's degree from the University of California, Berkeley.

Grace Peralta—Marin Clean Energy

Grace assists with the development, implementation and coordination of MCE's Multifamily Program. Grace also supports MCE's Customer Programs Team with multiple tasks ranging from graphic design, public outreach, marketing and customer service. Prior to joining MCE, Grace worked on marketing and outreach for Rising Sun Energy Center, a Bay Area wide non-profit organization focused on energy efficiency, youth and workforce development. Grace has also worked on marketing and communications for major human rights organizations in Washington, D.C. Grace earned her B.A. in Communications for Development from the Pontifical Catholic University of Peru.

Srinidhi Sampath Kumar—California Housing Partnership Corporation

Srinidhi joined CHPC in 2018. As a Sustainable Housing Program Manager, she helps design and implement energy efficiency and solar programs that impact low-income Californians by engaging with affordable housing property owners. Along with coalition partners, she advocates for equitable energy efficiency, and building decarbonization policies that will improve resident's health and comfort. She leads CHPC's Green Rental Homes Energy Efficiency Network (GREEN) and informs affordable housing property owners of new sustainability policy and program initiatives. Prior to joining CHPC, Srinidhi worked as customer programs specialist with Marin Clean Energy in San Rafael where she spearheaded the launch and implementation of the Low-Income Families and Tenants (LIFT) pilot program. Srinidhi received her Master of City Planning from the University of California, Berkeley and her B.A. in Economics from Stella Maris College.

Gregory Sherman—Bright Power

Greg spearheads Bright Power's first satellite office in Oakland, California. In this venture, the day-to-day finds Greg building partnerships with owners, managers, developers, architects, local government agencies, and other key stakeholders. Greg is expanding our national presence and helping Bright Power make an even greater impact in the buildings of our clients such as LivCor, MG Properties Group, AIG, Fairfield Residential, Bridge Property Management, J.P. Morgan Asset Management, Equity Residential, Related, LeFrak, Kaled Management Corp., Goldman Group, Fisher Organization, and Sares Regis. Prior to working at Bright Power, he was a commercial building appraiser and construction foreman. His energy audit experience has included multifamily residences, commercial offices, and industrial warehouses, and he relishes opportunities to conduct hands-on measurement and verification and use data to turn efficiency skeptics into believers. Greg is a

Certified Energy Manager, Existing Buildings Commissioning Professional, BPI Multifamily Building Analyst and LEED EB O+M.

Maria Stamas—Natural Resources Defense Council

Maria Stamas is an attorney and Western Director of Energy Affordability for the Natural Resources Defense Council, where she advocates for equitable clean energy solutions as a means to mitigate the effects of climate change. Maria testifies and participates in regulatory proceedings before the California Public Utilities Commission, the California Energy Commission, and the State Legislature. In particular, she focuses on clean energy policies and programs for low-income and underserved communities, energy upgrades for multi-unit properties, and building benchmarking and data transparency. Maria holds a J.D. from Berkeley Law, an M.A. in Energy & Resources from the Univ. of California, Berkeley, and a B.A. degree from Oberlin College. She has a wide range of experience in the energy sector, including as an analyst for the Rocky Mountain Institute; a researcher for the Lawrence Berkeley National Lab; and a consultant for Alphabet Energy, a start-up thermoelectric company. She has also worked for Commissioner Florio at the California Public Utilities Commission and Keyes, Fox & Wiedman LLP.

Stephanie Wang—California Housing Partnership Corporation

Stephanie Wang is Policy Director at CHPC, where she leads policy initiatives and works with coalition partners to improve and expand sustainable energy and water programs and resources for affordable housing owners and renters. Before joining CHPC, Stephanie led California policy and strategy initiatives for the Center for Sustainable Energy. She worked with diverse stakeholders to identify barriers and develop solutions for empowering all Californians to participate in the benefits of the clean energy economy. Stephanie has also served as the Policy Director of the Clean Coalition, where she advanced policies to support Solar For All and resilient community microgrids. Stephanie previously practiced real estate finance law as an associate attorney with Fried Frank in New York and Cox Castle & Nicholson in San Francisco. Stephanie earned a Juris Doctor from the University of Michigan Law School and a Bachelor of Arts in Political Science from the University of Michigan.

Tom White—Eden Housing

Tom is Energy & Sustainability Manager for Eden Housing Inc., an owner and developer of affordable housing currently responsible for over 10,000 homes in California. In this capacity, he works with multi-family operations, property and asset managers to both benchmark their building characteristics and improve the performance of their residential portfolio. Tom previously was the co-owner of Rockhead & Quarry LLC, a Berkeley-based affordable and market-rate single and multi-family housing developer, where he was responsible for financing, budgeting, contractor and property management, vetting prospective tenants and contractors, design input, negotiations with City staff on land use planning, entitlements and permitting. Tom has also served as Publisher and Executive Director of Home Energy Magazine and has experience as a social entrepreneur working with not-for-profits that need help starting or improving social enterprises that rely on earned-income. He holds a B.A. from San Francisco State University.

Sasha Wisotsky—California Department of Housing and Community Development

Sasha is the Data and Research Manager for Housing Policy at the California Department of Housing and Community Development (HCD). Her experience in affordable housing spans nearly fifteen years in the public, private and non-profit sectors through housing policy, finance, operations and asset management. At HCD, Sasha works on topics including land use, preservation of affordable housing and analysis of housing production statewide. Sasha also represents HCD in interagency partnerships focused on connecting housing to other issues including transportation, energy and climate adaptation. She earned her B.A. from UC Berkeley and her M.A. in Urban Planning from UCLA.

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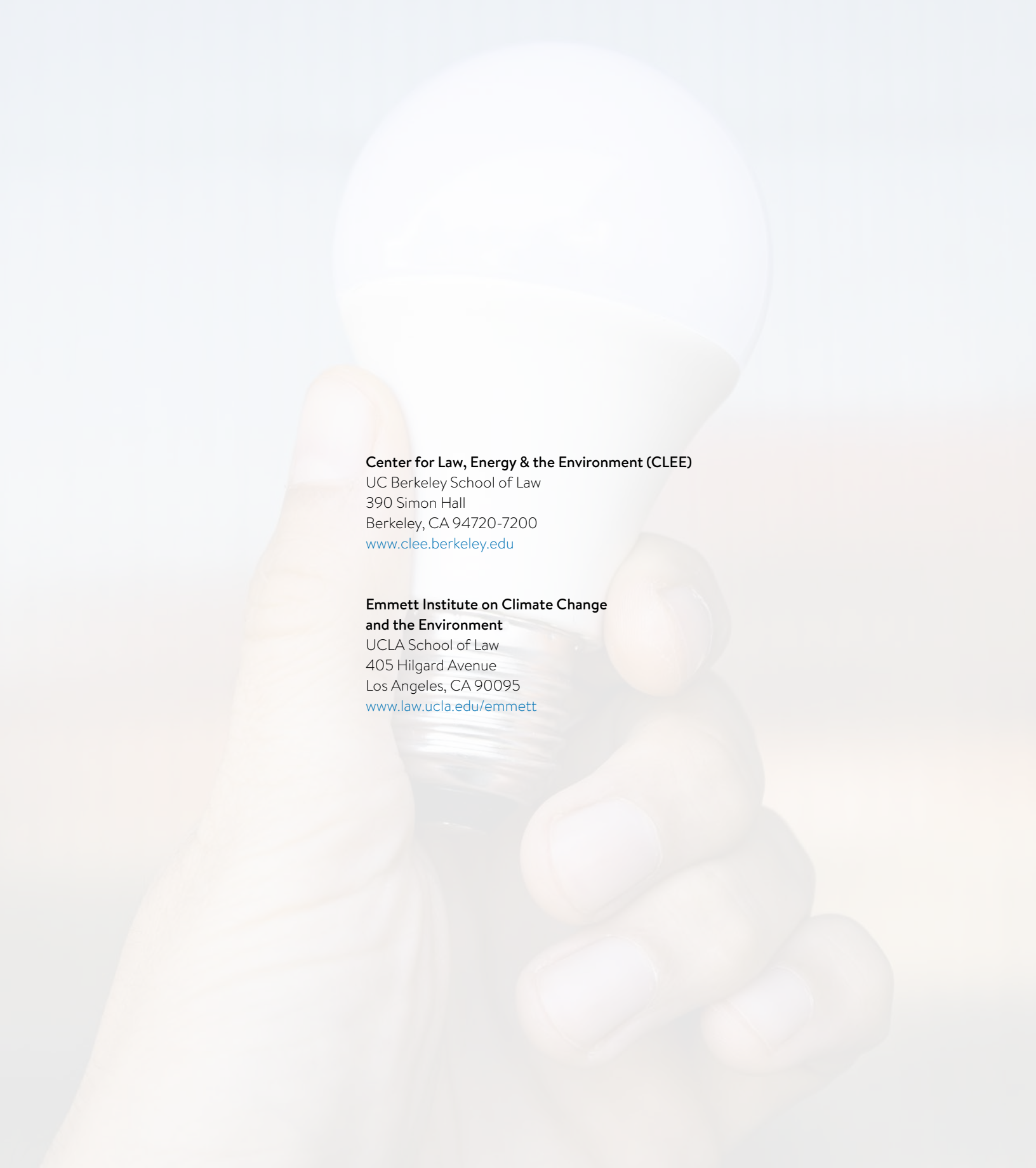

Center for Law, Energy & the Environment (CLEE)
UC Berkeley School of Law
390 Simon Hall
Berkeley, CA 94720-7200
www.clee.berkeley.edu

Emmett Institute on Climate Change and the Environment
UCLA School of Law
405 Hilgard Avenue
Los Angeles, CA 90095
www.law.ucla.edu/emmett

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