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Towards an Accessible Financing Solution

Additional submitted attachment is included below.

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Towards an Accessible Financing Solution

A POLICY ROADMAP WITH PROGRAM
IMPLEMENTATION CONSIDERATIONS FOR
TARIFFED ON-BILL PROGRAMS IN CALIFORNIA

JULY 2020

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Building Decarbonization Coalition

REPORT AUTHORS:

*Bruce Mast, Ardena Energy, LLC
Holmes Hummel, Clean Energy Works
Jeanne Clinton*



**BUILDING
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The Building Decarbonization Coalition is a 501(c)(3) nonprofit organization whose mission is to convene the stakeholders necessary to drive the conversation around the full decarbonization of the building stock. The Coalition brings together industry, advocacy, government experts, and the private sector to develop integrated and effective approaches to make decarbonization a reality. A list of members can be found here: www.buildingdecarb.org/members.

Executive Summary

Introduction to the Executive Summary

California has established the ambitious climate protection goal of achieving full carbon neutrality by 2045 and to do so in a way that supports the health and economic resiliency of urban and rural communities, particularly low income and disadvantaged communities. To achieve this goal, the residential building sector, along with every other sector, must reach zero emissions, including greenhouse gases (GHGs) from fossil-fuel end uses. To achieve building decarbonization at scale, California will need an artful combination of updated building codes, appliance standards, regulatory requirements, public funding, and ratepayer-funded incentives, combined with policies and programs that overcome long-standing upfront cost barriers that deter households from making cost-effective clean energy investments.

California also needs an equitable emissions reduction strategy. If we are to reach the state’s policy objectives, a building decarbonization strategy must be robust enough to enable the participation of California’s low- and moderate-income (LMI) and renter households, who together represent more than 40 percent of the state’s population. California must identify the means to overcome the upfront cost and split incentive barriers in order to put decarbonization investments within reach of all Californians, regardless of income, credit history, liquidity, or home ownership status. As signatories to the Equitable Building Electrification framework pointed out, Environmental and Social Justice (ESJ) communities “...are likely to be left using gas if market forces are the primary driver of electrification.”¹ A grant-only approach to LMI building decarbonization investments would require a cumulative 25-year public and ratepayer capital commitment on the order of \$72–150 billion. **This level of spending on building decarbonization would dwarf any public expenditure the state of California has made for energy efficiency or renewable energy programs.** One can thus infer that exclusive reliance on grant-only programs leaves ESJ communities at risk of getting left behind.

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1 Miller et al., *Equitable Building Electrification*, p. 22





The Building Decarbonization Coalition launched the Accessible Financing Project to address these barriers and expand access to clean energy upgrades with a combination of funding and financing. The Project goal was to develop a policy roadmap for opening the clean energy economy to LMI households and renters, specifically in the realm of upgrades that decarbonize buildings. In the course of stakeholder engagement, it became evident that there was strong interest in wading further into issues of due diligence and implementation. Our recommendations will outline a path to address all three dimensions.

While our focus is on identifying solutions to barriers faced by LMI households and renters, it is not our intent to limit the recommended finance solution to these customer segments. Our overarching goal remains an accessible financing solution that is universally accessible to *all* California households, without regard to income level. Our belief is that a solution that works for the most challenging use cases (LMI households and renters) will also expand accessibility for easier use cases (e.g., higher-income property owners).

We also note that a financing mechanism need not replace or diminish existing grant or free direct-installation programs for lower income residents. Combining grants with accessible finance mechanisms can expand overall access and participation. This approach will accelerate adoption of more comprehensive investments in building energy upgrades, and thus leverage public funding with financed investment for greater impact.

To effectively address upfront cost and split incentive barriers, and to support the scale of investment state policy requires, we defined the following design criteria as benchmarks of success:

1. Ability to finance over long periods (10–15 years) even in rental units with multiple changes in tenancy
2. Ability to leverage utility bill savings to defray investment costs, rather than rely on consumer credit or home equity
3. Cash-positive outcomes that assure LMI customers will not experience increased energy burdens
4. Ability to scale to serve millions of California households

A threshold research finding that guided the Project's subsequent investigations is that consumer credit finance products are ill suited to meet the design criteria above. This knowledge already has motivated multiple public agencies to develop policy recommendations and solutions that would facilitate site-specific clean energy investments with utility or societal capital and site-specific cost recovery consistent with regular terms of service offered by utilities. This approach offers three key benefits that align directly with Project design criteria:

- Assigning the capital commitment to a site (e.g. home, condominium, or apartment through its utility meter), rather than to an individual, avoids the need for consumer credit risk screening that would otherwise disqualify more than one third of all consumers based on income, credit score, or renter status.
- Leveraging a utility's existing mechanisms for making utility capital investments with cost recovery through monthly bills allows a single utility bill to combine decarbonization investment service costs for "behind-the-meter" improvements with the lower utility bills resulting from the improvements made.
- The level of uncollected revenue on expected utility bill payments (i.e. charge-off rate) is typically low compared to much higher default levels on consumer debt instruments, making cost recovery via the utility bill attractive and lower risk.

Consistent with those policy recommendations, the BDC Accessible Financing Project research team prioritized attention to the potential to address the key design requirements with site-specific investment and cost recovery through utility tariffed on-bill programs.

Combining Multiple Value Streams to Mobilize Investment

While some residential decarbonization investments in California will produce positive bill savings with current market conditions, this is not true for all of our state's housing stock today, even if the value proposition continues to improve over the next decade. For many, the savings based on current energy prices and equipment costs will be too modest to cover the *full investment cost* and, for others,

such as those living in moderate climate zones, the savings may not cover even the *incremental costs*. Yet our state's climate goals dictate that we achieve zero emissions in the housing sector. This dilemma requires a broader economic lens to recognize the total value of clean energy investments accruing to different stakeholders, and then striving to both align and combine the multiple value streams.

Conceptually, utility bill savings alone need not cover the full cost of clean energy investments. While the total cost of many building decarbonization upgrades are not cost effective by leveraging customer bill savings alone, *some portion of every decarbonization upgrade would meet the cost effectiveness criteria for a tariffed on-bill investment. This means that building decarbonization upgrades require a combination of financing for the portion of the upgrade costs that can be recovered from bill savings, and other co-funding associated with one or more of the additional value streams:*

1. **Customer co-benefits.** It is reasonable to expect occupants (owners and renters) to harness the value of any additional benefits experienced beyond utility bill savings (such as better health, lower health care costs, increased comfort, etc., which are considered "co-benefits") with a co-pay that captures some of the value of these co-benefits.
2. **Societal costs and benefits.** To the extent that net societal costs and benefits of decarbonization are positive yet not already reflected in retail energy prices, public funding sources should contribute to those decarbonization investments.
3. **Grid operator costs and benefits.** Decarbonization activities that reduce utility system delivery costs, improve grid flexibility to balance intermittent generation sources, or enhance system performance can produce value streams that harness the motivation to invest. For example, the value of avoided costs to the gas distribution system and the associated grid co-investments may be higher when whole communities (or all buildings served by a single distribution branch) decarbonize at one time.
4. **Landlord-tenant equity.** Co-payments by landlords for some of the cost of replacing heating, cooling, and water heating equipment could be considered a core co-funding requirement, in keeping with their fiduciary responsibility to provide space heating and hot water.

Overview of Existing Tariffed On-Bill Programs

Tariffed on-bill programs based on the PAYS® (Pay As You Save®)² system have been successfully implemented during the past 18 years in eight states by 18 utilities from Hawaii to New Hampshire, including investor owned, cooperative, and municipal utilities. More than \$30 million has been invested in energy efficiency and renewable upgrades at 5,000 locations.³ Utilities that have experience offering tariffed on-bill programs have reported results that indicate consistently high adoption rates for building energy efficiency upgrades and low charge-off rates for nonpayment, even in areas characterized by conditions of persistent poverty.

In 2019, U.S Department of Energy (DOE) released an Issue Brief on the topic of tariffed on-bill programs through its Better Buildings Solutions Center.⁴ Below is an adapted excerpt:

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A tariffed on-bill program allows a utility to pay for cost-effective energy improvements at a specific residence, such as home heating and cooling units, and to recover its costs for those improvements over time through a dedicated charge on the utility bill that is immediately less than the estimated savings from the improvements.

The tariffed on-bill model differs from on-bill loans and repayment models in that tariffs are not a loan, but rather a utility investment for which cost recovery is tied to the utility meter according to terms set forth in a utility tariff.⁵

A tariff (or tariff rider) approved by utility regulators sets forth the terms of service for an investment made at a single location, with the cost recovery assigned only to the meter at that location. The tariff charge will remain attached to the meter at the improved location, regardless of who occupies the property, until utility cost recovery is complete.

The tariffed on-bill upgrade is associated with the utility meter location, not an individual household account. Therefore, utilities do not have to evaluate occupant credit scores and debt-to-income ratios, nor screen participants for homeownership status.

.....

Because there is no customer debt obligation, the terms in the tariffed on-bill program apply automatically to the current customer as well as future customers at each upgraded location. The tariffed charge for cost recovery of the utility expenditure survives foreclosure proceedings, changes in tenancy, and can be floated through periods of vacancy.

Residents pay utility bills that are lower than they would have been without the upgrades and, if designed with consumer protections in place, the energy savings are greater than the tariff charge that recovers the utility investment. This reduces risk to residents, who, if they used on-bill financing or repayment, might otherwise have been forced to pay off their debt if they wished to move before the loan repayment was complete.

The on-bill tariff program is especially good for removing barriers to rental home upgrades because the program enables a utility to recover its cost for energy improvements even if [initial] renters leave before the recovery is complete.

.....

2 Pay As You Save® and its acronym, PAYS® were trademarked by the US Patent and Trademark Office as a system with specific essential elements and minimum program requirements. Energy Efficiency Institute, Inc. (EEI), which holds the trademarks, has never charged any entity for using its marks. The trademarks ensure that "Pay As You Save" and "PAYS" may only be used to refer to programs that have PAYS' essential elements and minimum program requirements.

3 Hummel and Lachman, "What is inclusive financing?"

4 DOE, *On-Bill Tariff Programs*.

5 According to the Regulatory Assistance Project, a tariff is "a listing of rates, charges, and other terms of service for a utility customer class, as approved by the regulator." (Lazar, *Electricity Regulation in the US*, p. 199).

Near-Term Pathway to Tariffed On-Bill Programs

Our assessment of the current regulatory environment in California is that publicly owned utilities (POUs) and investor-owned utilities (IOUs) already have broad discretion to implement tariffed on-bill programs, subject to review and approval by their governing board, in the case of POUs, or by the California Public Utilities Commission (CPUC) in the case of IOUs. The CPUC and POU governing boards have the authority to authorize:

- utility investments of capital
- public purposes to be served by utilities regarding energy, related environmental dimensions including greenhouse gases (GHGs), and customer health, safety, and comfort
- rules for utility procurement and deployment of capital, infrastructure, and services
- billing mechanisms and tariffs

For IOUs, a rate case application is considered and authorized by the CPUC for cost recovery of the total amount of investment and capital required, including authorized rate of return on equity and debt. Utility tariffs describe the details of cost recovery via service charges on affected customers' bills.

POUs have autonomy to enact comparable tariffs, subject to review and approval by their governing boards. Two California local governments (Town of Windsor and the City of Hayward) have used their public water utility capital sources and billing systems to administer Pay As You Save® efficiency programs that mirror many of the features of the tariffed on-bill model we address here.

Community Choice Aggregators (CCAs) in California are currently not authorized to initiate tariffed on-bill programs because no California electric or gas utility is yet approved to make site-specific investments through a tariff that assigns cost recovery to a location rather than a cus-

tomers.⁶ In accordance with current California policies, only distribution utilities are permitted to disconnect customers for non-payment for an essential utility service, and no electric or gas utility regulator has yet determined that site-specific energy upgrades such as energy efficiency and building decarbonization are essential utility services. With such approval, a utility could partner with one or more CCAs to serve as a program operator to coordinate local implementation of the investment program.

We recommend that POUs and IOUs move expeditiously to secure necessary approvals for the design and launch of tariffed on-bill programs for building energy upgrades that could include building decarbonization, energy efficiency, and more. Specifically, the CPUC and POU governing boards should follow a three-stage approach, starting with establishing a policy framework, then proceeding to due diligence, and then providing direction on implementation.

ESTABLISH POLICY FRAMEWORK

CPUC and POU governing boards should provide enabling direction that sets in motion the program due diligence and planning process. This phase involves establishing threshold regulatory policies that establish tariffed on-bill programs as permissible. It also sets parameters for the scope of due diligence required for select program design elements, notably consumer protections and capital sources.

Regulators should:

1. Authorize utilities to deploy capital and recover cost for building decarbonization upgrades via tariffed on-bill structures that enable participation regardless of income, credit score, or renter status
2. Authorize utilities to make these “behind the meter” investments on terms that assure a path to ownership for customers while also assuring full cost recovery with a return on utility investment, on par with conventional utility investments
3. Direct that tariffed on-bill payments be treated as a regular element of utility tariffs and bill payment, subject to customary procedures and notices should there be payment arrears



6 Municipal water utilities and water districts are not regulated by the CPUC. Two municipal utilities (i.e., the Town of Windsor and the City of Hayward) received permission from their oversight bodies and implemented tariffed on-bill water efficiency programs. California permitted water utilities to implement tariffed on-bill programs when it passed the Water Bill Savings Act (Senate Bill 564).

4. Establish minimum thresholds for consumer protections
5. Establish guidelines for source capital, considering implications for utility balance sheets and access to broader capital markets

DUE DILIGENCE AND FEASIBILITY

While this White Paper attempts to provide guidance on key implementation issues, a comprehensive due diligence and feasibility analysis is beyond the scope of this effort. Toward that end, regulators should allocate resources to investigate economics and cost allocations, financial and legal risks, and stakeholder roles and responsibilities. This phase should address the following critical issues:

Economics and Cost Allocations

1. Conduct economic potential study encompassing full span of potential decarbonization investments on the customer side of the meter; quantify expected societal benefits from promising decarbonization packages; incorporate current assumptions about future rate increases, transition to time-of-use (TOU) rates, net energy metering (NEM), and CARE discounts into customer economic analysis
2. Analyze financial implications of assigning indirect costs (e.g., cost of capital, program administration, measurement and verification (M&V), loss reserves) to participating customers versus ratepayers
3. Investigate information system requirements and associated capital investments to support customer billing under different risk-reward allocation scenarios
4. Assess market potential for decarbonization packages offering attractive customer economic benefits; incorporate analysis of customer-specific Advanced Metering Infrastructure (AMI) data to inform customer segmentation and estimate potential investment contributions from customer energy cost savings; estimate supporting incentive and customer co-pay requirements, including landlord co-pays for rental housing retrofits.

Financial and Legal Risks

5. Perform risk analysis, including perspectives of current and successor customers, ratepayers, program sponsors, energy services companies and other private-sector service providers, and capital providers
6. Identify consumer protection mechanisms that balance costs, risks, and rewards, and authorize mechanisms to mitigate the potential for above-normal costs to ratepayers from unpaid bills (e.g. reserve funds).
7. Investigate options for source capital, supported by strong assurances of repayment
8. Evaluate potential jurisdictional issues that could be brought up around liability and property law; determine appropriate legal framework for ownership of investment assets

Roles and Responsibilities for Program Offerings

9. Articulate possible roles for POUs and CCAs
10. Establish ground rules for program sponsors to obtain access to customer-specific gas and electricity consumption, including whole-building consumption data for multifamily facilities
11. Authorize third parties to take on responsibility for customer utility bill payments

As part of due diligence activities above, the research team should conduct active stakeholder engagement, with particular attention to ESJ communities, prospective capital providers, and private sector service providers.

Based on due diligence outcomes, regulators should provide guidance on:

1. Performance metrics for program success, considering potential metrics such as default or charge-off rates, market share, participant demographics, contribution to customer wealth building, economic performance, GHG emissions reductions, other social outcomes
2. Scope of decarbonization measures and criteria for integrating multiple funding sources
3. Assignment of indirect costs (e.g., cost of capital, program administration, M&V, loss reserves) to participating customers versus ratepayers, leading to authorized funding from ratepayer sources
4. Program parameters, including consumer protection mechanisms, capital sources, and risk allocations

IMPLEMENTATION

Based on the blueprint established through the due diligence process, program sponsors should be empowered to design and implement programs, including:

1. Conduct market research to assess optimal methods for communicating program costs, risks, and rewards to consumers
2. Develop customer acquisition strategies and phased roll-out plan
3. Establish detailed implementation plans

Longer-Term Policy Roadmap for Achieving Scale and Meeting Climate Goals

The scale and speed of investments required to meet the state’s climate action goals dictate an emphasis on scalable solutions capable of attracting substantial private investment. The near-term policy pathway described above should provide critical early momentum. Additional policy developments should focus on accelerating that momentum.

Parallel implementation of what could be multiple local and regional tariff on-bill programs does not automatically lead to a scalable statewide solution that would be attractive to large-scale capital providers. To avoid fragmented solutions, policy development should focus on two issues:

1. Combine public investments in related decarbonization strategies (e.g., energy efficiency, electrification, rooftop solar, and on-site energy storage) and align program policies and procedures to capture larger total value streams for integrated projects. For example, more efficiency and electrification investments can be achieved when combined with the cash flows of on-site solar projects. Combining multiple value streams, including tariffed on-bill investment, will expand the number of financially viable decarbonization projects.
2. Move towards integrated statewide program administration and implementation to enable large aggregated investment portfolios and the associated economies of scale in securing capital and managing overhead costs.

RECOMMENDATIONS FOR ENABLING LARGE SCALE CAPITAL DEPLOYMENT FOR BUILDING DECARBONIZATION

The following recommendations aim to expand complementary public funding opportunities for core tariffed on-bill programs enacted as a part of the Near-Term Pathway.

DECISION-MAKERS	ACTIONS NEEDED
<p>CPUC and POU regulators</p>	<ul style="list-style-type: none"> • Authorize terms of a tariff that includes broad and common definitions of eligible households, improvements, and any necessary qualification criteria applicable to any/all decarbonization measures financed • Continue to incorporate decarbonization measures into all energy efficiency (EE) programs, prioritizing attention to customers residing in disadvantaged communities, those already qualified for LMI programs, and those demonstrating the greatest opportunities for energy cost savings • Consider integrating into one overall initiative accessible financing to complement funding for all decarbonization, EE, solar, and electric vehicle (EV) charging efforts, and prioritize attention to low income households
<p>CPUC or California Energy Commission (CEC) with State Treasurer’s Office or the California Infrastructure Bank</p>	<ul style="list-style-type: none"> • Conduct due diligence on capital requirements and sources for an accessible financing mechanism for site-specific investment and cost recovery: <ul style="list-style-type: none"> • Potential annual California transaction volumes needed over time • Capital source options • Reserve fund options • Structures of finance administration models with low administrative costs and transaction fees
<p>State legislature</p>	<ul style="list-style-type: none"> • Enable broad and deep participation in decarbonization by authorizing government funding to leverage deployment of even larger private capital flows through tariffed on-bill investment programs • Assign responsibility to a state agency to identify workable mechanisms to combine funding resources to achieve GHG reductions⁷ • Consistent with recommendations from the CEC’s 2019 Energy Efficiency Action Plan, require agencies to work towards structural alignment across relevant program administrators and investment siloes⁸ • Allow “siloes” public and ratepayer funding resources to be channeled to a unified decarbonization investment mechanism that can support broad sets of decarbonization improvements to California housing



7 Funding resources could include the Greenhouse Gas Reduction Fund, utility GHG allowance proceeds, the full spectrum of clean energy funding (e.g. tax credits, rebates, and utility funds), indoor housing health and comfort improvement measures, housing purchase and renovation funds, and utility funding reflecting the value of distributed energy solutions including beneficial electrification and more.

8 See, for example, Energy Efficiency Action Plan recommendation for Funding Sources for Beyond Ratepayer Portfolio (Kenney, Bird, and Rosales, 2019, p. 93), which states “In addition to the utility programs run by IOUs and POUs, there is a need for a comprehensive program that removes silos between clean energy solutions, supports grid-interactive buildings, and helps customers across sectors understand the numerous benefits to energy efficiency and clean energy.” The Energy Efficiency Action Plan also recommends implementation of a statewide tariffed on-bill program.



RECOMMENDATIONS FOR STATEWIDE PROGRAM ADMINISTRATION

DECISION-MAKERS	ACTIONS NEEDED
CPUC and POU regulators	<ul style="list-style-type: none"> • Authorize utilities to deploy capital and recover cost for building decarbonization upgrades via tariffed on-bill structures that enable participation regardless of income, credit score, or renter status • Take a portfolio approach to guide cost-effective climate investment decisions rather than site- or silo-program specific cost-effectiveness criteria
State legislature	<ul style="list-style-type: none"> • Establish parameters for public funding that reflect the full social benefits of decarbonization • Designate CEC or another state entity, in partnership with California Air Resources Board (CARB), CPUC, and Housing and Community Development (HCD) among others, to oversee implementation and progress with building decarbonization investment adoption strategies • Approve assigning tariffed on-bill notices for building energy upgrades to property records, as already authorized in the California Water Bill Savings Act (Senate Bill 564, McGuire, Chapter 430, Statutes of 2017) for water efficiency upgrades⁹
Designated State Agency	<ul style="list-style-type: none"> • Determine what entity or entities should administer building decarbonization investment transactions • Encourage and reward innovative approaches to achieve high levels of participation, prioritizing disadvantaged communities

Time is a critical factor in capitalizing tariffed on-bill investments at a scale sufficient to achieve California’s policy objectives. While these recommendations may be taken up in any order, near-term pathway actions by utilities and utility regulators are critical to getting started at an initial scale. Supporting actions by the state legislature and governor can accelerate implementation.

9 Government Code Section 6588.8 and 6586.7



White Paper Organization

The remainder of this document is organized as follows:

- **Introduction:** Provides a high-level overview of the nature and magnitude of the challenge this Project addresses; sets forth design criteria for addressing the challenge; summarizes related prior policy recommendations; and lays the foundation for further discussion of site-specific investment and cost recovery through utility tariffed on-bill programs
- **Combining Multiple Value Streams:** Explores the challenge of financing clean energy investments exclusively through utility bill savings; discusses the necessity of combining tariffed on-bill investments with incentives and co-payments, based on multiple value streams to diverse stakeholders
- **Introduction to Site-Specific Investments and Cost Recovery:** Provides a rationale for site-specific versus person-specific investments; outlines the function of an opt-in tariff; assesses tariffed on-bill mechanism relative to Project design criteria; summarizes key tariffed on-bill attributes; and compares the tariffed on-bill solution to financing-based alternatives
- **General Provisions:** Provides program design guidance on criteria for qualifying to participate, terms of transaction, non-payment recourse, application of tariffed terms to successor customers, and consumer protections
- **Sourcing Capital and Managing Portfolio Risk:** Outlines options for sourcing capital to underwrite tariffed on-bill investments
- **Other Implementation Topics:** Offers program implementation recommendations for notifications to successor customers, tenant-landlord provisions, and alternative approaches to performance risk mitigation
- **Scalability and Market Potential:** Explores the opportunities and challenges for scaling clean energy investments, with a focus on the need to eliminate misalignment of multiple single programs, combine public and ratepayer funds for integrated solutions, and address workforce issues
- **Implementation Metrics:** Offers a short set of implementation metrics for evaluating program performance relevant to the Project design criteria
- **Conclusions and Recommendations:** Offers a policy roadmap to enable the near-term launch of tariffed on-bill programs and outlines a pathway to achieve program scale

Introduction

California's Commitment to Equity in Pursuit of Aggressive Climate Action Goals

California has established ambitious climate protection goals. Senate Bill 100 (De León), signed into law by Governor Brown in 2018, sets a state goal of 100 percent zero-carbon electricity by 2045. Going further, Brown's Executive Order B-55-18 directs California to achieve full carbon neutrality by 2045 and to do so in a way that supports the health and economic resiliency of urban and rural communities, particularly low-income and disadvantaged communities.

To achieve these goals, the residential building sector must reach zero emissions, including GHGs from fossil-fuel end uses. CARB's 2018 GHG emissions inventory found that direct emissions from residential household use contributed 6.1 percent of the state's total emissions.¹⁰ The CEC has found that space heating and water heating end uses contribute 86 percent of residential fossil fuel consumption.¹¹

A starting premise for the Accessible Financing Project is that **future policies**, including financing mechanisms, **should be crafted with the goal of facilitating multiple decarbonization investments, incorporating a combination of energy efficiency, electrification, rooftop solar, and on-site energy storage, all of which contribute to reductions in housing's GHG footprint.** The customer economics of energy efficiency and rooftop solar have been well documented over time. More recently, Energy and Environmental Economics, Inc. (E3) has investigated the customer economics of electrification measures. E3 found that **electrification can reduce total greenhouse gas emissions in single family and low-rise multifamily homes by ~75–90 percent by 2050**, including the impacts of upstream methane leakage and refrigerant gas leakage from air conditioners and heat pumps.¹²

10 2000–2017 GHG Emissions Trends Report Data, <https://www.arb.ca.gov/cc/inventory/data/data.htm>

11 2010 California Residential Appliance Saturation Survey

12 Mahone et al., *Residential Building Electrification*



Based on E3’s analysis, we estimate that bare-bones space conditioning and water-heating electrification upgrades with no associated energy efficiency improvements could have an average total cost in the range of \$12–25,000 per household, depending on utility provider, climate zone, building type, and other factors considered in the E3 analysis. To the extent that equipment is replaced on burn-out as part of expected replacement, E3 estimates that incremental costs can range from \$1,400–2,100 for heat pump water heaters. For heat pump space conditioning, incremental cost estimates range from capital savings of \$3,000 up to net costs of \$1,300. The associated combined bill savings for heat pump space conditioning and water heating can be up to \$750 per year in single family homes and up to \$300 per year in low-rise multifamily homes. Household costs and savings are summarized in Table 1.

While bill savings from efficiency and water heating on their own may not produce net savings for customers, our analysis suggests that the lifecycle economics for electrification measures, combined with on-site solar equipment, can be positive. More importantly, the inclusion of funding streams for co-benefits would improve project financial performance, with or without solar. The contributions from energy efficiency investments will need to be evaluated on a case by case basis. As a policy matter, we recommend that public investments in decarbonization measures be guided by portfolio-level cost-effectiveness considerations, even while customer investments must be constrained by project-specific criteria.

Table 1. Expected Household Capital and Operating Cost Impacts for Selected Clean Energy Investments with No Co-Benefits or Other Value Streams Included¹³

CURRENT ESTIMATES PER HOUSEHOLD VALUES	HEAT PUMP SPACE CONDITIONING	HEAT PUMP WATER HEATER	ROOFTOP SOLAR	6% EFFICIENCY PACKAGE	16% EFFICIENCY PACKAGE
Investment cost (a)	SF: \$13,679–20,663 LRMF: \$6,785–15,016	SF: \$3,599–4,662 MF: \$3,349–4,388	\$3,000–5,000 / kW ¹⁴	SF: \$1,980	SF: \$8,733
Incremental investment cost (b)	SF: \$(2,948)–1,377 LRMF: \$(1,743)–1,323	SF: \$1,601–2,064 LRMF: \$1,435–1,927	\$3,000–5,000 / kW	SF: \$1,980	SF: \$8,733
Annual bill savings (c)	SF: \$112–597 LRMF: \$24–201	SF: \$12–138 LRMF: \$22–121	\$170–350 / kW ¹⁵	SF: \$63	SF: \$155
Measure life (yrs.) (d)	18	13	20	20	20
Lifetime bill savings (c*d)¹⁶	SF: \$2,016–10,746 LRMF: \$432–3,618	SF: \$156–1,794 LRMF: \$286–1,573	\$3,400–7,000 / kW	SF: \$1,260	SF: \$3,100
Lifecycle savings – (lifetime bill savings minus incremental investment costs)	SF: \$1,857 - 10,044 LRMF: \$(1,074) - 5,429	SF: \$(2,130) - (205) LRMF: \$(1,895) - (318)	+\$0–2,000 / kW	SF: \$(720)	SF: \$(5,633)

SF: Single family, LRMF: Low-Rise Multi-Family

13 Electrification measure results from Mahone et al., *Residential Building Electrification*. Energy efficiency results derived from the Home Upgrade Workpaper Calculation Tool, V.7, developed by Southern California Edison. See workpaper PGECOALL109-R3, <http://www.deeresources.net/workpapers>

14 From <https://sites.energycenter.org/solar/homeowners/cost> Quoted price range excludes investment tax credits. Most residential solar systems average 3-5 kW.

15 Derived from data from Project Sunroof Data Explorer, <https://www.google.com/get/sunroof/data-explorer/>

16 Utility bill savings estimates are based on prevailing retail rates. CARE customers could expect utility bill savings on the order of 20 percent less for gas savings and 35 percent less for electric savings. Utility bill impacts for electrification measures would be more muted because of offsetting gas and electricity rate discounts.

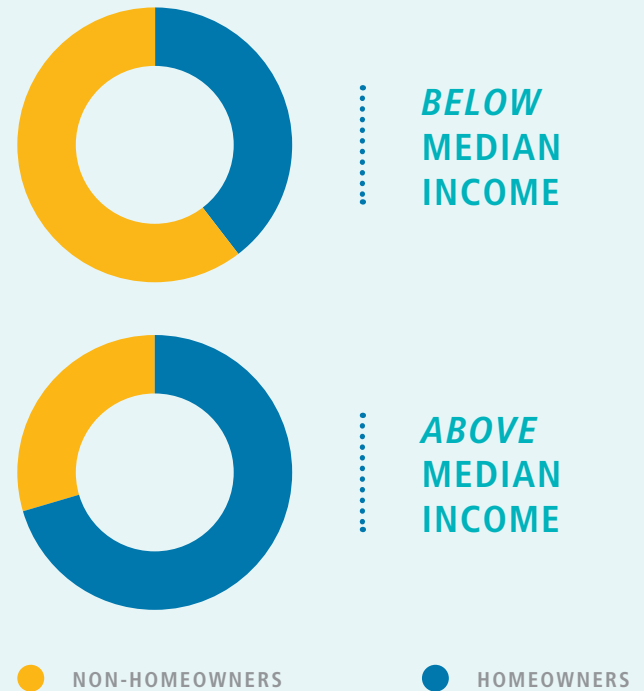
It is plausible to assume that homeowners with ready access to capital can largely finance their building decarbonization upgrades with conventional consumer savings, credit card, or loan mechanisms. However, prior experience from energy efficiency programs has shown that the economic *capacity* to finance upgrades alone has not been sufficient to mobilize most households to undertake them voluntarily over the past few decades, even with incentives. California’s ability to achieve large scale energy efficiency resource development over multiple decades reflects an artful combination of updated building codes, appliance standards, regulatory requirements, and public and ratepayer funded incentives. For building decarbonization, a similar combination of instruments will be needed, including a need for policies that overcome a long-standing upfront cost barrier that deters even people with the capacity to capitalize cost-effective upgrades from making that financial commitment.

While our focus is on addressing barriers faced by LMI households and renters, it is not our intent to recommend income-eligible programs limited to these customer segments. **Our overarching goal remains an accessible financing solution that is universally accessible to all California households**, without regard to income category. Our belief is that a solution that works for the most challenging use cases (LMI households and renters) will also expand accessibility for easier use cases (e.g., higher-income property owners).

The Need for an Equitable Emissions Reduction Strategy

A building decarbonization strategy that ignores more than 40 percent of California’s residents is doomed to fail them and fail to reach the state’s policy objectives. As signatories to the Equitable Building Electrification framework pointed out, Environmental and Social Justice (ESJ) communities “...are likely to be left using gas if market forces are the primary driver of electrification.”¹⁷ The Building Decarbonization Coalition launched the Accessible Financing Project following release of the Equitable Building Electrification Framework, which itself recommends use of tariffed on-bill financing, and each recog-

More than 45% of CA households are in homes they do not own



Low home ownership rates limits access to capital for lower income households.

SOURCE: U.S. CENSUS BUREAU, 2015

nizes the high stakes for economic inclusion in the clean energy economy.

California is home to more than 4 million low-income households and more than 5.8 million households in rental housing, including 2 million moderate- and above moderate-income renter households.¹⁸ Taken together, approximately 6 million households, or more than 40 percent of all California households, lack ready access to private capital for upgrading their homes.¹⁹ **Ensuring that LMI households and renters have access to affordable clean energy solutions is essential to meeting a host of policy objectives for health, economic development, and environmental protection, including California’s climate protection goals.**

17 Miller et al., *Equitable Building Electrification*, p. 22

18 <https://factfinder.census.gov/bkmk/cf/1.0/en/state/California/HOUSING>

19 Calculated as the overlap of LMI and renters, i.e., all LMI households plus all non-LMI renters

Approximately **6 million** households, or more than **40 percent** of all California households, lack ready access to private capital for upgrading their homes



The impact of poverty on household energy use manifests itself in at least two tangible ways:

ENERGY BURDEN.

In the most recent Low Income Needs Assessment commissioned by the CPUC in 2016, one third of low-income households in California reached in the survey indicated that they struggle with energy bills either often or constantly.²⁰ According to that survey data, households below 100 percent of the Federal Poverty Level (FPL) experienced energy burdens averaging 8.2 percent, whereas households with incomes exceeding 300 percent of FPL averaged less than 1.4 percent.²¹

UTILITY DISCONNECTIONS.

Low-income customers face a disproportionate risk of utility disconnections. Shutoff rates increased by more than 50 percent since 2010, culminating in 886,000 household shut offs in 2017. In 2017, the disconnection rate rose as high as 9.3 percent for customers in Southern California Edison territory.²² The threat of or actual utility disconnection can lead to a host of other issues. Levy and Sledge (2012) found that paying utility bills was the most common reason for high-cost payday loans, which can worsen the cycle of poverty.²³ Other studies have found that shutting off utilities can contribute to homelessness.²⁴

20 Evergreen Economics. *Needs Assessment for the ESA and CARE Programs*, p. 7

21 *Ibid.*, p. 50

22 Sandoval and Toney, *Living Without Power*, p. 18

23 Levy and Sledge, *Small-Dollar Credit Consumers*, p. 4

24 Vick and Norton, *Metropolitan Housing Report 2008*, as cited in Drehobl and Ross, *Lifting the High Energy Burden*, p. 13

Low income households contending with these impacts of poverty, as well as moderate income households, some households above moderate-income, and renters at every income level together face an array of barriers to making investments in clean energy upgrades, including building decarbonization:

**TENANT / LANDLORD SPLIT INCENTIVES
DETERRING INVESTMENT.**

A landlord may decline to participate in an energy program if the landlord must make the capital outlay, but the benefits largely flow to the tenant paying the utility bills. Likewise, tenants may decline to participate if they must pay the front-end improvement costs but are unable to reap the full financial benefits.²⁵ One quarter of Californians are renters who are living on low or extremely low incomes²⁶, and the CEC’s Barriers Study found this issue affects them most acutely.

**LACK OF ACCESS TO CAPITAL AND CASH FLOW
CONSTRAINTS.**

Currently, one third of Californians lack sufficient income to meet their basic needs.²⁷ Many competing demands facing LMI households, such as childcare or medical expenses, pose barriers to economic opportunities that are not immediately cash positive.

**CREDIT SCORE QUALIFICATION CRITERIA THAT
LIMITS ACCESS TO CONSUMER CREDIT.**

Access to financing is often limited to those who can demonstrate a credit history with a score above a minimum threshold. Research published by the Federal Reserve Board suggests that household income is only moderately correlated with consumers’ credit scores.²⁸ Thus, these challenges are not isolated to low-income households and can be expected to increase the size of the population needing an option for overcoming the upfront investment costs without depending on consumer credit.

Given these financial barriers, **California has historically relied preferentially on 100 percent grant programs to bring energy efficiency and renewable energy services to a limited number of lower income households each year**, and for households with moderate income and higher, it has sought to overcome the upfront cost barrier by offering rebate payments to reimburse customers who first must pay the full upfront cost for eligible upgrades. Signatories to the Equitable Building Electrification Framework have raised concerns about the equity implications of such strategies in retrospect, citing studies that have found the majority of benefits flowed to higher income households. They set forth a vision for an equitable approach to building electrification that prioritizes attention to constituents described by the CPUC as ESJ communities:



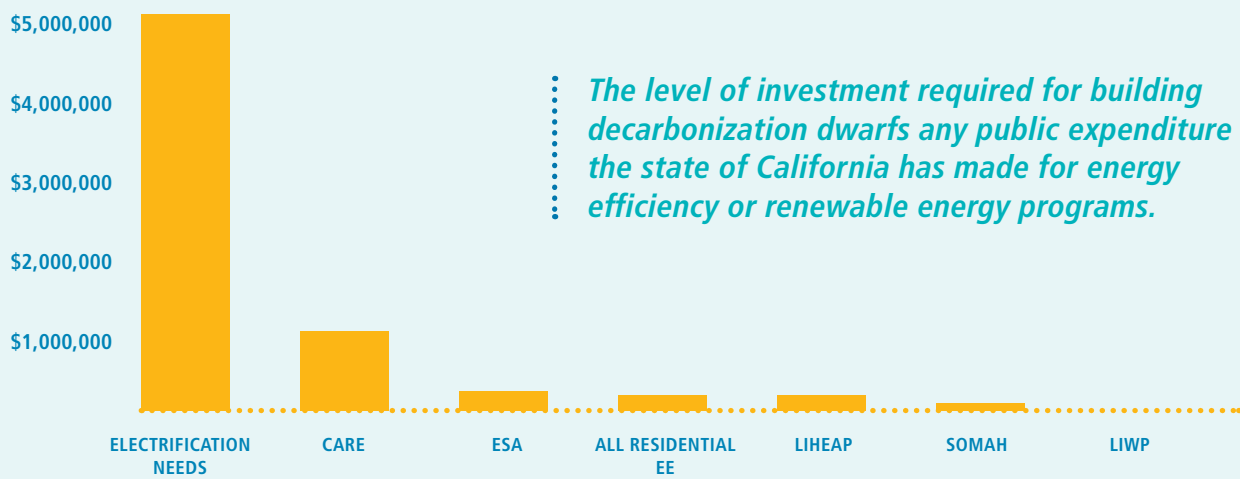
Clean energy movements of the past, including rooftop solar and energy efficiency, have benefited those on the higher end of the income scale far more than those on the lower end, and have been slow to gain traction in ESJ communities. This pattern of relying on a market-driven, trickle-down approach that largely fails to deliver has led to significant distrust among the communities that are still waiting for their share of benefits. Through building electrification, California can break out of this pattern and create a plan that actively centers environmental justice and equity from the start. This must begin by targeting what the California Public Utilities Commission has termed environmental and social justice communities, the communities that have been long left behind by the state’s thriving green economy.²⁹



25 Scavo et al., *Low-Income Barriers Study*, p. 30
26 2017 American Community Survey. Total Household Income by Ownership of Dwelling (tenure). <https://www.census.gov/programssurveys/acs/>.
27 Block et al., *Struggling to Stay Afloat*, p. 9
28 Beer, Ionescu, and Li, “Are Income and Credit Scores Highly Correlated?”, p. 1
29 Miller et al., *Equitable Building Electrification*, p. 13

Going forward, relying on the same historic approaches would also appear insufficient to capitalize building decarbonization upgrades, given the number of households affected by the barriers above. Assuming financial assistance for 6 million LMI and renter decarbonization upgrades will be needed by 2045, a grant-only solution for electrification of space conditioning and water heating in the range of \$12–25,000 per household would require a cumulative public and ratepayer capital commitment on the order of \$72–150 billion. **This level of spending on building decarbonization would dwarf any public expenditure the state of California has made for energy efficiency or renewable energy programs.**

Estimated Annual Investment Needs (\$000) for LMI Decarbonization 2020-2050 Compared to Current Expenditures for Residential Energy Efficiency



Fortunately, this investment need not come entirely from public funds. First, it is worth noting that any existing equipment will eventually need to be replaced as it reaches the end of its useful life. So, it is not unreasonable to expect some level of cost sharing by the owner. More importantly, customer utility bill savings are an important source of value for leveraging capital to lower the upfront installation costs. For example, using Table 1 above, a financing program that draws on 80 percent of up to \$750 annual bill savings for heat pump space conditioning and water heating could recover up to \$600 per customer per year. Extended over 6 million customers without assuming changes in commodity prices or equipment costs, 80 percent of the maximum estimated bill savings for these two types of upgrades to heat pumps **would represent the ability to support a cumulative value of up to \$36 billion over 10 years. That would be one-fourth to one-half the total estimated investment required, based on current market conditions.**

Wanted: An Accessible Financing Solution

California needs to expand the options for overcoming the upfront cost barrier in order to put decarbonization investments within reach of all Californians, regardless of income, credit history, liquidity, or home ownership status. A financing mechanism accessible for all does not need to replace or diminish direct installation programs for lower income residents, nor does it displace consumer credit options already available in the marketplace. **An accessible financing solution expands access and participation, accelerates adoption of more comprehensive investments in building energy upgrades, and leverages public investments for greater impact.**

The Building Decarbonization Coalition launched the Accessible Financing Project to address these barriers and expand access to clean energy investments. The Project goal is to develop a policy roadmap for widening the clean energy economy to LMI households and renters, specifically in the realm of upgrades that decarbonize buildings.

To effectively address the barriers articulated above and support the scale of investment required, we developed the following design criteria as benchmarks of success:

1. Ability to finance over long periods (10–15 years) even in rental units with multiple changes in tenancy
2. Ability to leverage utility bill savings to defray investment costs, rather than rely on consumer credit or home equity
3. Cash-positive outcomes that assure LMI customers will not experience increased energy burdens
4. Ability to scale to serve millions of California households

A threshold research finding that guided the Project’s subsequent investigations is that typical consumer credit products are ill suited to address the design criteria above. The limitations on the accessibility of consumer credit products has motivated multiple public agencies in a half dozen states to develop policy recommendations and program solutions that facilitate site-specific investment with site-specific cost recovery, consistent with other normal terms of service offered by utilities.

In 2015, California state law Senate Bill 350 (De León, Chapter 547, Statutes of 2015) directed the CEC to study barriers to low-income customers participating in the clean energy economy. After months of extensive stakeholder consultation and multiple rounds of public comments and draft review, the CEC concluded, as expected, that financing is a barrier to low-income customers. In its report, the CEC advanced recommendations for addressing barriers to financing, including the following:

.....
The CPUC should consider developing a tariffed on-bill pilot for investments in energy efficiency that targets low-income customers regardless of credit score or renter status, and that do not pass on a debt obligation to the customer. Utilities could use the program to make energy upgrade investments and recover the cost through the bill, so long as the recovery charge is less than the [total] estimated savings. The Energy Commission should encourage and provide technical assistance to publicly owned utilities (POUs) and other load-serving entities seeking to implement a tariffed on-bill pilot.³⁰
.....

Following the CEC’s Barriers Study, the University of California Center for Law, Energy & Environment convened stakeholders who had expertise in multi-family housing to give closer attention to barriers uniquely affecting renters. The results of their deliberations were published in a report that identified recommendations to address key challenges, including lack of reliable, long-term funding that inhibits market transformation:

.....
The California Public Utilities Commission and utilities could propose, and institute utility tariffed on-bill programs that capitalize energy efficiency retrofits without making [consumer] loans. ... This model is similar to on-bill financing in that the utility bears the upfront cost of efficiency measures and [the utility] 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.³¹
.....

In a separate and subsequent process devoted specifically to building electrification, Greenlining Institute and Energy Efficiency For All convened stakeholders to develop a framework for equitable building electrification released on September 2019. The framework underscores the

30 Scavo et al., *Low-Income Barriers Study*, p. 7
31 Elkind and Lamm, *Low-Income, High Efficiency*, p. 33



importance of ensuring funding for energy efficiency and clean energy programs, and it ultimately recommends:

.....
*Find ways to support Environmental and Social Justice (ESJ) households through alternative financing such as tariffed on-bill financing.*³²
.....

The CEC issues an Energy Efficiency Action Plan for the state every two years, and the Energy Efficiency Action Plan finalized in December 2019 includes a similar recommendation:

.....
*Implement tariffed on-bill repayment programs statewide to open new financing mechanisms for low-to-middle-income households and multifamily units, with eligibility not based on credit score or income.*³³
.....

Consistent with the recommendations in the cited reports, the BDC Accessible Financing Project research team prioritized attention to the potential to address the key design

requirements with site-specific investment and cost recovery through utility tariffed on-bill programs. The remainder of this report explores tariffed on-bill investment with the goal of shedding light on the following questions:

- What can we learn from prior experience implementing tariffed on-bill programs and related financing solutions, both in California and around the nation?
- What are the critical policies that must be put in place to enable implementation of tariffed on-bill programs or other financing programs that meet our design requirements?
- What are the critical implementation issues that must be addressed for such a financing solution to be successfully deployed in California?

It is our hope that this white paper will spur critical thinking along these lines among stakeholder communities with the most at stake and that this critical thinking can be harnessed to devise a solution that truly puts decarbonization investments within reach of all Californians.

32 Miller et al., *Equitable Building Electrification*, p. 43

33 Kenney, Bird, and Rosales, *2019 California Energy Efficiency Action Plan*, p. 8

Combining Multiple Value Streams to Mobilize Investment

As E3 has documented, space conditioning and water heating electrification measures will usually produce positive bill savings, but the savings will generally be too modest to cover the full investment cost and, for some customers, savings may not cover even the incremental costs.³⁴ Table 1 illustrates that other building energy upgrades face this challenge as well. In considering program options for leveraging utility bill savings to defray decarbonization investment costs, at least three distinct economic issues have emerged:

- 1. Customer benefits of decarbonization extend beyond utility bill savings.** Decarbonization investments can increase property asset value for owners, improve comfort and indoor air quality, provide resilience against power outages and energy price spikes, and other co-benefits. While an array of decarbonization co-benefits has been identified, those benefits do not show up on the utility bill itself.
- 2. Societal benefits of decarbonization extend beyond customer benefits.** Investments in building decarbonization generate an array of societal benefits (e.g. GHG reductions, local air quality improvements, and improved public health outcomes) that are not fully reflected in retail rate structures and thus not captured in customer bill savings. A social equity issue arises if those wide-ranging benefits are financed solely based on the energy utility bill savings that would otherwise accrue to individual households, especially low-income households, and not from wider societal beneficiaries.
- 3. Landlords have an obligation to provide habitable housing, including space and water heating systems, yet no obligation to provide lower utility costs.** Tenants are entitled to the benefit of a landlord's "implied warranty of habitability."³⁵ Among other things, landlords have a fiduciary duty



34 Mahone et al., *Residential Building Electrification*, pp. 69-81
35 California Civil Code §§ 1925 to 1954.05; 1954.50 to 1954.605; 1961 to 1995.340



to provide space heating and hot water services to their tenants, yet landlords have little incentive to incur a higher cost for replacement equipment that produces wider benefits than just habitability or direct value for tenants through their bill savings. Financing the entire replacement of old mechanical systems via tenant-paid utility bill savings in an attempt to achieve decarbonization would unfairly shift the habitability burden from landlords to tenants.

While these issues are not the only ones policy-makers face in crafting an accessible financing solution, the issues share a common feature in that they can be addressed by first recognizing the full value of clean energy investments to different stakeholders and then striving to align and combine the value streams.³⁶ It is important to understand the magnitude of these values, to whom they accrue, and to what extent these value streams are or are not currently incorporated in the decarbonization investment calculus. A full value premise can be illustrated by the following table, which presents a diverse set of value streams that could be combined to catalyze decarbonization investments.

Table 2. Value Streams from Decarbonization Benefits to Multiple Stakeholders and How to Capture

BENEFICIARY	VALUE SOURCE	CURRENT AND PROPOSED INVESTMENT MECHANISMS
Occupant (owner or renter)	Utility bill savings	Tariffed on-bill investments; some occupants also will be able and willing to access consumer credit products
	Occupant co-benefits	Occupant (or health care insurer stand-in) co-pay for improvements to health, comfort, convenience, etc.
Building owner / landlord (including mortgage lien holder, property insurance, etc.)	Asset value and reduced maintenance costs	Building owner co-pay
	Tax credits	Building owner co-pay, collect reimbursement through reduced tax liability (e.g. Low Income Housing Tax Credits)
Utility (including ratepayers and shareholders)	Energy resource and grid benefits	Options include (a) utility contribution to upfront investment cost, (b) tariff reform, or (c) operating incentives, modeled on Demand Response (DR) programs. Costs recovered through rate base
	Reduced cost of CARE discount support with lower energy use	Upfront investment support to reduce recovery cost charge to eligible households
Society	Avoided GHGs	Upfront incentive payment, either downstream (customer) or upstream / midstream (manufacturer / distributor), funded by Greenhouse Gas Reduction Fund.
	Avoided local air pollution	Upfront incentive, either downstream or upstream / midstream, funded by any state- or local-collected pollution taxes and charges
	Economic Development (e.g. job creation)	Market transformation program investments in workforce development, etc.
	Equity	Enhanced investment contributions to reduce energy cost burden for low-income households (e.g. ESA, SOMAH, TECH, and LIWP)

36 It is worth noting that this approach aligns well with the Regulatory Assistance Project’s proposal for six principles to guide beneficial electrification in the public interest. See, for example, Farnsworth et al. *Beneficial Electrification*, pp. 9-11

Conceptually, utility bill savings alone need not cover the full cost of clean energy investments. While the total cost of many building decarbonization upgrades are not cost effective by leveraging customer bill savings alone, *some portion* of every decarbonization upgrade would meet the cost effectiveness criteria for a tariffed on-bill investment. As the table of value streams above illustrates, an accessible financing mechanism can and should be scaled to the value of the utility bill savings; with all other beneficiaries contributing to the investment at levels commensurate with the value each derives.

1. **Customer co-benefits.** It is reasonable to expect occupants (owners and renters) to co-pay for investments in proportion to their non-utility bill benefits.
2. **Societal costs and benefits.** To the extent that societal costs and benefits are not already reflected in retail energy prices, society should contribute its fair share.³⁷
3. **Grid operator costs and benefits.** Value streams created by decarbonization activities that reduce delivery costs or enhance performance, harnessing the motivation to invest. These can be paid in the form of capitalized front-end incentives or ongoing performance-based contributions to cost recovery.³⁸
4. **Landlord-Tenant Equity.** For landlords, financial participation in mechanical system replacement can be considered a core requirement, consistent with their fiduciary duty to provide space heating and hot water.

These findings imply a need to apply a value-stack approach to program cost contributions. For simplicity, Table 2 focuses on those value sources that lend themselves to quantification through currently available methods. We anticipate that a combination of value streams could “stack” to support a solution in which a tariffed on-bill investment would be complemented with additional funding streams. This could be done through rules allowing “back office” funding transfers from singular purpose funds and programs to a decarbonization investment pro-



gram and tariff-on-bill finance mechanisms that accept incentive payments to reduce the net amount to be recovered from occupants. Through this mechanism, multiple programs could co-fund comprehensive decarbonization investments and each program count impacts associated with its specific program goals. In this way, program resources could be delivered to the market through an integrated mechanism that side-steps the need to align multiple program policies and procedures. We discuss this further in the next section on site-specific investment and cost recovery.

In the short term, we expect it would be feasible to serve at least some customers by combining tariffed on-bill investment with existing energy efficiency and related incentive programs.

For the longer term, we identify below some research steps on quantification methods for societal and grid benefits needed to significantly expand the economic and market potential for decarbonization with a combination of multiple value streams.



37 CPUC Decision D.20-03-027, adopted March 26, 2020 directs the TECH electrification program evaluation to include or consider non-energy benefits to customers, improved housing affordability, and the health effects of improved indoor air quality. See: <http://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M330/K031/330031291.PDF>

38 Some argue that the value of avoided costs to the gas distribution system and the associated grid co-investments may be higher when whole communities (or distribution branches) decarbonize at one time.



As funded research in the field continues to progress, it may be possible to incorporate additional value streams that can be quantified and monetized to increase overall value to stakeholders. We recommend that progress in monetizing these values be incorporated into broader co-funding of decarbonization investments in the residential sector. These include:

- Total change in household expenses for current and successor occupants after utility bill changes
- Increases in underlying property asset value attributable to improvements
- Health benefits through improved comfort or indoor air quality, where cost savings or benefits are measured as lower health care costs and increased wages from avoided illnesses
- Risk reduction to property insurance companies and insurance policy holders via clean energy investments that also address deferred

maintenance issues, improve building system durability, or improve building resilience to weather and seismic events and associated Public Safety Power Shutoff (PSPS) events, including events caused by wildfire risk mitigation

- Local economic gains and their multiplier effects from higher household disposable incomes from utility bills savings and green economy workforce income and associated tax revenue to governments. (Studies have quantified local economic impacts from the “green economy”, but these larger societal benefits typically are not considered in green energy deployment efforts or in seeking cost-sharing.)

The concept of combining multiple value streams to fund beneficial decarbonization investments is broadly consistent with the state’s approach to determining the cost effectiveness of ratepayer investments in energy efficiency

and clean energy technologies.³⁹ That said, there is reason to believe current methods may not fully monetize all costs and benefits. For one thing, current methods typically rely on average values for financial model inputs, whereas the underlying costs and benefits can be expected to vary across customers, grid connection points, and over time. A more granular analysis would better equip program designers to identify specific sites for cost-effective investment. A related issue is that broad-scale investment in electrification measures can be expected to impact utility costs per customer for both gas and electric distribution infrastructure maintenance, either positively or negatively, depending on how and when investments are targeted.⁴⁰

To the extent that some value streams reflect unmonetized externalities, they should be quantified and internalized by the responsible party in order to fully capture all value streams related to decarbonization, including but not limited to utility bill savings. The Accessible Financing Project offers a set of proposals for facilitating an approach to funding and financing decarbonization that harnesses a combination of multiple value streams:

1. Refine methodologies for **quantifying societal benefits** from clean energy investments. Methods should be technology-neutral and should be applied consistently to calculate societal contributions to all behind-the-meter clean energy investments, across all programs. This action may require coordination between the CPUC, CEC, and CARB.
2. Likewise, refine methodologies for **quantifying grid benefits** from clean energy investments, accounting for locational and temporal variations in grid impacts from different technologies.⁴¹ CPUC and IOUs could lead this effort, with coordination from the CEC and POU's.
3. Apply quantification methods for societal, grid, and customer benefits to identify the **most compelling decarbonization investments** that would generate the largest value streams across different geographic areas and climate conditions.⁴² This action may require coordination between the CPUC, CEC, and CARB.
4. Conduct a granular analysis of **decarbonization market potential** that accounts for the full stack of revenue streams that might co-fund decarbonization investments. This analysis will provide a clearer estimate of the public investment required and the private capital that can be leveraged to achieve the scope and rate of decarbonization investment consistent with California climate policy goals. To the extent feasible, meter-based approaches using AMI data should be used to quantify incremental impacts across customer sites and over time, consistent with recommendations from the CEC's *2019 California Energy Efficiency Action Plan*.⁴³ Similarly, detailed grid models should be used to quantify marginal cost implications for transmission and distribution services.⁴⁴

39 For example, the CPUC has developed an Avoided Cost Calculator to inform the cost-effectiveness of Commission demand-side programs and tariffs, including the avoided costs of Transmission and Distribution.

40 The CPUC has taken up this issue in Proceeding R.20-01-007, Rulemaking to Establish Policies, Processes, and Rules to Ensure Safe and Reliable Gas Systems in California and Perform Long-Term Gas System Planning

The CEC has tackled this issue via its funding for *Natural Gas Distribution in California's Low-Carbon Future*, an interim report for the future of natural gas project (PIER-16-011) conducted by Energy and Environmental Economics, Inc., and the University of California, Irvine, in support of the CEC's Natural Gas Research and Development Program. See Aas, et al., *Challenge of Retail Gas*.

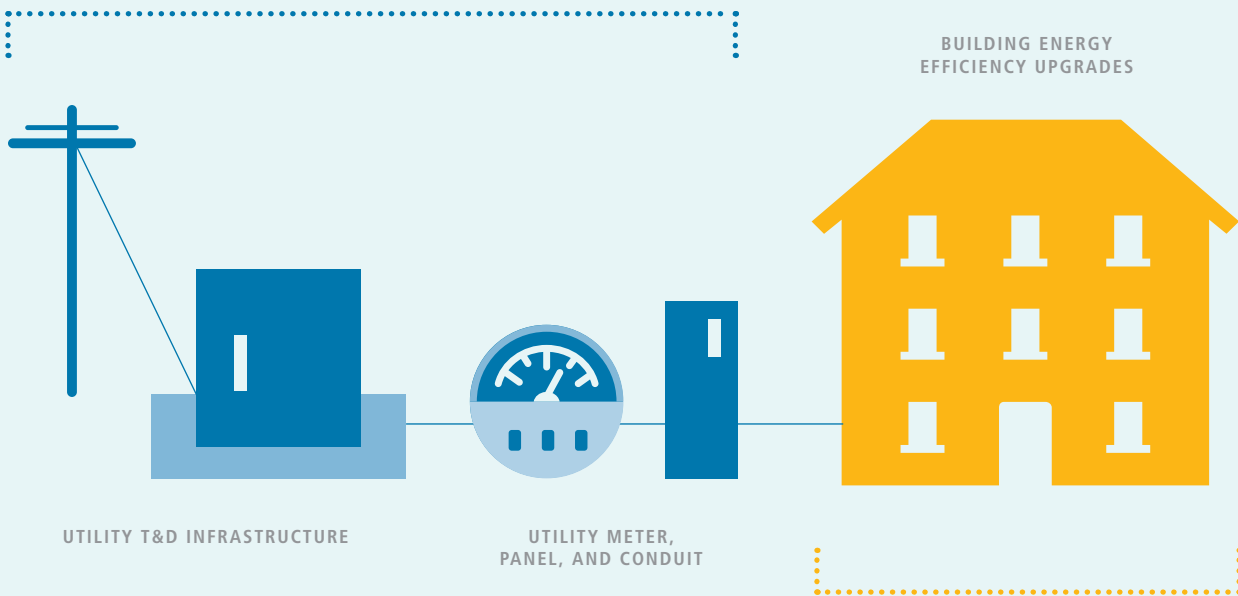
41 Again, a suitable starting point may be the existing cost effectiveness methodology analysis from the Distribution Resources Planning proceeding (R.14-08-013 et al.).

42 Existing analysis of energy efficiency (e.g., Sathe et al., *2019 EE Potential Study*) and electrification potential and climate pathways modeling (Mahone et al., *California PATHWAYS Model*; idem, *Residential Building Electrification*) can inform this step.

43 See, for example, the discussion of Energy Efficiency as a Resource in the *2019 California Energy Efficiency Action Plan* (Kenney, Bird, and Rosales, p. 22) It should be noted that a comprehensive site-level analysis requires access to both electricity and gas consumption. Regulators may need to adopt new policies for single-fuel utilities to gain access to data to support such analysis.

44 For example, Pacific Gas & Electric Company (PG&E) has relied on Willdan's LoadSEER since 2011 as a core application to support its Integrated Grid Planning team, which is responsible for planning, capitalizing, and optimizing the future of the electric distribution network that serves over 5 million California customers. LoadSEER provides load forecasting, solar, storage, and EV adoption scenario planning and insights that support capital decisions on where and when to upgrade the system. The California Public Utility Commission recognized PG&E's use of LoadSEER as a best practice for electric grid modeling. LoadSEER provides PG&E decision makers with the dynamic, granular forecasting required to understand the reliability and financial impacts of these changes up to 20 years into the future at hourly resolution.

TYPICAL UTILITY RATE-BASED INVESTMENTS



Utilities in multiple states offer tariffed terms of service for site-specific investments in building energy upgrades with site-specific cost recovery on the utility bill.

SITE-SPECIFIC INVESTMENTS WITH SITE-SPECIFIC COST RECOVERY CREATE AN INCLUSIVE OPTION FOR OVERCOMING UPFRONT COST BARRIERS FOR ALL

Introduction to Site-Specific Investments and Cost Recovery

Rationale for Site-specific Transaction vs. Person-specific Transaction

An accessible financing solution for decarbonization upgrades needs a way to recover costs with a site-specific revenue stream within the useful life of the upgrades, which could be more than a decade. Assigning the capital commitment to an individual person rather than a site would introduce consumer credit risk into the transaction, which would result in the systematic disqualification of more than one third of all consumers based on income, credit score, and renter status.

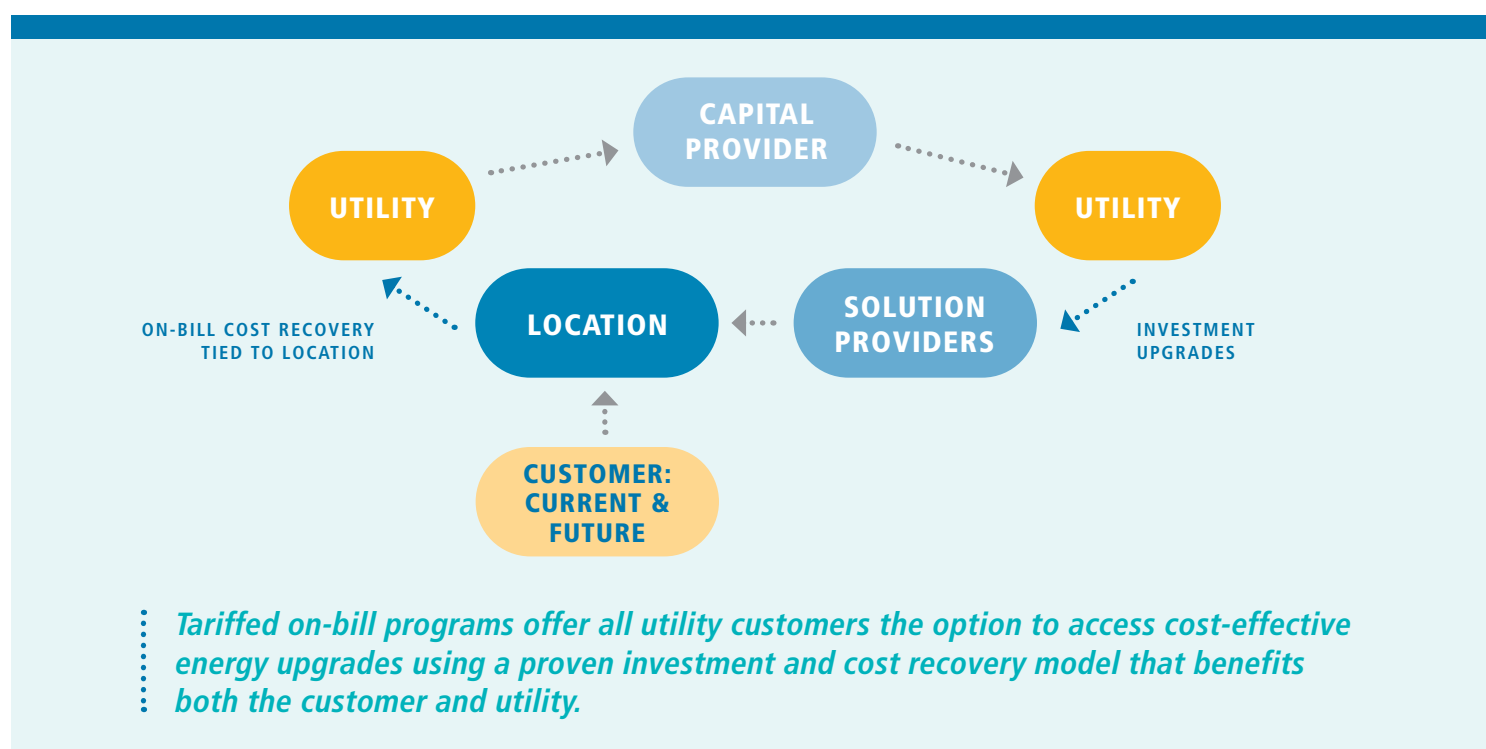
Utilities have existing mechanisms for making system-wide investments with system-wide cost recovery through monthly bills, and with a surge of interest in energy solutions on the customer's side of the meter, some utilities have introduced site-specific investment with site-specific cost recovery investing in distributed energy resources "behind" the meter. This allows a single utility bill to combine the energy or decarbonization service costs with the lower utility bills resulting from the improvements made.

The level of uncollected revenue on expected utility bill payments (i.e. charge-off rate) is typically low compared to default levels on consumer debt instruments, making cost recovery via the utility bill attractive and lower risk. The logistics of a payment collection system need to handle transactions both with the participating customers and in aggregating and passing revenue on to the capital provider source/ instrument at low transaction cost. The payment system itself should be able to support the envisioned scale of hundreds of thousands or millions of households being served.

Tariffed Investments with On-Bill Cost Recovery

Utilities offer services with terms that are set forth in documents called tariffs. Tariffs are different than loans, leases, or lien-backed loans, such as the financial product in a Property Assessed Clean Energy (PACE) program. Tariffs typically describe the amount that all customers in a specific market segment (e.g. residential or commercial) will pay for services delivered through a shared infrastructure system, and therefore, tariffs typically facilitate investment in infrastructure that serves all customers on the system and also facilitates the recovery of those costs along with operating costs from all customers using the system.

By contrast, utility regulators and oversight boards can also approve a special-purpose *tariff* with terms of service that allow the utility to invest in upgrades at a *specific site* in its service area and recover its cost for that investment only from that site through a charge *on the bill*, ideally one that is less than the estimated savings. The name *tariffed on-bill* is a literal description of the mechanism that allows a utility to deploy capital to cost-effective upgrades at the grid edge (i.e. on the customer's side of the meter) with an assurance that the utility will be able to recover its cost on terms that meet basic tenets of economic regulation in the utility sector: non-discriminatory, cost-based, just, reasonable, and fair.



Fulfilling Design Criteria for an Accessible Financing Solution

Utility regulators and oversight boards approve the terms of service for essential utility services, which are billed monthly. In addition, a utility regulator may choose to approve the use of the utility bill to collect revenue for services provided by a third party. These options have distinctly different attributes:

- 1. Tariffed investment with on-bill cost recovery.** Billed as an ongoing line item for an energy service on the regular energy utility bill; recovers capital deployed for an essential utility service “behind-the-meter” and generates benefits to occupant with easy ability to scale capital acquisition; assures end of on-bill charge when cost recovery is complete, at which point customer has a pathway to ownership; considered utility capital investment and not consumer or property debt obligation during the investment cost recovery period; expected high household adoption rates, based on prior experience.

2. Stand-alone (sometimes called “third-party”) charge on utility bill. Billing for an elective service to current customer, per some agreed-upon terms with an individual, but without a long-term payment obligation tied to the meter or successor dwelling unit occupants; unable to utilize standard non-payment remedies for energy utility services bill; risk of successor occupant’s unwillingness to take on payments; shortens depth and payback periods that a prudent investor is willing to take on.

Recommended investment and cost recovery mechanism: *Adopt a tariff obligation for a site-specific decarbonization investment with a monthly cost recovery charge assigned to the meter location and thus to successor occupants / end users.*

The exact amount of the obligation would be based on the scale of the investment made at the site as well as the terms of the tariffed on-bill program, which consider the cost and benefits expected from the improvements made, and factor in any co-payments made by others.

Tariffed investment with on-bill cost recovery assures revenue for a utility-arranged “behind-the-meter” investment will be recovered through a regulator-approved tariff and available to repay the capital funds secured to make these investments. This solution addresses three of our four design criteria:

- **Long-term payment collection:** Utility tariffs already are designed to collect sufficient revenue to meet authorized utility long-term capital investment obligations over the cost recovery times required. This meets the criterion to finance improvements over 10-15 years. The ability to link the tariff to a specific site supports investments in rental units with multiple changes in tenancy.
- **Leverage utility bill savings to defray investment costs:** Recovery costs would be set to long periods to best match the long-term energy use and

cost savings expected to occur. The utility billing platform ensures that decarbonization cost recovery payments are offset in whole or part by energy use and cost savings related to any energy resources. The decarbonization service fee is intended to be offset by lowered energy usage and thus lower costs when taking all energy services into account.⁴⁵

- **Cost and scale:** The existing utility billing system offers an easy means to maintain a service fee on the bill.⁴⁶ Utilities already have billing systems with individual customer accounts to which the decarbonization tariffed on-bill cost recovery service fee would be included. Utilities also utilize “common-area meters” for multi-family buildings and property-level energy use that, if so desired, could be assigned some portion of a decarbonization service fee supporting multi-family housing.

Satisfaction of our fourth criterion, cash-positive outcomes, is subject to program design choices, as discussed below, under “General Provisions: Consumer Protections”.

Potential for Integration: Combining Financing and Funding

While analysis by E3 and others has shown that not all building decarbonization upgrades are cost effective with customer bill savings alone, *some portion* of every decarbonization upgrade would meet the cost effectiveness criteria for a tariffed on-bill investment. Under these conditions, financing the *entire* cost of the upgrades could result in *negative cash flow* for participating customers. For that reason, building decarbonization upgrades require an approach that combines financing for the portion of the upgrade costs that would be cost effective with bill savings alone, alongside funding associated with other value streams as identified in the prior section.

45 The degree of bill offset and total cost reduction for a specific property may depend on the specific gas and electricity tariffs applicable both at the outset of participation and as these change over the years.

46 The four California IOUs currently offer loans funded by ratepayers to non-residential customers seeking energy efficiency upgrades, and multi-family common area meters are eligible as well. The utility collects the debt payments through each utility’s on bill financing (OBF) program. Utilities have found this conducive to getting traction on efficiency improvements, and producing larger savings, as evidenced by the utilities’ recent increases in their OBF loan caps from \$100,000 to \$250,000 per meter. Source: Interview with CAEATFA program manager David Gibbs, February 18, 2020.



Existing tariffed on-bill programs allow multiple mechanisms through which funding can flow to a project site, including existing utility rebate and support programs available to all customers, incentive payments to participants for undertaking the upgrades, government funded programs, and even discretionary consumer spending. With these features, tariffed on-bill investments are compatible with an approach to building decarbonization that recognizes that most properties will need upgrades that could be paid for with a *combination of financing and funding*.

The remainder of this introduction to tariffed on-bill programs will focus on the portion of the upgrade costs that could be financed through a site-specific investment offering customers an assurance of immediate positive cash flow and assures utilities of site-specific cost recovery under the terms of an approved tariff. The balance of the

cost for the upgrades may be accounted for by utility incentive payments to participants, government subsidy programs, or other beneficiary discretionary payments called co-payments.

In cases where a customer is qualified for additional program cost assistance, utility investment through a tariffed on-bill program can be combined or “stacked” with benefits such as direct install programs or incentive and rebate programs. Customers that are income-qualified for discounted energy rates (e.g. CARE) and participating in tariffed on-bill programs, still are eligible for the tariff, though the lower cost of energy may also reduce the amount of utility bill savings realized by the customer since the balance of the savings accrue to ratepayers that are otherwise paying for the rate discount.

Overview of Tariffed On-Bill Programs from DOE Better Buildings Solutions Center

In 2016, the DOE launched a Clean Energy for Low Income Communities Accelerator (CELICA) that included in its scope financing solutions to address barriers to participation in clean energy solutions.

In 2019, DOE released an Issue Brief on the topic of tariffed on-bill programs through its Better Buildings Solutions Center.

⁴⁷ Below is an adapted excerpt:

A tariffed on-bill program allows a utility to pay for cost-effective energy improvements at a specific residence, such as home heating and cooling units, and to recover its costs for those improvements over time through a dedicated charge on the utility bill that is immediately less than the estimated savings from the improvements.

The tariffed on-bill model differs from on-bill loans and repayment models in that tariffs are not a loan, but rather a utility investment for which cost recovery is tied to the utility meter according to terms set forth in a utility tariff.⁴⁸

A tariff (or tariff rider) approved by utility regulators sets forth the terms of service for an investment made at a single location, with the cost recovery assigned only to the meter at that location. The tariff charge will remain attached to the meter at the improved location, regardless of who occupies the property, until utility cost recovery is complete.

The tariffed on-bill upgrade is associated with the utility meter location, not an individual household account. Therefore, utilities do not have to evaluate occupant credit scores and debt-to-income ratios,

nor screen participants for homeownership status.

Because there is no customer debt obligation, the terms in the tariffed on-bill program apply automatically to the current customer as well as future customers at each upgraded location. The tariffed charge for cost recovery of the utility expenditure survives foreclosure proceedings, changes in tenancy, and can be floated through periods of vacancy.

Residents pay utility bills that are lower than they would have been without the upgrades and, if designed with consumer protections in place, the energy savings are greater than the tariff charge that recovers the utility investment. This reduces risk to residents, who, if they used on-bill financing or repayment, might otherwise have been forced to pay off their debt if they wished to move before the loan repayment was complete.

The on-bill tariff program is especially good for removing barriers to rental home upgrades because the program enables a utility to recover its cost for energy improvements even if renters leave before the recovery is complete.

Tariffed on-bill programs have demonstrated success in Kansas, North Carolina, Arkansas, Hawaii, New Hampshire, Tennessee, and Kentucky, even in areas of persistent poverty. Each of those programs included the minimum requirements and essential elements of a tariffed on-bill program that qualify for the use of a trademark, Pay As You Save® (PAYSA)®, which refers to tariffed on-bill programs that meet these criteria. (See side bar: *Essential elements of a tariffed on-bill program.*)

⁴⁷ DOE, *On-Bill Tariff Programs*.

⁴⁸ According to the Regulatory Assistance Project, a tariff is “a listing of rates, charges, and other terms of service for a utility customer class, as approved by the regulator.” (Lazar, *Electricity Regulation in the US*, p. 199).

Table 3. Key Differences Between On-bill Loan, PACE, and Tariffed On-bill Models

	ON-BILL LOAN	PACE	TARIFFED ON-BILL
What is the charge?	Debt payment on utility bill	Debt payment on property tax bill	Cost recovery line item on utility bill
What does a successor homeowner or occupant pay?	Some programs allow voluntary loan transfers but not automatic	In principle, transfer to buyer is possible, but transfers face resistance from mortgage industry	Cost recovery automatically applies to successor occupants
Consumer credit underwriting criteria	Necessary for many loan programs	Necessary for many programs, along with minimum thresholds for home equity	Consumer credit not involved. Utility may use bill payment history to confirm good standing.
Is utility disconnection possible for non-payment?	Yes, depending on legislative or gubernatorial policy and/or regulatory approval	No, but home foreclosure is possible.	Yes, with regulatory approval
Is investment cash positive to the occupant?	Maybe, if program ties bill payment to savings	No nexus between capital investment and bill impacts	Yes, immediate net savings is a core program requirement
Renters allowed to participate?	Yes, but few do	Yes, but few do	Yes

Adapted from DOE, *On-Bill Tariff Programs*

Elements of a Tariffed On-bill Program

Energy Efficiency Institute, Inc., has published an open-source set of essential elements and minimum requirements along with a list of program design attributes it considers to reflect best practices in the field after working on such programs since 2002.⁴⁹

A tariffed on-bill program should have these essential elements:

1. A tariffed charge assigned to a location, not to an individual customer;
2. Billing and payment on the utility bill with disconnection for non-payment; and
3. Independent certification that products are appropriate, and savings estimates exceed payments in both the near and long terms.

A tariffed on-bill program should meet these minimum program requirements:

1. The offer to the customer must not be burdened with customer risk, which undermines the offer’s attractiveness, results in fewer projects being completed, and reduces the program’s effectiveness in achieving its goals.
2. The utility doing billing and collection of tariffed on-bill charges agrees to pay the capital provider(s) each month the amount billed to TOB customers that month, regardless of the utility’s collections, and to treat any bad debt for TOB measures the same way that it treats all other bad debt.

49 Energy Efficiency Institute, Inc., “PAYS Essential Elements”

3. Tariffed on-bill offers will not be forced to compete with other rebate options. Any utility offering rebates and implementing a program using a tariffed on-bill program will offer the same rebates to all participants. Utilities can reduce the costs for rebates if rebates available to all customers are limited to the amount required to qualify an upgrade for the tariff.

Based on prior experience, best practices of tariffed on-bill programs include:

1. TOB upgrades must be proven technologies.
2. Participants must receive immediate net annual savings of at least 25 percent above program services charges (80 percent rule).
3. Duration of payments must not be more than 80% of the estimated life of shortest-life component or a full warranty/ insurance policy.
4. Mid-payment-term increases are not permitted.
5. The Program Services Charge must be a fixed amount.
6. Upgrades may not entail new debt obligation for participating customers.
7. Payments stop if upgrades stop working until they are repaired and working again.⁵⁰
8. Charges are also suspended for vacancy if meter is shut off, and the cost recovery period commensurately extended.
9. Repairs or vacancy can extend the duration of charges but may not increase the monthly payment.
10. Pre-payment of unbilled charges is not permitted (i.e., no payment without savings).
11. At conclusion of utility cost recovery, upgrades belong to building owner at that time.
12. Savings estimates may be reported to customers on a monthly or annual basis.
13. Upgrades may not have end-of-lease charge or transfer of ownership financial obligation.
14. Utility subsidies and state and federal credits can only be included in cost effectiveness analyses if they can be used to lower upgrades' initial cost (no post-installation rebates).
15. To assure immediate and durable cash-positive benefits to the customer, savings analysis must be site-specific using site energy, include no energy inflation or adders, and use the amount of savings expected at the end of cost recovery for upgrades whose savings degrade over time.

50 A utility arranging the capital or a program administrator handling site-specific investments might consider incorporating some outside equipment insurance or appliance maintenance protection arrangement.

General Provisions

Criteria for Qualifying to Participate

Tariffed on-bill programs are open to all customers regardless of income, credit score or renter status.⁵¹ The accessibility of tariffed on-bill programs stands in contrast to consumer credit products, which are subject to underwriting criteria that financial institutions apply to qualify or disqualify customers for access to capital at different prices. By contrast, a tariffed on-bill investment in a site-specific upgrade is qualified by an assessment of its cost effectiveness at that site. As a result, the personal credit history of the occupant is not a factor in the transaction, and it can change over time as occupants at that location change over time.

Expansive eligibility is a major factor in the ability of tariffed on-bill programs to reach and serve multiple market segments, as demonstrated in programs spanning 18 utilities in eight states. In the residential sector, these tariffed on-bill programs have reached LMI households, including residents in counties recognized by the federal government for persistent poverty. While some federal and state programs aim specifically to reach low-income households with energy efficiency upgrades, the scale of that funding has historically been far below the need. Tariffed on-bill programs have provided remarkable resilience by catalyzing new investment in energy efficiency upgrades even in economically distressed communities – without waiting for a sufficient and sustained flow of grant funding to arrive.

Terms of Transaction

Tariffed on-bill programs authorize a utility to capitalize site-specific upgrades where a customer agrees to terms of service that are approved by the utility's economic regulator, the entity that is charged with ensuring the terms



51 Although personal credit history is not a factor in program eligibility, some utilities have used bill payment history as an indicator that an account is in good standing before capitalizing upgrades at that site. On the other hand, some utilities have used bill payment history to identify and prioritized attention to sites with troubled accounts because it is an indicator of high energy burden where savings can generate additional non-energy benefits.



include both consumer protection and fair terms for cost recovery for the utility. These terms are set forth in a tariff document.

Monthly service charge. Because each investment is site-specific, the fixed monthly charge on the bill for cost recovery is site-specific as well. The charge is capped at a level below the estimated savings from the upgrades (typically 80 percent). Although the value of estimated savings will rise if electricity prices rise, the best practice in tariffed on-bill programs to date is to apply only current rates, assigning to the customer all of the potential for additional savings if there are rate increases in the future.

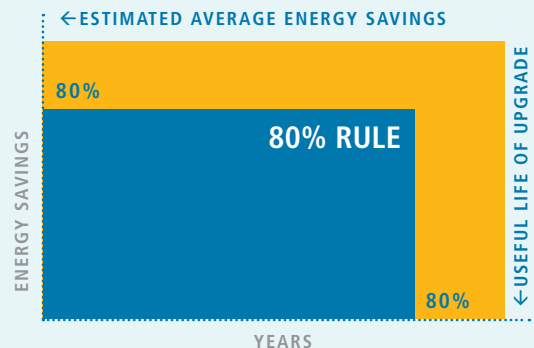
Period of cost recovery. The period of cost recovery is capped at 80 percent of the useful life of the upgrade, or the full length of a parts and labor warranty, whichever is greater. The CPUC has established approved useful life estimates for most commercially available technologies. Multiple upgrades can be combined into a single project, typically using either the shortest cost recovery period to apply to all upgrades or a savings-weighted average across the improvements undertaken.⁵²

Extending cost recovery. If some billing cycles are missed due to meter inactivity or nonpayment, the implementing utility can extend the duration of payments to assure its cost recovery from customers benefiting from the savings at an upgraded location. The terms of the tariff continue to apply to the location until all costs are recovered.

Cost of capital. The cost recovery charge includes the cost of capital deployed. There is no customer-paid interest payment on debt because the utility's capitalization of the upgrade is an investment and not a loan. If the source of capital is one that would be eligible to receive a regulated return for other system upgrades, the regulator may consider whether to allow similar treatment of site-specific upgrades so that the utility would have a similar degree of interest and motivation to pursue those business opportunities. (See next section for discussion of the options for capital sources.)

Program fees. Program administration fees can be funded from external sources or included in the project cost,

Illustration of 80% rule for a tariffed on-bill program based on the PAYS[®] system



$$\frac{\text{BLUE}}{\text{YELLOW}} = \frac{0.8 \times 0.8}{1.0} = \frac{0.64}{1.0} \approx \frac{2}{3}$$

Capping the monthly cost recovery charge at 80% of the estimated savings mitigates risk for the customer, and capping the period of cost recovery at 80% of the estimated useful life of the upgrades mitigates risk for the program sponsor.

which also facilitates the capitalization of those costs with cost recovery on the same terms as the equipment and installation costs. A recommended practice is to limit allowable recoverable costs to project material and installation costs, including the cost of capital that pays for the installation, and to put a cap on any administration fees that are included.

Incentives. If the building upgrades will generate value streams for the utility or for ratepayers broadly, the utility can offer incentive payments to undertake the building electrification upgrades. For example, Sacramento Municipal Utility District (SMUD) calculated the benefits of building electrification through multiple value streams, positioning the utility to offer attractive payments to reduce the upfront cost of electrification projects before the remaining cost is considered for a tariffed on-bill investment.⁵³

52 It is conceptually possible to have multiple upgrades at a single site, each with a different cost recovery period, though this approach has not been common in the field for primarily energy efficiency investments.

53 As of March 2020, SMUD offered customer incentives of \$2,500 per heat pump water heater and \$4,500 per heat pump HVAC unit.

Rebates. Rebate programs exist independent of tariffed on-bill programs, and the terms of service preserve the eligibility of customers to use any available rebate programs, rather than having them be treated as mutually exclusive options.

Co-payments. At sites where the building electrification upgrades would not meet the criteria for cost effectiveness in the tariffed on-bill program, a customer (or landlord) can elect to make a co-payment that reduces the upfront cost of the project to a level that would qualify it for utility capitalization through a tariffed on-bill program.

Proven technologies. Eligible projects are limited to proven technologies because the financial mechanism itself is not well suited for mitigating technology risk. A parts and labor warranty on equipment can address technology risk exposure for novel technologies.

Repairs. If the equipment installed through the tariffed on-bill program breaks, the customer should notify the utility or its program operator, at which the point the service charge for cost recovery is suspended until the cause can be determined. If the equipment breakdown is no fault of the customer, or if Fault Detection Diagnostics detect underperformance relative to design and systems commissioning outcomes, then the utility will either pay for the repair or replacement or end all service charges for cost recovery.⁵⁴

Non-payment Recourse

Tariffed on-bill programs are approved by utility regulators or oversight boards to provide an essential utility service. With regard to cost recovery and collections, the service charge is treated the same as the charge for other utility services, including being subject to customary procedures and notices of payment arrears. That being said, it is important to stress that tariffed on-bill programs function to reduce customer energy costs and thus reduce the risk of non-payment. To date, no utility offering a tariffed on-bill program has reported a disconnection for non-payment at a location where it has invested in cost-effective upgrades.

Automatic Application of Tariffed Terms to Successor Customer

As noted by the Issue Brief published by the U.S. Department of Energy: “Robust consumer protections must be in place for on-bill tariff programs to notify and explain to new residents that there is an additional financial obligation associated with the property as a result of investment in upgrades that have lowered the overall bill at that location.”⁵⁵ Because tariffed on-bill programs involve no assignment of a debt obligation, they do not involve imposing a legal obligation on one person that then must be transferred to another person. As a result, the tariffed charge survives foreclosure proceedings, changes in tenancy, and can be floated through periods of vacancy. That said, it is essential to notify successor customers of their benefits and obligations at an upgraded location to ensure that customers know about the improvements made to the home and to avoid potential misunderstandings. Notification is discussed further in the section on Implementation.

Consumer Protections

As previously discussed, a tariffed on-bill investment is not a loan, but rather a utility investment for which cost recovery is tied to the location served by the utility according to terms set forth in a utility tariff. As DOE describes it:

.....
A tariffed on-bill program allows a utility to pay for cost-effective energy improvements at a specific residence, such as home heating and cooling units, and to recover its costs for those improvements over time through a dedicated charge on the utility bill that is immediately less than the estimated savings from the improvements.
.....

54 A utility arranging the capital or a program administrator handling site-specific investments might consider incorporating some outside equipment insurance or appliance maintenance protection arrangement into the tariff or program terms.

55 DOE, *On-Bill Tariff Programs*

The cash-positive requirement is thus a central feature of the tariffed on-bill model. In practice, a requirement for cash-positive outcomes offers multiple benefits to program sponsors and participants.

- **Consumer protection.** The cash positive requirement serves an important consumer protection purpose by ensuring households do not incur higher costs for their energy services. This benefit is particularly critical in the context of the high background rate of disconnect notices for California IOU customers, as discussed in the Introduction.⁵⁶
- **Shared benefits.** Participants should share in the benefits of decarbonization, including joining in co-benefits that improve health, comfort, and safety. Low income and disadvantaged communities concerned with climate action and environmental justice should not be precluded from participating in solutions just because of the barriers to utilizing traditional forms of consumer finance or home ownership. Particularly for LMI households, clean energy investments should help build wealth. Thus, cash neutral is not enough. There have to be positive benefits for participants.
- **Higher customer acceptance rates.** Based on prior program experience, assurance of positive cash flows is expected to support higher rates of customer acceptance of program offers.
- **Risk management.** As discussed in more detail below, estimates of future energy savings are subject to a degree of uncertainty. Instituting a cash positive requirement thus provides a safety margin to households for performance risks.

While we recommend that public investments in decarbonization measures be guided by portfolio-level cost-effectiveness considerations, individual customer investments will necessarily be constrained by project-specific criteria. The importance of shielding customers from added energy burdens is paramount. We note the potential for cash positive requirements to restrict project scopes and thus limit the scale of decarbonization investments if no other value

streams are integrated with a tariffed on-bill program. We also note that tariffed on-bill programs in California will not exist in a vacuum. Complementary mechanisms for funding more comprehensive work scopes currently exist and more are under development, consistent with recommendations in Combining Multiple Value Streams.

SOURCES OF RISK AND MITIGATION STRATEGIES IN IMPLEMENTATION

We identify three categories of risk to (1) cash positive outcomes for participating customers and (2) business risks to program sponsors:

- **Performance Risk:** Factors that introduce uncertainty into the future metered performance of installed measures include: (a) project design shortcomings; (b) errors in project installation and commissioning; (c) operations and maintenance issues, including premature equipment failures; (d) data collection limitations; and (e) limitations in modeling and forecasting future energy performance.
- **Financial Risk:** Factors that introduce uncertainty into the financial performance of installed projects, independent of any performance risks include (a) uncertainty of future energy prices and tariffs⁵⁷; and (b) the potential for deflation.
- **Charge-off Risk:** Exogenous factors that can render a customer less able to pay utility bills, independent of project performance and financial attributes include (a) naturally occurring variability in energy consumption patterns due to changes in weather, occupancy, behavior, or acquisition of new energy-using technologies; (b) adverse changes to other household living expenses; or (c) adverse changes to household income.



56 Sandoval and Toney, *Living Without Power*

57 The utility bill impacts of decarbonization investments are calculated based on the ratio of electric to gas prices at the time of the investment with no forecast for escalation, so if the price of electricity rises faster than gas, then the actual savings would be smaller than estimated. While current signs in the market suggest that gas prices will rise faster than electricity prices, the relative rate of change remains a source of uncertainty.



PERFORMANCE RISK MITIGATION

In order to fulfill the assurance of net savings in a tariffed on-bill program, cost recovery charges must not exceed actual metered savings attributable to the tariffed on-bill investment, unless the cause is failure to maintain the upgrades or changes in the customer's desired level of service. Building owners and occupants are ill-equipped to assess, avoid, and mitigate performance risks, which do not include exogenous factors in the control of occupants, i.e., charge-off risks.

The program design challenge is that energy savings cannot be directly observed. The closest one can come to observing or measuring savings is to compare actual post-retrofit energy consumption to a synthetic baseline (i.e., a "counter-factual," representing a best estimate of what would have happened in the absence of the intervention). Differences between actual consumption and the baseline (i.e., "avoided energy use") represent a combination of factors, including true energy savings, exogenous changes, and uncertainty in the baseline itself.

For purposes of designing an opt-in tariff to recover site-specific investment costs, there are at least two approaches to this challenge. Both options start by establishing a baseline from historical energy consumption data and forecasting future customer energy savings. Both options then partition the associated benefits between the customer and the program. Option A, as described under Terms of Transaction, sets the program cost recovery as a fixed amount that is 20 percent less than the estimated savings and then attributes all future variation in avoided energy use to the customer savings portion. Variation is thus deemed to reflect charge-off risk factors within the customer control. In contrast, Option B fixes the customer savings portion and attributes all future variation in avoided energy use to the cost recovery amount. Variation is deemed to reflect performance risk factors within the program's control.

Option A offers the attractive feature of a simple, fixed cost recovery charge that is 20 percent less than the estimated savings. Its value as a consumer protection mechanism hinges on its ability to establish an accurate baseline, predict energy savings, and minimize performance risks. Only then can variations in avoided energy use be safely attributed to charge-off risk factors within the customer's control. Option A has been deployed repeatedly in tariffed on-bill programs.

Option B relaxes the requirement for perfect predictions and performance risk mitigation. It can also adjust the baseline for exogenous factors like weather. On the other hand, Option B requires a new cost recovery calculation every billing period. More importantly, variations within the customer's control are included in the variation assigned to the program, thereby creating a potential moral hazard. Option B has not been attempted in a tariffed on-bill context but finds precedent in Energy Services Company offerings.

FINANCIAL RISK MITIGATION

Energy price risks for both electricity and gas are mitigated by the exclusion of escalation in the development of the estimated savings and cost recovery charge. This approach is the same for both options A and B. The source of capital deployed for the decarbonization upgrades should have a term that is longer than the cost recovery period for the upgrades.

CHARGE-OFF RISK MITIGATION

Customers have the liberty to change the level of energy services they would like to use, which can result in utility bill changes that are unrelated to the decarbonization investments. It is appropriate for the customer to bear the risk of variable energy consumption to avoid creating a moral hazard that rewards waste. That said, there are methodological challenges associated with disentangling exogenous variables from the measurement and verification of savings based on meter data.



For purposes of mitigating program exposure to customer choices, we recognize three distinct sources of exogenous changes in energy services:

- 1. Rebound effects**, in which people increase their energy use as a result of lower operating costs stemming from improved energy performance. Nadel (*Rebound Effect*, p. 2) found the likely range for the rebound effect in space heating to be 1-12 percent, with rebound effects sometimes higher than this range for low-income households who could not afford to heat their homes adequately prior to weatherization. The study found comparable ranges for other end uses.
- 2. Customer purchase and investment decisions** that add substantial new energy loads. Examples in this category include remodel projects that add conditioned space to the home, installation of EV chargers, hot tubs, and similar energy-intensive appliances.
- 3. Normal variations due to life circumstances**, including changes in household composition, variations due to travel, addition of small plug loads, etc.

When customers are unable to pay the charges billed for a utility service, the unpaid charges are treated as outstanding accounts receivable. In the context of a tariffed on-bill program, the accounting treatment of unpaid cost recovery charges is the same as the treatment of unpaid charges for other utility services. Charges that remain unpaid are eventually determined to be uncollectible, at which point they are charged to all customers and *charged-off* as accounts receivable, consistent with the treatment of other uncollectible charges. Tariffed on-bill investments are not loans. Unpaid bills do not result in a financial default. All future billed charges for cost recovery are not charged-off, only the past billed charges that had been uncollectible. The utility can continue billing for cost recovery from the location when the meter is active, and it can extend the number of billing cycles for cost recovery to cover missed payments, provided that the upgrades continue to work.

Further discussion of risk mitigation strategies is presented under Other Implementation Topics below.

Sourcing Capital and Managing Portfolio Risk

Tariffed on-bill programs can draw capital from virtually any long-term source of capital available to a distribution utility. The versatility of the sources of capital that can be deployed is one of the attractive aspects of this instrument.

Capital Source Options

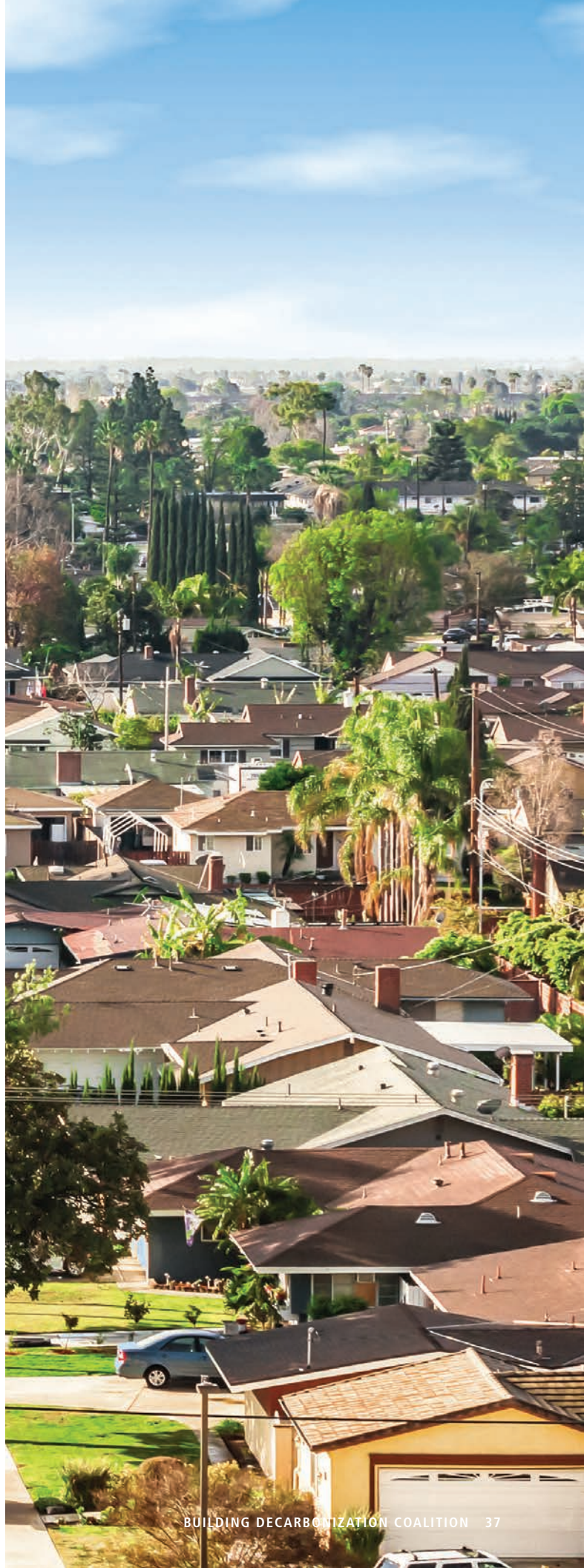
As an initial start-up source of capital, utility regulators may allocate a portion of *ratepayer* funds. The cost of capital assigned to ratepayer funds is typically assigned to be zero, even though the opportunity cost to ratepayers of using that capital is higher than zero. This results in a subsidy implicitly funded by ratepayers, whose own cost of capital is much higher. The zero percent cost of capital helps more projects meet the criteria for cost effectiveness in a tariffed on-bill program without a co-payment. The scale of ratepayer funding available is tightly constrained compared to open capital markets because ratepayer spending increases the rates for all customers by raising capital through utility rates for energy sales. **Because there is a limit to the latitude for raising utility rates, ratepayer funding is ultimately not a scalable solution even though it can be a successful source of quick start funds for a pilot program.**

Distribution utilities typically have a low cost of capital due to the effectiveness of their regulated terms of service in assuring payment. In California, investor-owned utilities have a weighted average cost of capital above seven percent.⁵⁸ This compares favorably to consumer credit products, and because the utility can deploy capital without making loans to customers, it is an advantaged option for those who would not be able or willing to take on a personal debt obligation.

Competitively priced capital for building decarbonization upgrades also can be sourced from vast capital markets, such as corporate green bonds, public bonds issued to fund a government financing facility (e.g. a state green bank), or by financial institutions in the private sector



58 See for example IOU actual and authorized rates of return, published at <https://www.cpuc.ca.gov/General.aspx?id=12093>





(e.g. banks). These sources of funds might have capital costs ranging from one to two percent for California state bonds to four to five percent for a corporate bond issuance from Southern California Edison.⁵⁹ The large scale of capital that can be deployed through tariffed on-bill programs also helps drive down the cost of capital for the projects they can reach, compared to other options for transactions at a similar scale.

Reserve Funds

Utilities offering a tariffed on-bill program are obligated to make scheduled payments to their capital providers regardless of the performance of their collections protocols for cost recovery charges. Their risk exposure is mitigated by the highly diversified nature of the investment portfolio as well as prevailing protocols for charging the small fraction of unpaid bills to all ratepayers. Tariffed on-bill investment programs support a large number of relatively small scale projects across many different sites. Diversification across so many project sites mitigates risk at a portfolio level. The current uncollected revenue charge off rate across all investments made through all known tariffed on-bill programs is less than 0.1 percent.⁶⁰

Even with a charge-off rate that is lower than the charge-off rate for a utility's mainline business of selling energy services, some utility executives may still express apprehension about the performance of their tariffed on-bill investment portfolios. One risk mitigation instrument that can help inspire confidence is a reserve fund capitalized

by a government entity or philanthropic foundation.⁶¹ An example of the latter is the Energy Solutions Reserve Fund (ESRF) established by a non-profit organization in North Carolina. ESRF offers to reimburse utilities each year for charges offs in their tariffed on-bill investment portfolio *in excess of the percent of charge offs for their main business* (e.g. electricity sales). This formulation assures that the utility would be motivated to apply its standard protocols for cost recovery to investments in the tariffed on-bill programs because it is in the first position to incur any losses, and it puts the reserve fund in a less risky "second loss" position. The amount of money held in reserve is approximately two percent of the total amount of investment it secures, and to date, no reimbursements have been claimed from the Energy Solutions Reserve Fund.

A similar purposed fund was authorized in 2013 by the CPUC to provide credit support from ratepayer efficiency funds for residential consumer and small commercial business energy efficiency loans being offered through the California Hub for Energy Efficiency Financing (CHEEF) pilot finance programs.⁶² Another credit support mechanism was authorized by the California Legislature to back-stop possible payment shortfalls from a portfolio of PACE transactions. Both credit mechanisms are administered by the California Alternative Energy and Advanced Transportation Finance Authority (CAEATFA), a wing of the State Treasurer's Office. The PACE credit program reports that "To date, 156,415 residential PACE financings valued at about \$3.6 billion are covered by the PACE Loss Reserve. CAEATFA has not received any claims on the loss reserve."⁶³

59 Goldfarb, "SCE paying up in bond sale"

60 Hummel and Lachman, "What is inclusive financing?"

61 More than a decade ago, one tariffed on-bill program for energy efficiency upgrades was designed alternatively with a fee on participants to fund a reserve that the utility would tap in the case its program incurs losses higher than the prevailing charge-off rate. Since then, such an approach has not been adopted elsewhere in tariffed on-bill investment programs because it undermines the value proposition to customers whose choice to participate is generating surplus benefits for the utility and society.

62 Because this is a lender-driven program, each enrolled lender is limited to receiving up to \$1 million in support for its qualifying consumer loan losses. See: <https://www.treasurer.ca.gov/caeatfa/cheef/cheefpilotprograms.pdf>. TOB, on the other hand, is not a consumer loan product.

63 <https://www.treasurer.ca.gov/caeatfa/pace/activity.asp>

Other Implementation Topics

Notification to Successor Customers

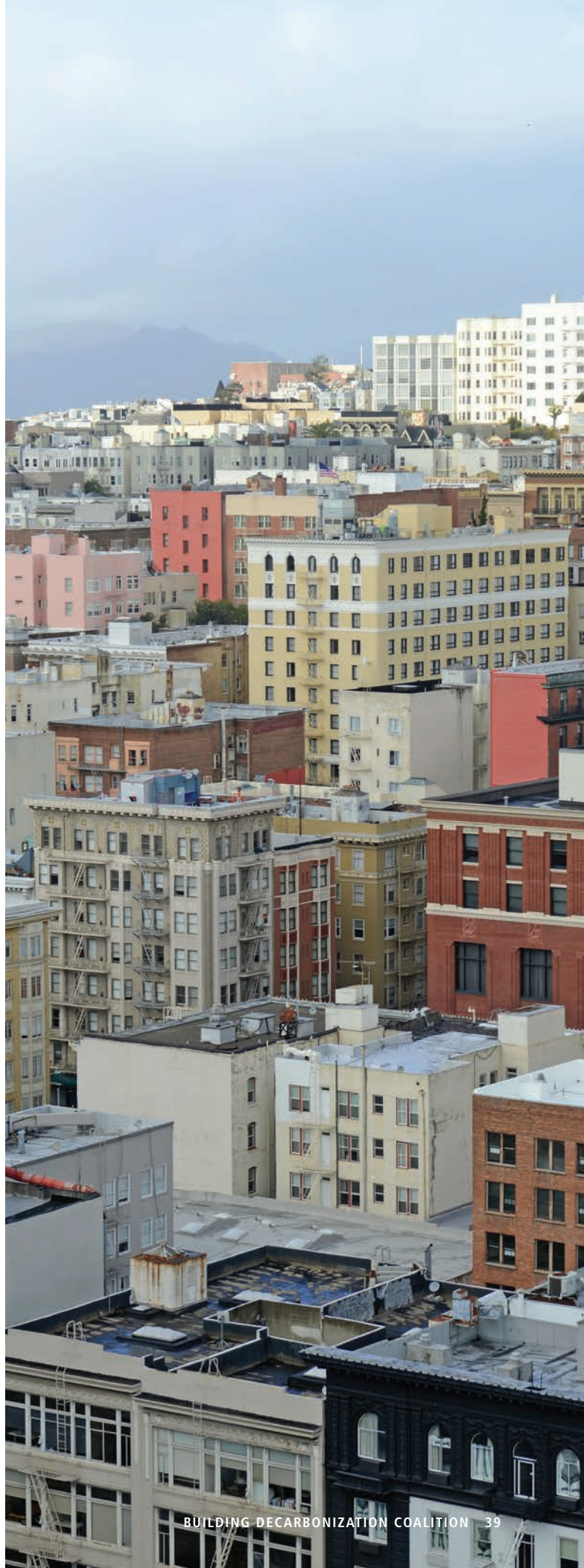
Prospective building purchasers need to know that the building has been upgraded through a utility program for which cost recovery is still underway. The implementing utility or program operator can record a Resource Efficiency Notice on the property records in jurisdictions where notices can be assigned to property records with a one-time payment.⁶⁴ The disclosed information needs to include the types of upgrades made, the date, the cost of the monthly charge, and the expected date of completion for cost recovery. The notice would thus be communicated to a prospective buyer in the course of a title search. This system for notifying successor customers does not require a seller to notify a purchaser of the upgrades because it provides sufficient notice to any prospective purchaser of a property who performs the minimum due diligence associated with a building purchase.

In tariffed on-bill programs for energy efficiency, owners are required to notify prospective tenants that they are considering renting a home upgraded for resource efficiency and lower operating costs.

The best notification process may not always ensure notice. Not all buyers perform due diligence prior to purchase. Not all landlords remember to comply with agreed-upon stipulations. The utility should ensure notice to successor customers at locations where upgrades have been installed. For example, when a successor customer applies for new service, the utility can send the new customer a letter explaining that the property has been improved for resource efficiency, outlining the benefits and obligations of the tariff that applies to the location until the utility's costs are recovered.



64 California requires that the only notices attached to property record be authorized by statute. The state legislature authorized such a notice in the Water Bill Savings Act of 2017 (Senate Bill 564), and it would presumably need to repeat this authorization for building energy upgrades.



A utility can help an owner to market their upgraded property as being less expensive to operate by offering to install a plaque on the outside of the main entrance of the housing unit. This also serves as an additional method of notification.

Provisions Specific to Tenants and Landlords

Rental units are eligible for upgrades in tariffed on-bill programs, making it possible for renters to benefit from the value streams the upgrades generate if the renters pay for the utility bills. In most rental properties, the renter and landlord have opposite interests related to investments in energy upgrades that generate net savings for renters, and these famously pervasive “split incentives” have been a persistent barrier to reaching rental market segments.

Participating renters in a tariffed on-bill program can be residents in single-family or multi-family buildings. In either case, the building owner must first agree to permit the utility to install resource efficiency upgrades in their building. The conditions of the agreement assure that (1) the owner will maintain the upgrades (and not damage them) and (2) the owner will notify prospective renters before they sign a lease that the utility has upgraded the unit on terms that include cost recovery on the monthly bill.

Landlords do not play a role in qualifying or disqualifying renters as customers eligible for a tariffed on-bill program unless they refuse to sign an Owners Agreement, an instance that has seldom been reported by existing tariffed on-bill programs. On the contrary, landlords have a financial motivation to help buy down the upfront cost of an upgrade to the point at which it would qualify for a utility upgrade in a tariffed on-bill program.

LANDLORD CO-PAYMENT REQUIREMENTS

As noted in the section on Combining Multiple Value Streams, tenants benefit from building decarbonization projects via reduced utility bills and improved occupant health and comfort outcomes. Property owners, meanwhile, may benefit from improved asset values. This latter benefit is particularly apparent for investments that can

be readily appraised (e.g., rooftop solar installations) and those investments that address a core obligation to warrant habitability, such as the provision of heat and hot water or correction of deferred maintenance issues.

Landlords have a fiduciary duty to provide space heating and hot water services to their tenants. Providing ratepayer funds for the full replacement cost of old mechanical systems would unfairly shift that burden from landlords to ratepayers. For this reason, the CPUC has adopted provisions for the Energy Savings Assistance Program (ESAP) to limit ratepayer funding for these core services.⁶⁵ We recommend that tariffed on-bill programs incorporate landlord co-payment provisions modeled on ESAP requirements.

One possible twist on a tariffed on-bill program design for in-unit decarbonization measures in multifamily housing is to attach cost recovery for in-unit improvements to the common area meters, which the landlord pays, rather than to the tenant meters. In this scenario, cost recovery would typically get passed through to tenants via Ratioed Utility Billing System (RUBS) formulas or other common area adjustments. Thus, cost recovery would still need to exclude the landlord’s co-payment requirements, as described above. This approach offers appealing opportunities for simplification in situations where the landlord is making comprehensive building improvements, including upgrades to all units.

RENTER PROTECTIONS AGAINST INCREASED HOUSING COST BURDENS

Whereas a well-designed utility tariffed on-bill program can shield tenants from increased energy burdens, it does not shield them from possible increased housing burdens. Stakeholders have raised the prospect that decarbonization investments capitalized through any financing mechanism could be cited as a cause for rent increases that erode or negate benefits of those improvements to the tenant, including any bill savings. The magnitude of this risk depends on the nature of the rental housing, as discussed below.

65 “The Utilities may opt to provide, at a nominal charge to the property owner, evaporative coolers, refrigerator replacement, and replacement air conditioners and heat pumps.” (CPUC, *ESA Policy and Procedures Manual*, p. 23)



Deed-restricted Affordable Housing and the Treatment of Utility Bill Savings

Deed-restricted affordable housing includes provisions for mortgage or rent subsidies that limit the cost to renters of combined rent plus utilities to 30 percent of their household income, for designated occupants whose maximum eligible income is a designated percentage of the Area Median Income. Expected utility costs are determined via utility allowance formulas. Both state and federal housing mortgage and rent assistance programs have specialized rules on handling changes in utility bills, relative to the level of rents charged to tenants and the associated subsidies to keep these rents low. Two types of federal housing assistance programs affect how utility bills are paid, which creates challenges to financing energy upgrades that are not unique to tariffed on-bill investment programs. To ensure utilities would be able to capitalize upgrades to buildings receiving these two types of federal housing assistance, either federal rule changes or adaptations to the tariff on-bill terms would be needed to make decarbonization investments attractive.

First, housing that receives mortgage financing via Low Income Housing Tax Credits (LIHTC) include a mechanism to amend total rents (higher) based on energy bill savings from energy efficiency, though solar benefits from the Solar On Multifamily Affordable Housing program are required to flow entirely to tenants. Utility tariffed on-bill programs must adopt a comparable provision to flow benefits through to tenants, since applying a cost recovery charge to the utility bill *and* adjusting the rent upward in the face of lower utility bills otherwise would constitute double charging.

Second, in the special case of upgrades performed on properties that receive combination rent/utility subsidies from U.S. Housing and Urban Development (HUD), the resulting utility bill savings flow back to HUD in the form of reduced rent/utility subsidies, as the utility bill declines. Tenants in HUD properties thus pay the same total rent plus utilities, and the landlord sees no financial benefit to offset investments. HUD spends more than \$6 billion each year paying the utility bills for federally subsidized housing.⁶⁶ The lack of incentive for landlords to facilitate or prioritize upgrades to the energy performance of these buildings is a chronic challenge, and further exploration would be needed to confirm whether utilities offering to capitalize building energy upgrades on tariffed on-bill terms could be adapted to the interests of HUD as well as landlords that pass through utility costs.

Market-rate Low-income Housing

Renter protections against increased housing costs are more problematic for market-rate low-income housing. In communities with rent control provisions, these requirements may offer protections. Local governments are the logical entities to monitor their local real estate markets and take action to preserve housing affordability. Affordability provisions will require consistent and uniform enforcement to be effective. We recommend that evaluations of utility tariffed on-bill investment programs seek data on subsequent rent changes to determine whether landlords are double billing renters for upgrades by authorizing utility cost recovery and then adding cost recovery to the rent. The San Joaquin Valley Pilot offers a possible precedent on this issue.⁶⁷ Any patterns of rent increases would merit a policy response.

66 HUD, https://www.hud.gov/program_offices/economic_development/eegb/utilities
67 CPUC, *Decision Approving San Joaquin Valley DAC Pilot Projects*, p. 86



ASSURING LANDLORDS MAKE DECARBONIZATION INVESTMENTS

The requirement in a tariffed on-bill program for a landlord to first grant permission for a utility to make decarbonization investments puts landlords in the position to veto tenant access to decarbonization benefits. In addition, a landlord can decline the option to make a co-payment that might be needed in order to reduce the project cost to a level at which it would generate positive cash flow for the tenant based on estimated bill savings. The 2019 California Low Income Needs Assessment report, citing Energy Savings Assistance contractors, reported that a barrier to ESA program participation occurs when a landlord will not sign the form to allow their renter to receive qualified targeted measure. According to the report, this barrier arises primarily but not exclusively in multifamily buildings. The study did not provide a numerical estimate of the incidence of this issue.⁶⁸

If there is a concern after a period of time that landlords are preventing renters from utilizing tariffed on-bill investments, landlords could be compelled to authorize and help capitalize decarbonization upgrades by implementing one or more of the following regulations from other jurisdictions:

- Set **minimum performance standards** for residential rental housing, including requirements for landlords to make specified property improvements by date certain (e.g., [City of Boulder SmartRegs](#))⁶⁹
- Establish **whole-building carbon intensity limits** for existing buildings (e.g., [New York City Local Law 97](#))⁷⁰
- Adopt a **“decarbonization bill of rights”** modeled on California’s Solar Rights Act.⁷¹
- Establish improved building permit compliance by adopting a **permit verification on sale** ordinance like Davis.⁷²

68 Opinion Dynamics and DNV GL, *2019 California Low-Income Needs Assessment*, p. 8

69 Petersen and Lalit, *Better Rentals, Better City*

70 See https://www1.nyc.gov/assets/buildings/local_laws/ll97of2019.pdf

71 The Solar Rights Act comprises the following California codes of law: California Civil Code Sections 714 and 714.1, California Civil Code Section 801, California Civil Code Section 801.5, California Government Code Section 65850.5, California Health and Safety Code Section 17959.1, California Government Code Section 66475.3, and California Government Code Section 66473.1

72 Enforcing permit compliance would shrink the cost gap between a landlord’s typical like-for-like replacement cost and the higher code-compliant replacement cost. Currently, the typical like-for-like cost is an unpermitted, questionably-compliant, and lower cost. See <https://www.cityofdavis.org/city-hall/community-development-and-sustainability/building/resale-program>

- After adopting improved permit compliance, adopt a **“No Stranded Assets ordinance”** requiring that all new installations of space conditioning and water heating equipment be high performing heat pump technologies. This would assure that lower/zero carbon appliances are gradually installed as old equipment burns out, and it would protect against re-purchase of gas appliance models.

Local governments through their enforcement of building codes and their business licensing powers, appear to be the most likely agents for assuring tenant access to decarbonization investments. Program sponsors should monitor renter participation in tariffed on-bill programs and, if systemic issues emerge, coordinate with local and state authorities to enact remedies.

Alternative Approaches to Performance Risk Mitigation

As described under Consumer Protections, above, program designers have at least a couple options for mitigating performance risks, depending on whether they prefer to attribute variation in avoided energy use to factors within the customer’s control or within the program’s control. The mechanics of implementing these options are described in more detail below.

OPTION A: FIXED COST RECOVERY CHARGE TIED TO PREDICTED ENERGY SAVINGS

Well-run tariffed on-bill programs estimate savings by collecting site-specific data for use in engineering models calibrated with historical bill data for each site in order to ensure the ex-ante estimates are as accurate as possible. After constructing site-specific estimates for energy savings, tariffed on-bill programs take the remaining inherent uncertainty in savings estimates into account by capping monthly cost recovery charges at 80 percent of estimated savings over 80 percent of the estimated life of the upgrades as specified in Elements of a Tariffed On-Bill Program.

Tariffed on-bill programs implemented to date apply these steps, which are set forth in more detail in the Model Tariff for Tariffed On-Bill Programs in Appendix A:

- 1. Estimate cost recovery requirements.** As part of the work scope development process, develop the initial cost recovery estimate incorporating the following requirements:
 - a. Conduct site-specific savings analysis** using site energy, include no energy inflation or adders, use the amount of savings expected at the end of cost recovery for upgrades whose savings degrade over time. Require engineering models of energy impacts to be calibrated to baseline energy consumption based on historical bill data for that location.
 - b. Calculate the Cost Recovery Charge**, which is no greater than 80 percent of the estimated savings to a participating customer based on current retail rates for electricity and/or gas.
- 2. Execute a Purchase Agreement with the customer.** The agreement should specify:
 - a.** Cost recovery term, not to exceed 80 percent of the expected useful life of the shortest-life component or a full warranty/insurance policy.
 - b.** Gas and electric prices to be applied to energy savings for purposes of calculating cost recovery amount are assumed to remain fixed for the duration of the cost recovery term, with no energy inflation or adders.
 - c.** Scope of work to be performed and actual cost for such work.
 - d.** The amount and duration of the fixed Program Service Charge.
- 3. Apply Program Service Charges.** Within 45 days of placing the upgrades in service, add Program Service Charges to the monthly utility bills. Service charges will be set for a duration not to exceed 80 percent of the estimated useful life of the upgrades or the length of a full parts and labor warranty, whichever is greater.



4. Optional: Establish reserve fund to mitigate program sponsor’s exposure to performance risk on terms that put the reserve fund in a second loss position with a cap on exposure, leaving the utility in the first loss position up to the utility’s current rate of uncollectable service charges for all services.

OPTION B: METERED SAVINGS VARIANT WITH MUTUALIZED SAVINGS ACROSS ALL CUSTOMERS

To date, there have yet been no sponsors for independent impact evaluations of the performance of the modeling tools and program protocols applied to generate savings estimates in existing tariffed on-bill programs via Option A. Program designers thus face an information gap in understanding how well the Option A prediction methods perform and how successful tariffed on-bill programs have been at relieving versus exacerbating customer energy burdens.

A review of the industry literature reveals a recurring finding that ex ante prediction methods may be limited in their ability to predict future whole-building decarbonization impacts with the degree of accuracy and precision required to support solid site-specific customer assurances of positive cash flow from investments.⁷³ Studies reviewing such cases indicate multiple factors in program design and delivery could cause the variation, including and not limited to inherent uncertainties in measuring model inputs, limitations related to model specifications and default assumptions, lack of model calibration to baseline energy consumption, and installation quality control short-comings. Furthermore, even when prediction methods cited in those studies predict well on average, they may perform inadequately on a project-by-project basis due to a similar array of causes.



73 If a program produced reliable ex ante energy savings predictions, at least on average, then the program realization rate, calculated as total actual metered energy savings divided by predicted savings, would be close to 100 percent. Instead, evaluations of multiple programs for whole-building efficiency upgrades have found actual savings in some to be substantially lower than predicted savings, sometimes as low as 30 and 40 percent of predictions. See for example, the following studies:

- Blanchard et al., *Actual and Estimated Energy Savings*
- DNV GL, *2015 Home Upgrade Program Impact Evaluation, 2017 Home Upgrade Program Impact Evaluation, and 2015-2017 ESA Program Impact Evaluation*
- Fowle, Greenstone, and Wolfram. "Do Energy Efficiency Investments Deliver?"
- Maher, *Accuracy of Engineering Models*
- Lenihan, *Realization Rate Attribution*

To be clear, none of the programs cited in the industry literature reference tariffed on-bill programs and there is no reason to believe the evaluated programs adopt the full suite of best practices that tariffed on-bill programs have developed. Further research is required to determine how well those best practices mitigate the prediction bias and uncertainty that other program evaluations have encountered.

As an alternative to the tariffed on-bill programs implemented in other states, California could introduce a new program design that ties cost recovery to metered results, conforming to CPUC's *Rulebook for Programs and Projects Based on Normalized Metered Energy Consumption*.⁷⁴ This approach is consistent with guidance from California Assembly Bill 802 (Williams 2015, Chapter 590, Statutes of 2015), which modifies California Public Utilities Code § 381.2(b) to "authorize electrical corporations or gas corporations to provide financial incentives, rebates, technical assistance, and support to their customers to increase the energy efficiency of existing buildings based on all estimated energy savings and energy usage reductions, taking into consideration the overall reduction in normalized metered energy consumption as a measure of energy savings."

In such a metered savings approach, cost recovery for the utility or its program sponsor would be tied to meter-based savings estimates rather than a fixed charge that is 20 percent lower than the estimated savings as described above. To shield participants for performance risks while mitigating those same risks from the program sponsor's perspective, performance risks could be mutualized across all participating customers in the portfolio. Pay-for-Performance programs and the Energy Services Company (ESCO) industry offer multiple options for allocating risk and structuring customer savings guarantees.⁷⁵ The example offered here guarantees the customer a fixed percentage of the metered savings and assigns the remainder to program cost recovery.

In this instance, implementation of a meter-based cash-positive assurance mechanism would proceed the same as the protocol above with the following differences:

- To develop the initial cost recovery requirements, each site has a calculated Cost Recovery Fraction, which is the fraction of predicted electricity and gas savings required to meet the cost recovery requirements for the contemplated scope of work. The Cost Recovery Fraction should not exceed 80 percent in order to provide a savings guarantee to the customer.
- The Program Service Charge, to be specified in a customer purchase agreement, would be calculated as the weather-adjusted metered electricity and gas savings for that month, multiplied by the Cost Recovery Fraction and by the Contractual Energy Prices. Program Service Charges may be either positive or negative, depending on the metered results. Metered savings would be determined in compliance with the Program Measurement and Verification Plan.⁷⁶
- Normal variations due to life circumstances are not possible to isolate statistically and not feasible or cost-effective to investigate via site-specific data collection. We recommend ignoring them in a metered savings program. This risk becomes even less important if risk is mutualized across the project portfolio because negative and positive variations will tend to cancel out.
- The sponsor may charge to a Reserve Fund any unpaid cost recovery charges, including lapses in cost recovery due to vacancies or equipment malfunction.

The above protocols shift performance risk as well as the effect of changes in behavior from the customer to the program sponsor, who may in turn delegate some or all of the risk to a program operator via a performance-based contract. The program sponsor or operator can mitigate these risks by adopting a set of best practices that should be common to all publicly funded energy programs as described below.

74 CPUC, *Rulebook for Programs and Projects Based on NMEC*

75 See, for example, Kramer, "Energy Savings Guarantees"

76 Pay-for-Performance Pilots being launched or underway in California and New York offer informative models for Measurement and Verification plans



PROGRAM ATTRIBUTES THAT IMPROVE SITE-SPECIFIC INVESTMENT PERFORMANCE

Regardless of the tariff structure adopted, a number of best practices can be identified to mitigate risks to participating customers and program sponsors alike. A non-exhaustive list includes the following:

1. Analyze meter data to identify customers likely to have an attractive opportunity for investment and direct program outreach to those customers.⁷⁷
2. Centralize responsibility for specifying models with the program implementer, based on site data collected by staff accountable to the program implementer.
3. The entity responsible for contracting with installation contractors should be responsible for performing due diligence on installation costs with competitive solicitations or negotiations to obtain the highest quality work possible with the most competitive prices.
4. Incorporate best practices for contractor training and licensing, video and photographs to support visual inspections for quality assurance at time of equipment installation, and related quality control measures. Require or reward systems commissioning of new mechanical systems.
5. Require contractors to be bonded and for their work to be bonded for a reasonable period of time (to ensure contractor error discovered based on discrepancies between estimated and actual savings can still be corrected).
6. Make contractors bear the cost for failed inspections of their work such that there are sufficient funds to perform 100 percent onsite inspection of their work if warranted.
7. Investigate opportunities to integrate submetering technologies into project scopes to provide real-time Fault-Detection Diagnostics (FDD) and improve attribution of energy consumption changes. The emergence of smart thermostats and Internet-enabled appliances offers additional opportunities in this sphere.

77 But note that a full accounting of investment opportunities for electrification measures requires access to both gas and electric consumption data. For single-fuel utilities, a change in regulatory policy would be required to make access possible.



Scalability and Market Potential

Attributes that Support to Scalability

Tariffed on-bill programs based on the PAYS® (Pay As You Save®)⁷⁸ system have been successfully implemented during the past 18 years in eight states by 18 utilities from Hawaii to New Hampshire, including investor owned, cooperative, and municipal utilities. More than \$40 million has been invested in energy efficiency and renewable upgrades at 5,000 locations.⁷⁹ Utilities that have experience offering tariffed on-bill programs have reported results that indicate consistently high adoption rates for building energy efficiency upgrades and low charge-off rates for nonpayment, even in areas characterized by conditions of persistent poverty. Compared to typical debt-based

financing programs, experience shows that PAYS has a strong market response for four reasons:

1. The addressable market is double the size because nearly all customers are eligible, including renters and LMI households.
2. Utilities that have implemented the PAYS tariffed on-bill model have reported that customers who receive a program offer accept it more than half of the time, indicating that more customers who are risk averse and debt constrained are able to participate.
3. Customers with access to tariffed on-bill programs tend to undertake projects that are larger in scope because the terms are more attractive.
4. The investment is more secure because utility collections have a charge-off rate that is approximately 10 times lower than unsecured consumer lending.⁸⁰

78 Pay As You Save® and its acronym, PAYS® were trademarked by the US Patent and Trademark Office as a system with specific essential elements and minimum program requirements. Energy Efficiency Institute, Inc. (EEI), which holds the trademarks, has never charged any entity for using its marks. The trademarks ensure that “Pay As You Save” and “PAYS” may only be used to refer to programs that have PAYS’ essential elements and minimum program requirements.

79 Hummel and Lachman, “What is inclusive financing?”

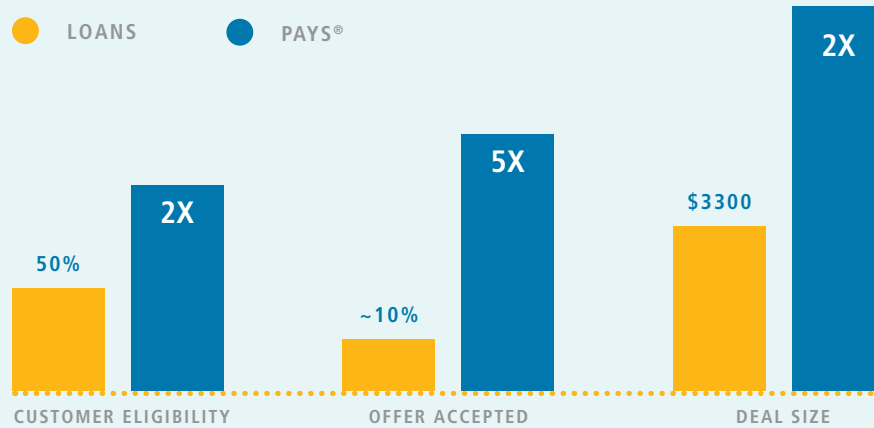
80 Charge-off rates on unsecured consumer loans typically range between 1.45 and 3.7 percent. Since 2012, the charge-off rate has varied between 1.74 and 2.63 percent. Charge-offs on credit card debt during that period have ranged from 2.92 to 4.24 percent. Source: Federal Reserve Consumer Finance Survey. <https://www.federalreserve.gov/releases/chargeoff/chgallsa.htm>

CPUC-approved uncollectible factors for IOUs are as follows:

- Southern California Edison, 0.211% for test year 2018 <http://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M293/K008/293008003.PDF>
- Pacific Gas & Electric Co., 0.337% for test year 2017 <http://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M186/K836/186836115.pdf>
- Southern California Gas Co., 0.313%; San Diego Gas & Electric Co., 0.174% for test year 2019 <http://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M316/K704/316704666.PDF>

Factors that affect the pace and scale of capital deployment for building energy upgrades

Experience with residential energy efficiency programs shows that PAYS has a strong market response, accelerated as a product of these multiples.



Tariffed on-bill programs like those already demonstrated in more than half a dozen states can expand participation among households facing the high degrees of energy burden and open doors of opportunity to underserved populations who have the most to gain in the clean energy revolution. These prior results provide a basis for optimism that a tariffed on-bill solution can help California achieve the investment scale required to meet its decarbonization goals.

The Building Decarbonization Coalition has called for an increase in the share of high efficiency heat pump space conditioning and water heating from five percent of sales in 2018, to 50 percent in 2025 and 100 percent in 2030.⁸¹ In support of these goals, we estimate that tariffed on-bill programs could unlock \$6–12 billion in capital per year to co-fund one million retrofits annually by 2030.⁸²

We also note that an expansion and acceleration of building decarbonization investment implies an expanded workforce to perform the work. Jones et al. (*Building Decarbonization Workforce*, p. ES-vi) estimates the need to increase the residential construction labor force by 26,000–39,300 jobs to serve the state’s retrofit needs through 2045. This estimate does not include the additional workforce required for housing construction to

address California’s current affordability crisis. As noted below, public investments to meet the workforce needs would be best accomplished via Market Transformation programs that allocate program costs to all ratepayers, not just tariffed on-bill or decarbonization program participants.

Integration Challenges to Scalability

As previously noted in the section on Combining Multiple Value Streams, residential clean-energy investments are unlikely to produce cash-positive outcomes for many Californians unless additional value streams are integrated and bring complementary funding. This finding triggers the need to stack or bundle tariffed on-bill investments with direct install or other incentive programs, which in turn, raises a risk that the eligibility and enrollment requirements for accessing the co-funding portion could pose an obstacle to benefiting from the accessible financing mechanism. Other challenges are the correlated need to factor other benefits and co-funding into any cost-effectiveness considerations and addressing several dimensions for the workforce needed to install significant levels of home improvements.

81 Building Decarbonization Coalition, *Roadmap to Decarbonize California Buildings*, p. 6

82 Assuming comprehensive retrofits on the order of \$12-24,000, with tariffed on-bill investments providing 50 percent of the capital, the remainder to come from incentives and customer co-pays.

PROGRAM MISALIGNMENT

While recognizing and quantifying the different value streams to stakeholders is an important step in building the value stack, the exercise does not by itself necessarily produce an integrated co-funding stack. Signatories to the Equitable Building Electrification Framework have found that this barrier affects even the combination of funding programs with no financing component.⁸³ One example of misalignment is the inconsistent criteria for customer eligibility between CPUC-administered low-income programs and CSD-administered programs. These differences introduce unnecessary complexity for customers who attempt to stack these different resources.

We believe that low income programs offer an excellent opportunity to begin long-needed program re-alignment. Tariffed on-bill programs for site-specific investment easily can support integrated solutions in a single project-based service for combined utility bill cost recovery supplemented by co-funding from other sources. By combining investments from multiple sources into a single project, we expect the overall outcome to be broader and deeper impacts, coupled with greater leverage of public and ratepayer dollars into actual investments with less funding eaten up by repetitive marketing and administrative cost from sequential silo programs.

The Accessible Financing Project offers a set of proposals for integrating multiple funding streams combined with tariffed on-bill investment via a value stack:

1. Explore opportunities to **standardize and streamline program** requirements across programs and technology investments. Alternatively, for programs with incompatible or inconsistent delivery channels, designate a single program as the lead service provider of choice and authorize or require related programs to co-fund benefit delivery through the designated program.⁸⁴
2. Work towards **structural alignment** across program administrators and investment siloes. The PUC has shown movement in this direction, for example, through its call for more integrated energy efficiency and demand response services, and its specific request that the next low income multi-family program for 2021-2026 coordinate with low income solar and demand response programs. Going further, regulators could channel programmatic investments through a unified Decarbonization Investment Mechanism(s) (DIM) that could support broad sets of decarbonization improvements to California housing.
3. **Focus on Performance** as a way of simplifying program quality assurance and quality control procedures that otherwise micromanage installation processes. New Advanced Measurement and Verification methods that leverage smart meter data are bringing this objective within reach.⁸⁵
4. Continue parallel **Market Transformation investments** that focus on commercializing new technologies, developing supply chain capacity, raising consumer awareness, and accelerating the decline in technology cost curves. Market Transformation program costs should be allocated to all ratepayers, not just tariffed on-bill or decarbonization program participants.⁸⁶

WORKFORCE CONSIDERATIONS THAT COULD IMPACT PROJECT COSTS AND FEASIBILITY

Many clean energy policies and programs are urged to adopt workforce training, compensation, and/or credential requirements. There are multiple dimensions – adequate size of a trained labor force, compensation standards, relationships of training and supervision to installation quality and project performance, and combined effects on project costs, realized bill savings, and other expected benefits. Beyond the workforce itself, there are issues of oversight of this workforce – through building permits, inspections, and compliance enforcement.

83 Miller et al., *Equitable Building Electrification*, p. 20

84 The San Joaquin Valley Proceeding (CPUC proceeding R.15-03-010) offers instructive examples for aligning multiple program funding sources to support an integrated program outcome.

85 See for example the open-source CalTRACK methods, which have been embedded in multiple Pay-for-Performance programs. <https://www.caltrack.org/>

86 The important role for market transformation strategies is evidenced by the recent CPUC BUILD and TECH decision in the Decarbonization proceeding R.19-01-011. The commission speaks to the need for parallel efforts to provide financing, coordinate across programs (e.g. efficiency, demand response, electrification, solar, self-generation, and wildfire rebuilding), and address the lack of current markets to monetize full grid and climate values. CPUC Decision D.20-03-027, adopted March 26, 2020, op. cit.



Compensation and benefits. We recognize that high-road contractor training and certification requirements will generally support higher quality measure installations. We also acknowledge that increased high road job opportunities offer economic benefits to disadvantaged workers and their communities. According to the January 2019 report, *Rebuilding California: The Golden State's Housing Workforce Reckoning*, residential construction workers earn 33 percent less per year than non-residential construction workers; and non-residential contractors' contributions to fringe benefits are triple those of residential contractors.⁸⁷

On the other hand, we observe that consumers generally are reluctant to pay for installation quality protections such as offered by higher skill set requirements, obtaining local building permits, and/or fair market wages. Jones et al. observes that the residential construction trades represent traditionally "low-road" sectors in which low cost is the primary driver of competition between firms, and there are low barriers to entry and high turnover of workers. The authors go on to explore policy interventions to reform the competitive dynamics in low-road industries to improve job quality and engage more highly skilled workers. The authors note "Such efforts are not necessarily compatible with lowest upfront cost work, but they do help ensure quality work is performed resulting in satisfied customers, accelerated market transformation, and availability of skilled workers."⁸⁸

Code compliance and quality. Lack of consumer demand (willingness to pay) for quality construction, high code compliance complexity and costs, and weak enforcement of existing building codes, have combined to foster a thriving black market for HVAC installations that fail to secure local building permits and the associated quality inspections. A recent DNV GL study completed for the CPUC showed that the majority (71–92%) of Residential HVAC system installations are unpermitted.⁸⁹

Code compliance adds cost and complexity to contractor service delivery. The requirement for publicly incentivized projects to comply with code, combined with the lack of consistent code enforcement, adds differential cost burdens to participating contractors that puts them at a competitive disadvantage. This dynamic stifles contractor participation and limits program scalability. Consistent with requirements in Senate Bill 1414 (Wolk, Chapter 678, Statutes of 2016), we encourage the CEC to focus efforts on establishing a level playing field for all contractors by eliminating the black market of unpermitted HVAC installations. In the meantime, there will be a continuing need to invest in workforce capacity building as part of market transformation programs.

87 Littlehale, *California Housing Workforce*, as cited by Jones et al., *Building Decarbonization Workforce*, p. 10

88 Ibid, p. ES-vii

89 DNV GL, *HVAC Permit and Code Compliance*, p. 3

Implementation Metrics

In consideration of the design criteria that the research team put forward to guide the Accessible Financing Project, the research team proposes the following metrics to evaluate program performance relevant to the criteria.

Table 4. Proposed Implementation Metrics, Grouped by Design Criteria

METRIC	CRITERIA FOR SUCCESS
1. Ability to finance over long periods (10–15 years) even in rental units with multiple changes in tenancy, etc.	
Number and fraction of tariffed on-bill projects serving occupants on CARE and FERA rates and tenant-occupied homes	% consistent with tenant representation in source population
2. Ability to leverage utility bill savings to defray investment costs, rather than rely on consumer credit or home equity	
Value of investment transactions supported by tariffed on-bill payments expected from occupants over cost recovery period	Meet or exceed implementation plan
Change in the fraction of public and private capital deployed for decarbonization before and after introduction of a tariffed on-bill program	Private capital > 50% of total
GHG reduction per \$ of public investment, including ratepayer spending	Higher GHG/public \$ spend than baseline (ESA, SOMAH, etc.)
3. Cash-positive outcomes that assure LMI customers will not have increased energy burdens	
Change in customer utility bills over time, with attribution of changes to <ul style="list-style-type: none"> • Changes in regular utility tariff levels • Changes in energy consumption attributable to decarbonization investments • Exogenous changes in energy consumption 	Decarbonization investments contribute zero net increases to customer utility bills, excluding regular tariff level changes and exogenous factors
Annual incidence among participating customers of 48-hour shutoff notices	Lower than background rate of shutoff notices
4. Ability to scale to serve millions of California households	
Volume of technology installations capitalized through tariffed on-bill programs, evaluated by eligible technology category	

The research team believes these metrics are broadly consistent with similar metrics that have been applied over time to related energy efficiency, decarbonization, and financing programs. They are thus reasonable and within the CPUC’s purview to direct IOU program sponsors to collect and track.

As evidence of alignment with current and past practices, we note the statutory metrics the Commission has endorsed in its adopted Decision for TECH:⁹⁰

1. cost per metric ton of avoided GHG emissions (using meter-based data whenever appropriate and feasible)

90 CPUC Proceeding R.19-01-011, Decision D.20-03-027, adopted March 26, 2020. See: <http://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M330/K031/330031291.PDF>



2. projected annual and lifetime utility bill savings (using meter-based data whenever appropriate and feasible)
3. market share for eligible technologies Further, the Commission decision directs that evaluation of savings and cost-effectiveness “to ensure that customer utility bills do not increase, and that a full range of costs and benefits to the customer (e.g., non-energy impacts and improvements in energy services) is evaluated.”

Additionally, the Commission decision directs staff and the program evaluator to consider a number of possible additional metrics including (1) market share data (“i.e. demographic factors”) for technology adoption, (2) customer outreach and customer satisfaction, benchmarked relative to customer awareness and satisfaction of customer incentive and direct install programs; and (3) contractor performance, as measured by program quality control outcomes.

Conclusions and Recommendations

The Accessible Financing research team recommends two sets of actions: (1) near-term actions required to enable tariffed on-bill solutions in California; and (2) longer-term policy roadmap for achieving scale. These are described below.

Near-Term Pathway to Tariffed On-bill Programs

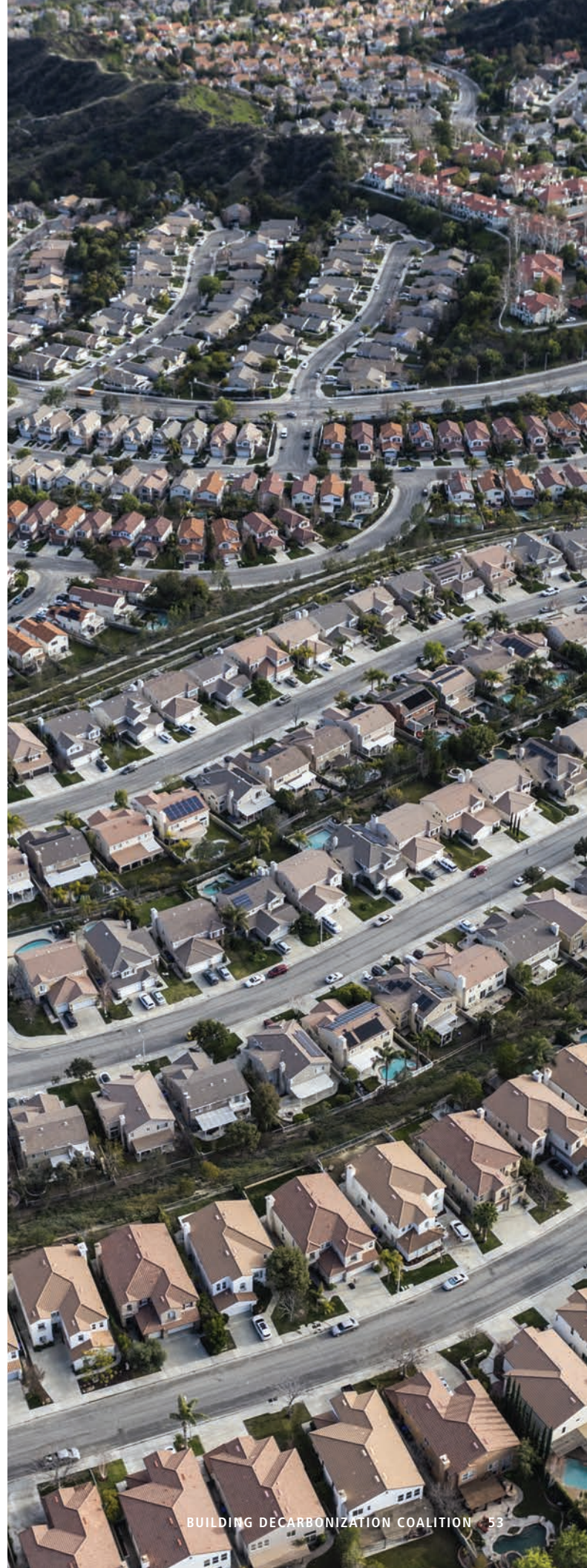
Our assessment of the current regulatory environment is that publicly owned utilities (POUs) and investor-owned utilities (IOUs) already have broad discretion to implement tariffed on-bill programs, subject to review and approval by their governing board (in the case of POUs) or by the CPUC (in the case of IOUs). The CPUC has the authority to authorize:

- utility investments of capital;
- public purposes to be served by utilities regarding energy, related environmental dimensions including greenhouse gases, and customer health, safety, and comfort;
- rules for utility procurement and deployment of capital, infrastructure, and services, and
- billing mechanisms and tariffs.

For IOUs, a rate case application is considered and authorized by the CPUC for cost recovery of the total amount of investment and capital required, including authorized rate of return on equity and debt. Utility tariffs describe the details of cost recovery via service charges on affected customers' bills.

POUs have autonomy to enact comparable tariffs, subject to review and approval by their governing boards. Two local governments (Town of Windsor and the City of Hayward) have used their public water utility capital sources and billing systems to administer Pay As You Save® efficiency programs that mirror many of the features of the tariffed on-bill model we address here.

Community Choice Aggregators (CCAs) in California are currently not authorized to initiate tariffed on-bill



programs because no California electric or gas utility is yet approved to make site-specific investments through a tariff that assigns cost recovery to a location rather than a customer.⁹¹ In accordance with current California policies, only distribution utilities are permitted to disconnect customers for non-payment for an essential utility service, and no electric or gas utility regulator has yet determined that site-specific energy upgrades such as energy efficiency and building decarbonization are essential utility services. With such approval, a utility could partner with one or more CCAs to serve as a program operator to coordinate local implementation of the investment program.

We recommend that POU and IOUs move expeditiously to secure necessary approvals for the design and launch of tariffed on-bill programs for building energy upgrades that could include building decarbonization, energy efficiency, and more. Specifically, the CPUC and POU governing boards should follow a three-stage approach, starting with establishing a policy framework, then proceeding to due diligence, and then providing direction on implementation.

ESTABLISH POLICY FRAMEWORK

CPUC and POU governing boards should provide enabling direction that sets in motion the program due diligence and planning process. This phase involves establishing threshold regulatory policies that establish tariffed on-bill programs as permissible. It also sets parameters for the scope of due diligence required for select program design elements, notably consumer protections and capital sources. Regulators should:

1. Authorize utilities to deploy capital and recover cost for building decarbonization upgrades via tariffed on-bill structures that enable participation regardless of income, credit score, or renter status.
2. Authorize utilities to make these “behind the meter” investments on terms that assure a path to ownership for customers while also assuring full cost recovery with a return on utility investment, on par with conventional utility investments.

3. Direct that tariffed on-bill payments be treated as a regular element of utility tariffs and bill payment, subject to customary procedures and notices should there be payment arrears.
4. Establish minimum thresholds for consumer protections
5. Establish guidelines for source capital, considering implications for utility balance sheets and access to broader capital markets

DUE DILIGENCE AND FEASIBILITY

While this White Paper attempts to provide guidance on key implementation issues, a comprehensive due diligence and feasibility study is beyond the scope of this effort. Toward that end, regulators should allocate resources to investigate economics and cost allocations, financial and legal risks, and stakeholder roles and responsibilities. This phase should address the following critical issues:

Economics and Cost Allocations

1. Conduct economic potential study encompassing full span of potential decarbonization investments on the customer side of the meter; quantify expected societal benefits from promising decarbonization packages; incorporate current assumptions about future rate increases, transition to TOU rates, NEM, and CARE discounts into customer economic analysis
2. Analyze financial implications of assigning indirect costs (e.g., cost of capital, program administration, M&V, loss reserves) to participating customers versus ratepayers
3. Investigate information system requirements and associated capital investments to support customer billing under different risk-reward allocation scenarios
4. Assess market potential for decarbonization packages offering attractive customer economic benefits. Incorporate analysis of customer-specific AMI data to inform customer segmentation and estimate



91 Municipal water utilities and water districts are not regulated by the CPUC. Two municipal utilities (i.e., the Town of Windsor and the City of Hayward) received permission from their oversight bodies and implemented tariffed on-bill water efficiency programs. California permitted water utilities to implement tariffed on-bill programs when it passed the Water Bill Savings Act (Senate Bill 564).



potential investment contributions from customer energy cost savings; estimate supporting incentive and customer co-pay requirements, including landlord co-pays for rental housing retrofits

Financial and Legal Risks

5. Perform risk analysis, including perspectives of current and successor customers, ratepayers, program sponsors, energy services companies and other private-sector service providers, and capital providers
6. Identify consumer protection mechanisms that balance costs, risks, and rewards and authorize mechanisms to mitigate the potential for above-normal costs to ratepayers from unpaid bills (e.g. reserve funds)
7. Investigate options for source capital, supported by strong assurances of repayment
8. Evaluate potential jurisdictional issues that could be brought up around liability and property law; determine appropriate legal framework for ownership of investment assets

Roles and Responsibilities for Program Offerings

9. Articulate possible roles for POUs and CCAs
10. Establish ground rules for program sponsors to obtain access to customer-specific gas and electricity

consumption, including whole-building consumption data for multifamily facilities

11. Authorize third parties to take on responsibility for customer utility bill payments

As part of due diligence activities above, the research team should conduct active stakeholder engagement, with particular attention to ESJ communities, prospective capital providers, and private sector service providers.

Based on due diligence outcomes, regulators should provide guidance on:

1. Performance metrics for program success, considering potential metrics such as default or charge-off rates, market share, participant demographics, contribution to customer wealth building, economic performance, GHG emissions reductions, other social outcomes
2. Scope of decarbonization measures and criteria for integrating multiple funding sources
3. Assignment of indirect costs (e.g., cost of capital, program administration, M&V, loss reserves) to participating customers versus ratepayers, leading to authorized funding from ratepayer sources
4. Program parameters, including consumer protection mechanisms, capital sources, and risk allocations

A successful due diligence process will require a multi-disciplinary team with the capacity for creative problem-solving and an array of skill sets related to:

- Legal understanding of requirements and solutions for utility, capital, consumer, and real estate and insurance stakeholders
- Utility finance and revenue requirements
- Private-sector capital provider requirements, risk-reward expectations
- Residential installations, transactions (supply chains, contractors)
- Customer economics of investment options
- Project finance
- Performance risk assessment and assignment, site-level investment criteria
- Consumer protection
- ESJ and consumer market engagement
- Consumer / property owner product and service offering design
- Marketing, customer acquisition strategies
- IT / billing system interface

IMPLEMENTATION

Based on the blueprint established through the due diligence process, program sponsors should be empowered to design and implement programs, including:

1. Conduct market research to assess optimal methods for communicating program costs, risks, and rewards to consumers
2. Develop customer acquisition strategies and phased roll-out plan
3. Establish detailed implementation plans

Longer-Term Policy Roadmap for Achieving Scale and Meeting Climate Goals

The scale and speed of investments required to meet the state's climate action goals dictate an emphasis on scalable solutions capable of attracting substantial private investment. The near-term policy pathway described above should provide critical early momentum. Additional policy developments should focus on accelerating that momentum.

Parallel implementation of what could be multiple local and regional tariff on-bill programs does not automatically lead to a scalable statewide solution. To achieve the levels of investment that would be attractive to large-scale capital providers, policy development should focus on two issues:

1. Combine public investments in related decarbonization strategies (e.g., energy efficiency, electrification, rooftop solar, and on-site energy storage) and align program policies and procedures to facilitate capturing larger total value streams for integrated projects. For example, more efficiency and electrification investments can be achieved when combined with the cash flows of on-site solar projects. Combining multiple value streams, including tariffed on-bill investment, will expand the number of financially viable decarbonization projects.
2. Move towards integrated statewide program administration and implementation to enable large aggregated investment portfolios and the associated economies of scale in securing capital and managing overhead costs.

RECOMMENDATIONS FOR ENABLING LARGE SCALE CAPITAL DEPLOYMENT FOR BUILDING DECARBONIZATION

The following recommendations aim to expand complementary public funding opportunities for core tariffed on-bill programs enacted as a part of the Near-Term Pathway.

DECISION-MAKERS	ACTIONS NEEDED
<p>CPUC and POU regulators</p>	<ul style="list-style-type: none"> • Authorize terms of a tariff that includes broad and common definitions of eligible households, improvements, and any necessary qualification criteria applicable to any/all decarbonization measures financed. • Continue to incorporate decarbonization measures into all EE programs, prioritizing attention to customers residing in disadvantaged communities, those already qualified for LMI programs, and those demonstrating the greatest opportunities for energy cost savings. • Consider integrating into one overall initiative accessible financing to complement funding for all decarbonization, EE, solar, and EV- charging efforts, and prioritize attention to low income households.
<p>CPUC or CEC with State Treasurer’s Office or the California Infrastructure Bank</p>	<ul style="list-style-type: none"> • Conduct due diligence on capital requirements and sources for an accessible financing mechanism for site-specific investment and cost recovery: <ul style="list-style-type: none"> • Potential annual California transaction volumes needed over time • Capital source options • Reserve fund options • Structures of finance administration models with low administrative costs and transaction fees.
<p>State legislature</p>	<ul style="list-style-type: none"> • Enable broad and deep participation in decarbonization by authorizing government funding to leverage deployment of even larger private capital flows through tariffed on-bill investment programs. • Assign responsibility to a state agency to identify workable mechanisms to combine funding resources to achieve GHG reductions.⁹² • Consistent with recommendations from the CEC’s 2019 Energy Efficiency Action Plan, require agencies to work towards structural alignment across relevant program administrators and investment siloes.⁹³ • Allow “siloeed” public and ratepayer funding resources to be channeled to a unified decarbonization investment mechanism that can support broad sets of decarbonization improvements to California housing.



92 Funding resources could include the Greenhouse Gas Reduction Fund, utility GHG allowance proceeds, the full spectrum of clean energy funding (e.g. tax credits, rebates, and utility funds), indoor housing health and comfort improvement measures, housing purchase and renovation funds, and utility funding reflecting the value of distributed energy solutions including beneficial electrification and more.

93 See, for example, Energy Efficiency Action Plan recommendation for Funding Sources for Beyond Ratepayer Portfolio (p. 93), which states “In addition to the utility programs run by IOUs and POUs, there is a need for a comprehensive program that removes silos between clean energy solutions, supports grid-interactive buildings, and helps customers across sectors understand the numerous benefits to energy efficiency and clean energy.” The Energy Efficiency Action Plan also recommends implementation of a statewide tariffed on-bill program. (Kenney, Bird, and Rosales, 2019 California Energy Efficiency Action Plan)



RECOMMENDATIONS FOR STATEWIDE PROGRAM ADMINISTRATION

DECISION-MAKERS	ACTIONS NEEDED
<p>CPUC and POU regulators</p>	<ul style="list-style-type: none"> • Authorize utilities to deploy capital and recover cost for building decarbonization upgrades via tariffed on-bill structures that enable participation regardless of income, credit score, or renter status. • Take a statewide portfolio approach to guide cost-effective climate investment decisions rather than site- or silo-program specific cost-effectiveness criteria.
<p>State legislature</p>	<ul style="list-style-type: none"> • Establish parameters for public funding that reflect the full social benefits of decarbonization. • Designate CEC or another state entity, in partnership with CARB, CPUC, and HCD among others, to oversee implementation and progress with building decarbonization investment adoption strategies. • Approve assigning tariffed on-bill notices for building energy upgrades to property records, as already authorized in the California Water Bill Savings Act (Senate Bill 564) for water efficiency upgrades.⁹⁴
<p>Designated State Agency</p>	<ul style="list-style-type: none"> • Determine what entity or entities should administer building decarbonization investment transactions. • Encourage and reward innovative approaches to achieve high levels of participation, prioritizing disadvantaged communities.

Time is a critical factor in capitalizing tariffed on-bill investments at a scale sufficient to achieve California’s policy objectives. While these recommendations may be taken up in any order, near-term pathway actions by utilities and utility regulators are critical to getting started at an initial scale. Supporting actions by the state legislature and governor can facilitate accelerated implementation.

94 Government Code Section 6588.8 and 6586.7

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Appendix A. Model Tariff Language

Pay As You Save[®] (PAYS) Model Tariff⁹⁵

- 1 Eligibility:** Eligible on an optional and voluntary basis to any customer who takes service under any rate schedule for energy efficiency improvements (upgrades) where the utility provides electric service to the structure. It shall not be a requirement that the structure be all-electric.

- 2 Participation:** To participate in the Program, a customer must: 1) request from the utility an analysis of cost-effective upgrades; 2) agree to the terms of the cost-effectiveness analysis fee as described in Section 3.4; and 3) sign the Efficiency Upgrade Agreement, which defines customer benefits and obligations, and implement any project that does not require an upfront payment from the customer as described in Section 3.3.
 - 2.1 Ownership:** If the customer is not the building owner, the building owner must sign an Owner Agreement, agreeing to not remove or damage the upgrades, to maintain them, and to provide notice of the benefits and obligations associated with the upgrades at the location to the next owner or customer before the sale or rental of the property.

 - 2.2 Notice:** The owner must agree as part of the Efficiency Upgrade Agreement (if the owner is the customer) or Owners Agreement to have a Notice attached to their property records. Failure to obtain the signature on the Notice Form of a successor customer who is renting the premises or a purchaser, in jurisdictions in which the utility cannot attach the Notice to the property records, indicating that the successor customer received notice will constitute the owner's acceptance of consequential damages and permission for a tenant or purchaser to break their lease or sales agreement without penalty.

- 3 Energy Efficiency Plans:** The utility will have its Program Operator or approved energy efficiency contractor perform a cost-effectiveness analysis and prepare an Energy Efficiency Plan (Plan) identifying recommended upgrades to improve energy efficiency and lower power costs.
 - 3.1 Incentive Payment:** The utility may reduce the upgrade cost with an incentive payment for program participation that is less than or equal to the value of the upgrades to the utility or a rebate that is available to any customer who installs a specific improvement.

 - 3.2 Net Savings:** Recommended upgrades shall be limited to those where the annual Program Service Charges (Service Charges), including program fees and the utility's charges for capital, are no greater than 80% of the estimated annual savings to a participating customer based on current retail rates for electricity and/or gas.

 - 3.3 Co-pay Option:** In order to qualify a project that is not cost effective for the Program, customers may agree to pay the portion of a project's cost that prevents it from qualifying for the Program as an upfront payment to the contractor. The utility will assume no responsibility for such upfront payments to the contractor.

 - 3.4 Cost-Effectiveness Analysis Fee:** If the cost of the cost-effectiveness analysis exceeds the value to the utility of upgrades accepted by customers for installation based on the Utility Cost test, the utility will recover from participants the portion of the cost for the analysis that is greater than the value of the upgrades to the utility. The utility will not recover costs for the analysis if the Energy Efficiency Plan concludes that proposed upgrades are cost effective only with a co-pay. The utility will recover all of its costs for the analysis at a

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location from a customer who declines to install upgrades identified in an Energy Efficiency Plan that does not require a co-pay. Customer costs for analyses, if any, will be recovered from participants by rolling them into Service Charges as described in Section 7.

- 3.5 Existing Buildings:** Projects that address upgrades to existing buildings deemed unlikely to be habitable or to serve their intended purpose for the duration of utility cost recovery will not be approved unless other funding can effect necessary repairs. If a building is a manufactured home, it must be built on a permanent foundation and fabricated after 1982 to be eligible.
- 4 Approved Program Operator:** Utility may operate the program directly with its own staff resources or hire an experienced Program Operator to implement the program.
- 5 Approved Contractor:** Should the customer decide to proceed with implementing the Plan, the utility shall determine the appropriate monthly Service Charge as described below. The customer shall sign the Agreement and select a contractor from the utility's list of approved contractors.
- 6 Quality Assurance:** When the energy efficiency upgrades are completed, the contractor shall be paid by the utility, following on-site or telephone inspection and approval of the installation by the utility or its Program Operator.
- 7 Program Services Charge:** The utility will recover the costs for its investments including any fees as allowed in this tariff through a monthly Service Charge assigned to the location where upgrades are installed and paid by customers occupying that location until all utility costs have been recovered. Service Charges will also be set for a duration not to exceed 80% of estimated life of the upgrades or the length of a full parts and labor warranty, whichever is greater and in no case longer than twelve years. The Service Charges and duration of payments will be included in the Efficiency Upgrade Agreement.
- 7.1 Cost Recovery:** No sooner than 45 days after approval by the utility or its Program Operator, the customer shall be billed the monthly Service Charge as determined by the utility. The utility will bill and collect Service Charges until cost recovery is complete except in cases discussed in Section 8. Prepayment of unbilled charges will not be permitted. This facilitates installed upgrades remaining and continuing to function at the location for at least the duration of cost recovery.
- 7.2 Eligible Upgrades:** All upgrades must have Energy Star certification, if applicable. The utility may seek to negotiate with contractors or upgrade suppliers extended warranties to minimize the risk of upgrade failure on behalf of all customers.
- 7.3 Ownership of Upgrades:** During the period of time when Service Charges are billed to customers at locations where upgrades have been installed, the utility will retain ownership of the upgrades. Upon termination of the Service Charge, ownership will be transferred to the building owner.
- 7.4 Maintenance of Upgrades:** Participating customers and building owners (if the customer is not the building owner) must agree, when signing the Efficiency Upgrade Agreement or the Owner Agreement, to keep the upgrades in place for the duration of Service Charges, to maintain the upgrades per manufacturers' instructions, and report the failure of any upgrades to the Program Operator or utility as soon as possible. If an upgrade fails, the utility is responsible for determining its cause and for repairing the equipment in a timely manner as long as the owner, customer, or occupants did not damage the upgrades, in which case they will reimburse the utility as described in Section 8.
- 7.5 Termination of Service Charge:** Once the utility's costs for upgrades at a location have been recovered, including its cost of capital, the cost paid to the contractor to perform the work, costs for any repairs made to the upgrades as described in Section 8, the monthly Service Charge shall no longer be billed, except as described in Sections 7.7 and 8.

- 7.6 Vacancy:** If a location at which upgrades have been installed becomes vacant for any reason and electric service is disconnected, Service Charges will be suspended until a successor customer takes occupancy. If a building owner maintains electric service at the location, the building owner will be billed Service Charges as part of any charges it incurs while electric service is turned on.
- 7.7 Extension of Program Charge:** If the monthly Service Charge is reduced or suspended for any reason, once repairs have been successfully effected or service reconnected, the number of total monthly payments shall be extended until the Service Charges collected equal the utility's cost for installation as described in Section 7, including costs associated with repairs, deferred payments, and missed payments as long as the current occupant is still benefitting from the upgrades.
- 7.8 Tied to the Location:** Until cost recovery for upgrades at a location is complete or the upgrades fail as described in Section 8, the terms of this tariff shall be binding on the metered structure or facility and any future customer who shall receive service at that location.
- 7.9 Disconnection for Non-Payment:** Without regard to any other Commission or utility rules or policies, the Service Charges shall be considered as an essential part of the customer's bill for electric service, and the utility may disconnect the metered structure for non-payment of Service Charges under the same provisions as for any other electric service. If service is disconnected for customers on pre-paid payment plans, Service Charges will be pro-rated by the day.
- 8 Repairs:** Should, at any future time during the billing of Service Charges, the utility determine that the installed upgrades are no longer functioning as intended and that the occupant, or building owner if different, did not damage or fail to maintain the upgrades in place, the utility shall reduce or suspend the Service Charges until such time as the utility and/or its contractor can repair the upgrades. If the upgrades cannot be repaired or replaced cost effectively, the utility will waive remaining charges.

If the utility determines the occupant, or building owner if different, did damage or fail to maintain the upgrades in place as described in Section 7.4, it will seek to recover all costs associated with the installation, including any fees, incentives paid to lower project costs, and legal fees.

The Service Charges will continue until utility cost recovery is complete as long as the upgrades continue to function.

- 8.1 Monitoring and Evaluation:** The utility or its Program Operator will compare each participant's post-installation actual annual savings to estimated annual savings at least once for each location. If any instances are identified where actual savings are below 80% of the location's estimated savings, the utility or its Program Operator will investigate to identify the cause and take appropriate action including those described in Section 8 above or enforcing agreements with contractors or participating customers.

Model Tariff for a Metered Savings Variant of a Tariffed On-Bill Program

The model tariff for the Pay As You Save (PAYS) system developed by Energy Efficiency Institute, Inc., has been used as the basis tariffs approved by utility commissions and regulatory oversight bodies in multiple states. More than 90 percent of the text below is drawn verbatim from the model PAYS tariff, with the exception of sections 14, 15, 16, 21, and 23, which are significantly different.

To date, the adapted tariff language below has not been proposed by a utility to a regulatory oversight authority, and therefore, it has not been reviewed or approved by any utility regulatory authority.

1. **Eligibility:** Eligible on an optional and voluntary basis to any utility customer who takes service under any rate schedule for decarbonization improvements (upgrades) where the utility provides electric or gas service to the structure.
2. **Participation:** To participate in the Program, a customer must: 1) request from the utility an analysis of cost-effective upgrades, 2) agree to the terms of the Site Assessment Fee as described in Section 6, and 3) review the Purchase Agreement that defines customer benefits and obligations, and implement any project that does not require an upfront payment from the customer as described in Section 7.
3. **Ownership:** If the customer is not the building owner, the building owner must sign an Owner Agreement, agreeing to not remove or damage the upgrades, to maintain them, and to provide notice of the benefits and obligations associated with the upgrades at the location to the next owner or customer before the sale or rental of the property
4. **Notice:** The owner must agree as part of the Purchase Agreement (if the owner is the customer) or Owners Agreement to have a Notice attached to their property records. Failure to obtain the signature on the Notice Form of a successor customer who is renting the premises or a purchaser, in jurisdictions in which the utility cannot attach the Notice to the property records, indicating that the successor customer received notice will constitute the owner's acceptance of consequential damages and permission for a tenant or purchaser to break their lease or sales agreement without penalty.
5. **Decarbonization Plan:** The utility will have its Program Operator or approved decarbonization contractor perform a Site Assessment and prepare a Decarbonization Plan (Plan), identifying recommended upgrades to reduce greenhouse gas emissions (GHGs) and lower energy costs.
6. **Incentive Payment:** The utility may make an incentive payment for program participation that is less than or equal to the value of the upgrades to the utility.
7. **Net Savings:** Recommended upgrades shall be limited to those where the annualized Program cost recovery requirement, including project installation costs, site assessment costs, program fees, and the utility's cost for capital, but excluding any applicable utility incentives or customer co-payments, are no greater than 80 percent of the estimated annual benefit from reduction to a customer's annual utility charges based on current rates in electricity and gas costs.
8. **Co-payment Option:** In order to qualify a project for the Program that is not cost effective, customers may agree to pay the portion of a project's cost that prevents it from qualifying for the program as an upfront payment to the contractor. The utility will assume no responsibility for such upfront payments to the contractor.
9. **Site Assessment Fee:** Site assessment costs are eligible for inclusion in Program cost recovery requirements. The utility will recover all of its costs for the analysis at a location from a customer who declines to install upgrades identified in a Decarbonization Plan that do not require a co-payment.
10. **Existing Buildings:** Projects that address upgrades to existing buildings deemed unlikely to be habitable or to serve their intended purpose for the duration of the Cost Recovery Period will not be approved unless other funding can affect necessary repairs.
11. **Approved Program Operator:** Utility may operate the program directly with its own staff resources or hire an experienced Program Operator to implement the program.
12. **Approved Contractor:** Should the customer determine to proceed with implementing the Plan, the utility shall determine the appropriate monthly Service Charges as described below. The customer shall sign the Agreement and select a contractor from the utility's list of approved contractors.

- 13. Quality Assurance:** When the decarbonization upgrades are completed, the contractor shall be paid by the utility, following on-site or telephone inspection and approval of the installation by the utility or its Program Operator in accordance with the Program Quality Assurance Plan.
- 14. Program Services Charge:** The utility will recover the costs for its investments including any fees as allowed in this tariff through a monthly Program Service Charge assigned to the meter at the location where upgrades are installed and paid by customers occupying that location. As part of the Site Assessment, the utility shall estimate the Cost Recovery Fraction, which is the fraction of electricity and gas savings required to meet its cost recovery requirements. The Cost Recovery Fraction shall not exceed 80 percent of the expected savings. The Program Service Charge shall be calculated as the metered electricity and gas savings for that month, multiplied by the Cost Recovery Fraction and by the Contractual Energy Prices, as described in Section 15. Program Service Charges may be either positive or negative, depending on the metered results. Metered savings shall be determined in compliance with the Program Measurement and Verification Plan.
- 15. Contractual Energy Prices:** Energy prices to be applied for purposes of calculating Program Services Charges shall be based on current rates in electricity and gas costs and shall remain constant for the duration of the Cost Recovery Period. Energy prices shall be specified in the Purchase Agreement.
- 16. Cost Recovery Period:** The Cost Recovery Period shall be set for a duration not to exceed the estimated life of the upgrades. The Cost Recovery Period shall be specified in the Purchase Agreement.
- 17. Cost Recovery:** No sooner than 45 days after approval by the utility or its Program Operator, the customer shall be billed the monthly Program Services Charge as determined by the utility. The utility will bill and collect the Program Services Charge for the duration of the Cost Recovery Period.
- 18. Eligible Upgrades:** The Program Operator shall publish a list of eligible upgrade measures and their performance specifications. The utility may seek to negotiate with contractors or upgrade suppliers extended warranties to minimize the risk of upgrade failure on behalf of all customers
- 19. Ownership of Upgrades:** During the period of time when Service Charges are billed to customers at locations where upgrades have been installed, the utility will retain ownership of the upgrades. Upon termination of the Service Charge, ownership will be transferred to the building owner.
- 20. Maintenance of Upgrades:** Participating customers and building owners (if the customer is not the building owner) must agree, when signing the Purchase Agreement or the Owner Agreement, to keep the upgrades in place for the duration of Service Charges, to maintain the upgrades per manufacturers' instructions, and report the failure of any upgrades to the Program Operator or utility as soon as possible. If an upgrade fails, the utility is responsible for determining its cause and for repairing the equipment in a timely manner as long as the owner, customer, or occupants did not damage the upgrades, in which case they will reimburse the utility as described in Section 26.
- 21. Termination of Service Charge:** Not applicable, except as specified in Section 26.
- 22. Vacancy:** If a location at which upgrades have been installed becomes vacant for any reason and electric service is disconnected, Program Services Charges will be suspended until a successor customer takes occupancy. If a building owner maintains electric service at the location, the building owner will be billed Service Charges as part of any charges it incurs while electric service is turned on.
- 23. Extension of Program Charge:** Not applicable.
- 24. Tied to the Location:** Throughout the Cost Recovery Period or until the upgrades fail as described in Section 26, the terms of this tariff shall be binding on the metered structure and any future customer who shall receive service at that location.

25. Disconnection for Non-Payment: Without regard to any other Commission or utility rules or policies, the Service Charges shall be considered as an essential part of the customer's bill for electric service, and the utility may disconnect the metered structure for non- payment of Service Charges under the same provisions as for any other electric service.

26. Repairs: Should, at any future time during the Cost Recovery Period, the utility determine that the installed Upgrades are no longer functioning as intended and that the occupant, or building owner if different, did not damage or fail to maintain the upgrades in place, the utility shall reduce or suspend the Program Service Charge until such time as the utility and/or its contractor can repair the upgrade. If the upgrade cannot be repaired or replaced cost effectively, the utility will waive remaining charges.

If the utility determines the occupant, or building owner if different, did damage or fail to maintain the upgrades in place, it will seek to recover all costs associated with the installation, including any fees, incentives paid to lower project costs, and legal fees.



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