BayREN Energy Efficiency Business Plan 2018-2025

BAY AREA Regional Energy Network

Bay Area communities working together for a sustainable energy future

January 23, 2017

BayREN Business Plan 2018-2025
Table of Contents

The CAEECC Issues Tracker is attached separately and will be uploaded to www.caeecc.org.

In each of the Sector sections, the following information is provided:

- Introduction
- Sector Summary
- Evolving Approaches
- Vision, Intervention Strategies, and Objectives
- Budget and Metrics
- Market Characterization and Trends
- Strategies and Tactics
- Coordinating Activities
    - Leverage Resources
    - EM&V Efforts
    - Marketing, Education & Outreach
    - Workforce Education and Training
    - Cross-Cutting Initiatives
    - Key Partners/Coordination

Section 1
OVERVIEW

BAY AREA Regional Energy Network

Section 1. Overview

Overview

BayREN Organization Introduction

BayREN Mission: "Bay Area communities working together for a sustainable energy future."

The Bay Area Regional Energy Network (BayREN) is a collaboration of the nine counties that make up the San Francisco Bay Area. Led by the Association of Bay Area Governments (ABAG), BayREN implements effective energy saving programs on a regional level and draws on the expertise, experience, and proven track record of Bay Area local governments to develop and administer successful energy efficiency, climate, resource, and sustainability programs. BayREN is funded by California utility ratepayers under the auspices of the California Public Utilities Commission (CPUC), as well as through grants and funding from member agencies, other state and federal agencies, and foundations. One of only two Regional Energy Networks in the state, BayREN represents 20% of the state's population.

BayREN fills an important gap in the provision of energy efficiency services. The BayREN provides a **regional solution** that better connects to local communities and conditions than is typically possible from a large utility. In addition, the BayREN provides services across jurisdictions that municipal-only programs cannot achieve.

- The BayREN, by its public nature, is accountable to community needs and ensuring that all ratepayers and citizens are included in its services.
- The BayREN is led by local governments committed to greenhouse gas reductions, who use energy efficiency (EE) and integrated demand side management (IDSM) as essential tools to achieve climate goals in alignment with local and state policy.
- The BayREN coordinates activities with a variety of related local government programs, such as housing renovation, water conservation, community planning, economic, and job development and training so that program activities can serve multiple community needs.
- Coordination among the local governments through the BayREN allows the programs to benefit from economies of scale, increased capacity, and focused administrative coordination with utilities and state government, as well as potential foundation support and available federal funding that can expand and enhance program services.

Business Plan Purpose

The BayREN Business Plan provides a ten-year vision, with clear goals, strategies, and tactics to increase the access and availability of energy efficiency services to a broad range of ratepayers and sectors, including moderate income residents, multifamily property owners, small and medium commercial businesses, and local government municipalities. This Plan enhances and expands the BayREN's efforts in the Residential, Commercial, and Public Sector. In addition, the BayREN Business Plan provides two

cross-cutting sector chapters: Water-Energy Nexus and Codes and Standards. The Plan provides details and information about how the BayREN will complement and support Pacific Gas & Electric Company (PG&E), Marin Clean Energy (MCE), and local government partnerships efforts to create a full range of energy efficiency services to the Bay Area. As a ten-year Plan, the strategies and tactics are designed to be flexible and broad enough to allow for agility and responsiveness to market challenges and demands, while offering a transparent presentation of the BayREN's approach, budget, and metrics. Specific details and program design will be provided as instructed by the CPUC in Implementation Plan filings.

BayREN Market Definition and Role

The BayREN recognizes that due to its relative size to the market in the Bay Area, and in comparison to PG&E's scope, its potential impact and influence must be focused. To that end, the BayREN sees high value in positioning itself at the early stages of Market Transformation, incubating and testing out new and different approaches to successful energy efficiency programs within the residential, commercial, and public sectors. Ultimately, the primary objective of the strategic interventions laid out in this Business Plan is to identify, test, and scale successful approaches to the hard-to-reach markets by its varied partners, including PG&E, other local governments, Community Choice Aggregators (CCAs), and if appropriate, the BayREN itself. The BayREN has begun to scale its work within the Multifamily market and for its Water Bill Savings Program program. Equally, its work with Property Assessed Clean Energy (PACE) and its Codes & Standards program have seen promising results that will be expanded in the business plan.

Regional Coordination and Alignment

The BayREN is one of a number of program administrators in the Bay Area. This includes PG&E throughout the region; Marin Clean Energy (MCE) in part of the BayREN territory; other existing and new CCAs scattered through the region with the potential for future program development; and local government partnerships (LGPs) via PG&E. This environment requires focused, proactive, and ongoing coordination among the program administrators to avoid duplication and confusion. The BayREN holds regular meetings with both PG&E and MCE, and works closely with LGPs to avoid duplication of efforts, and to determine how to leverage the respective efforts. As more CCAs become viable, the BayREN anticipates working with these groups to assist in building capacity and partnering in running programs for these new entities as appropriate. The BayREN's business plan was developed with this complex environment in mind and is focused on regional activation, as well as on programs that are not natural fits for these other groups.

Future Opportunities

The future of the BayREN is to transition knowledge, relationships, and experience into the development of more integrated programs that go beyond sector-specific programs. This will be accomplished by:

- Partnering with state (e.g., CSD - Neighborhood Approaches, CEC - Advance Energy Communities via EPIC, DWR via Water Energy Grants) and federal (e.g. DOE, EPA)

organizations to develop community-scale efficiency programs with integrated solar and water efficiency, targeting moderate income communities. These "communities" would incorporate small commercial, residential, mix-use, and multifamily buildings within a single program area.
- Develop zero net energy (ZNE) or zero net carbon communities to advance state goals, integrating new and existing buildings across sectors.
- Provide regional support and coordination of CCAs' development and programs to advance energy efficiency and demand side management resources, and to avoid duplication of services.

California's Energy Needs

Working with Hard-to-Reach Communities

A critical reason for the development of the BayREN is the historic underserved members of urban communities by efficiency services from utility programs.[1] These communities include low (not covered in this plan) to moderate income households, minority populations, small businesses—especially within minority and ethnic neighborhoods, multifamily housing that serves lower income communities and non-profit and government agencies that provide critical services such as job training, homeless shelters, housing related services, and physical and mental health care clinics. All of these populations pay for utility services, either directly or indirectly, yet because they are more difficult to reach and have fewer resources for cost sharing, they are significantly underrepresented. Critical additional barriers include language, lack of education, lack of trust, lack of mobility, and inability to afford even some basic daily essentials.

While some efforts have been made by utilities to reach these historically underserved populations, continued pressure on utilities to improve cost-effectiveness and meet increased annual kWh savings goals have meant more emphasis on targeted markets that have abundant and scalable cost-effective savings potential, such as commercial lighting, and less emphasis on hard-to-reach markets with plenty of savings opportunities, but with limited ability to cost share and smaller savings per customer. In many states, cost-effectiveness is applied to every measure, sometimes even including prorated administrative costs. In California, cost-effectiveness is measured across the entire portfolio of ratepayer funded programs rather than measure-by-measure or program-by-program. Still, rising kWh goals and relatively stable annual efficiency budgets have meant that less cost-effective measures and programs receive smaller budgets, or are cut from the utility's portfolio.

BayREN develops improved approaches and better coordination of services to enhance services to these markets, thereby correcting the current imbalance of participation and encouraging the expansion of non-energy benefits to the residential, commercial, and public sectors.

[1] Scavo, Jordan, Suzanne Korosec, Esteban Guerrero, Bill Pennington, and Pamela Doughman. 2016. "Low-Income Barriers Study, Part A: Overcoming Barriers to Energy Efficiency and Renewables for Low-income customers and Small Business Contracting Opportunities in Disadvantaged Communities." California Energy Commission. Publication Number: CEC-300-2016-009-SD2, page 26.

Filling the Gaps

Equal to addressing hard-to-reach audiences, the RENs are charged with filling gaps in energy efficiency service provision for audiences where the utilities cannot or will not work. There are a number of reasons why utilities may not want to or cannot serve a particular audience. Beyond the "hard-to-reach", this includes difficulties in meeting stringent cost-effectiveness goals, lack of clear program designs that are scalable and suited for IOU program delivery methods, or addressing audiences that do not value or understand how or why they should work with a utility company. These gaps are not as easily defined or targeted as the "hard-to-reach" audiences and can vary by geography or by jurisdiction.

Each sector discussed in this Business Plan provides additional detail on these gaps as they apply. Some of the more notable audiences that will be considered include: building departments and code compliance professionals, small and medium commercial buildings, multifamily property owners, and small and under-resourced local government agencies.

Climate Change and Resiliency as Drivers

The second critical focal point of BayREN activities is the creation of a pathway to achieve climate and resiliency goals aligned with state and local government policy. Meeting these goals requires very deep reductions in building energy use and expansions of the use of renewable energy. Substantial cost reductions in distributed energy resources and storage have created opportunities for communities to have a strong role in the development of Zero Net Energy Buildings and Zero Energy Community projects, and to use these projects not only to impact carbon reduction, but also to enhance the resilience of communities. The BayREN communities are at risk from rising sea levels and other climate change impacts threatening both the economic viability of our communities and at-risk citizens.[2]

Proactively addressing climate threats is beyond the utility program scope, but very much aligned with state and local government policy. BayREN will be implementing programs that move communities to deep energy savings and distributed renewables in order to reduce costs, reduce carbon, improve resiliency, and help transform local economies. These efforts will be guided by a long-term market transformation strategy structured to further reduce the costs of deep efficiency and distributed energy resources over time, and to coordinate with grid constrained areas to reduce the investments needed to maintain energy services at the lowest costs. Further, as BayREN seeks to address these interrelated issues, in concert with energy efficiency, different, complementary funding sources will be sought.

Local governments are at the center of other critical activities to reduce carbon, such as land use and development planning, regulation and electrification of transportation systems, as well as resilience planning including providing emergency response and ensuring citizen welfare during climate related events. Better coordination of these activities with deep efficiency and distributed energy resources will improve community resilience by assuring that critical government services, communications, and medical treatment remain available during grid outages.

[2] MTC, Caltrans et al, "Climate Change and Extreme Weather Adaptation Options", December, 2014, page ES-1.

Regulatory Requirements

In 2012, the CPUC approved a unique and important new mechanism to help achieve the State of California's energy efficiency and climate goals—Regional Energy Networks or RENs.[3] These new entities would receive ratepayer funding to design and implement programs like a utility—all while demonstrating new approaches that lie outside a utility's scope. The first RENs, including the BayREN, harnessed existing local government capacities and infrastructures that had been expanded by ARRA (American Recovery and Reinvestment Act) funding to engage new audiences in regional energy efficiency programs. Based on this Decision, in the third quarter of 2013, the BayREN began as a pilot, delivering programs within the nine Bay Area counties.[4]

The BayREN is designed to be flexible, innovative, and in touch with local communities and municipal governments to achieve higher levels of success in historically hard-to-reach markets.[5] This includes moderate[6] income residential, multifamily properties, and small and medium commercial property owners. Specifically, the D.12-05-015 CPUC Decision, and more recent Decisions (including R13-11-005), direct the RENs to deliver:

1. Activities that utilities cannot or do not intend to undertake.
2. Activities where there is no current utility program offering, and where there is potential for scalability to a broader geographic reach, if successful.
3. Activities in hard to reach markets, whether or not there is a current utility program that may overlap.

BayREN Governance and Composition

At the formation of the BayREN, ABAG, as the Program Administrator, entered into a Memorandum of Understanding and a Contract for Services with one agency from each of the nine Bay Area counties. The agencies had established that they have energy efficiency experience and expertise; they also committed to ensuring that all qualifying residents in their respective counties would be provided information about BayREN programs and that outreach would be conducted to all jurisdictions. The lead agency is the point of contact in each county.

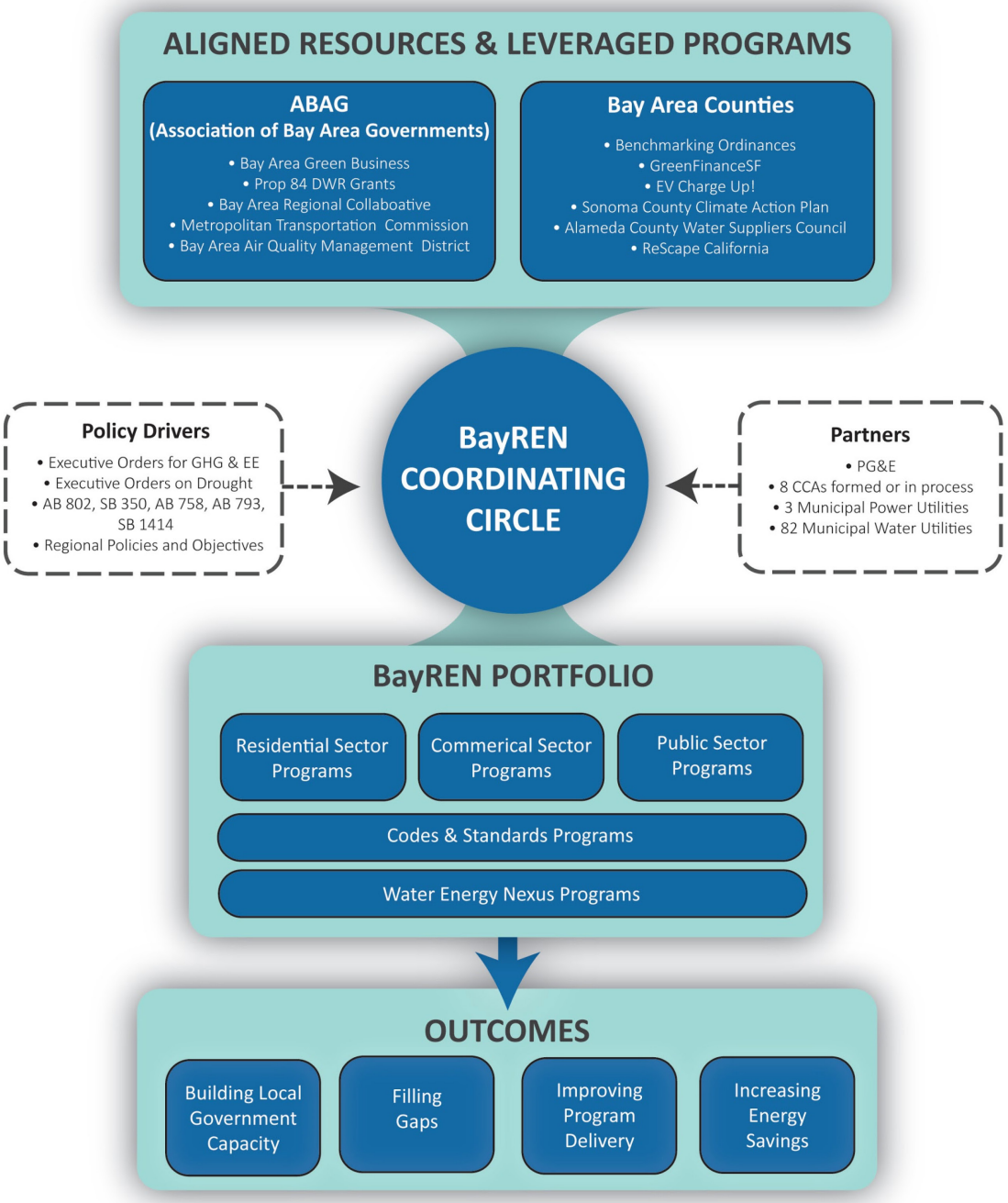
The BayREN's governance is through the "Coordinating Circle," which includes representation from ABAG and all nine Bay Area counties. Each BayREN member agency designates a voting member to the Coordinating Circle. This body makes decisions regarding overall policy, high-level programmatic issues,

[3] CPUC D.12-05-015 invited REN proposals, and D.12-11-015 approved the REN proposals.
[4] Counties of Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, Santa Clara, Solano, Sonoma.
[5] Definition of Hard-to-reach, "Hard to reach residential customers are defined as "those customers who do not have easy access to program information or generally do not participate in energy efficiency programs due to a language, income, housing type, geographic, or home ownership (split incentives) barrier." Hard to reach business customers also include factors such as business size and lease (split incentive) barriers." CPUC Energy Efficiency Policy Manual, July 2013.
[6] Low-income programs are not covered in the CPUC's Rolling Portfolio Business Planning. The BayREN currently does not have a low-income program but is exploring considering an application in the future.

and sector-level budgets. ABAG, as the Program Administrator, and each county agency receives one vote.

Individual programs are managed by a Lead, elected by the Coordinating Circle, upon a showing that they have expertise in the program area and that their agency (Lead Agencies) has the resources and the management breadth to lead the program on behalf of the whole region. While the Lead assigns the resources, roles, and priorities of the program, the Lead Agency is responsible for directly managing region-wide activities, as well as coordinating activities that are conducted at the individual county level by the individual BayREN member agencies. Collaboration among the Lead and individual counties takes place through individual program committees, in addition to the BayREN Coordinating Circle. This method of coordination and collaboration allows agencies with less experience and resources to both take advantage of a program that is operated regionally, as well as gain experience (and mentoring) with implementing the program activities from the other agencies. In addition, the BayREN's unique structure allows for operational synergies and stronger cross-sector engagement, coordination, and efficiencies. Examples of efficiencies include neighboring counties combining resources and jointly holding workshops or outreach events. In addition to cost savings, this allows property owners in different counties and contractors that work across the region, etc. to learn about relevant programs in a single, united fashion, rather than on a county by county basis. With the addition of several new sectors for the BayREN, it is anticipated that clear cross-walks and lessons learned will be shared at the Coordinating Circle, covering for example, residential/small commercial contractor recruitment and training; codes and standards—residential alignment to streamline and improve compliance; and similar activities.

Figure 1.1. Aligned Resources and Leveraged Programs for BayREN



The BayREN formation allows for expansion of programs and reasonable scaling capacity utilizing internal county resources, ABAG resources, collective resources as well as consultants. Given the existing structure, new programs will not increase the current level of administration.

State Policy and Legislation, CPUC Guidance, Strategic Plan

The State of California and its agencies have put forth a broad range of new regulations, legislation, and goals that fundamentally change how program administrators think about energy efficiency and about what solutions can address these new goals. Business as usual is insufficient and lacks the necessary range of tools and approaches.

The BayREN Business Plan considers relevant CPUC guidance documents, legislation, the California Long-term Energy Efficiency Strategic Plan (CAEESP), and associated action plans. New direction from the State, should there be any, will be incorporated into BayREN's program implementation over the coming years. In this Business Plan, each sector identifies and highlights this alignment, including, but not limited to:

- Governor's Executive Orders and State Goals.
- 2011 CAEESP and summary of proposed Strategic Plan Updates (CPUC).
- AB 758 – Implementing the Existing Buildings Energy Efficiency (EBEE) Action Plan.
- SB 350 – Clean Energy, especially the doubling of energy efficiency in buildings and the focus on disadvantaged communities.
- AB 802 – Benchmarking and Data.
- AB 793 - Energy Management Technologies.
- SB 1414 - Permit requirements.
- Zero Net Energy
    - New Residential ZNE Action Plan.
    - Initial Commercial ZNE Update to the Action Plan.
- Decision 12-11-015, and 15-10-028, R.13-11-055, et. al.
- Integrated demand side resources (IDSR) Proceeding and Cost-Effectiveness calculations.
- Local and regional planning for climate, sustainability, and resiliency.

Key Issues, Trends, and Experience Informing the Business Plan

The overriding influencing factor for the BayREN's Business Plan is BayREN's identity as a local government entity and how that identity can provide a different approach to energy efficiency. With that perspective, the BayREN sees the following issues and trends as important to address and consider in setting goals, developing programs, and evaluating the REN's value to ratepayers.

- **Hard-to-reach is hard to reach** - While the BayREN embraces the challenge to take on the hard-to-reach markets and those that the utilities will not, it also knows that demonstrating "success" for all the stakeholders, as it is currently defined, will be difficult. There must be a clear and definitive value given to the BayREN for embarking on and sustaining this effort that allows EM&V and regulators to credit and consider the difficulties inherent in the RENs' charge. New criteria to judge success in these markets must be established.

- **Cost-effectiveness** - In the same vein as above, cost-effectiveness is a persistent concern for the RENs. This issue has multiple elements: (1) The relative small REN portfolio of programs does not enable the diversity of programs to aggregate savings and cost-effectiveness in a beneficial way; (2) The hard-to-reach markets and those that the utilities will not take on are primarily not part of utility portfolios because they do not meet cost-effectiveness tests—in California or elsewhere; and (3) Inadequate length of time to accrue and determine savings for more challenging markets, particularly those with a goal of market transformation.[7] (The BayREN proposes some alternative approaches to cost-effectiveness in the next section.)

- **Data Access** - One of the most exciting technological breakthroughs in recent years is the richness and availability of data tools to target programs and encourage new behaviors, particularly through Smart Meters. However, the BayREN has no ability to use customer energy usage data based on current rules and policies. This lack of energy usage data for Bay Area property owners creates a substantial disadvantage for the BayREN in creating programs and approaches that leverage this information. The BayREN will work within these constraints to utilize other data it does have, such as access to property data, housing and transportation research from ABAG, and other sources. In addition, the BayREN will continue to advocate for more robust data sharing.

- **Unique Bay Area Energy profile** - The Bay Area is blessed with strong climate change/environment-positive audiences, which can be leveraged in education and marketing and outreach efforts. However, the generally moderate climate limits how much energy savings can be harvested by each customer, particularly in the whole building approaches supported by the

[7] CPUC, "Guidance on Designing and Implementing Energy Efficiency Market Transformation Initiatives", Ken Keating, et.al, December, 2014.

Strategic Plan. The density of population and the receptivity to energy efficiency messaging will help, as will new approaches to each of the sectors.

- **Evolution (technology, market, and policy)** - The BayREN must maintain agility and innovation to effectively respond and take advantage of technological changes as well as recognize and incorporate the impacts of these changes on the market. Since the adoption of the California Long-Term Energy Efficiency Strategic Plan, there have been substantial changes in policy, and it is likely that this will continue as the State tries to anticipate and respond to the needs required to address climate change, while expanding economic prosperity and social justice.

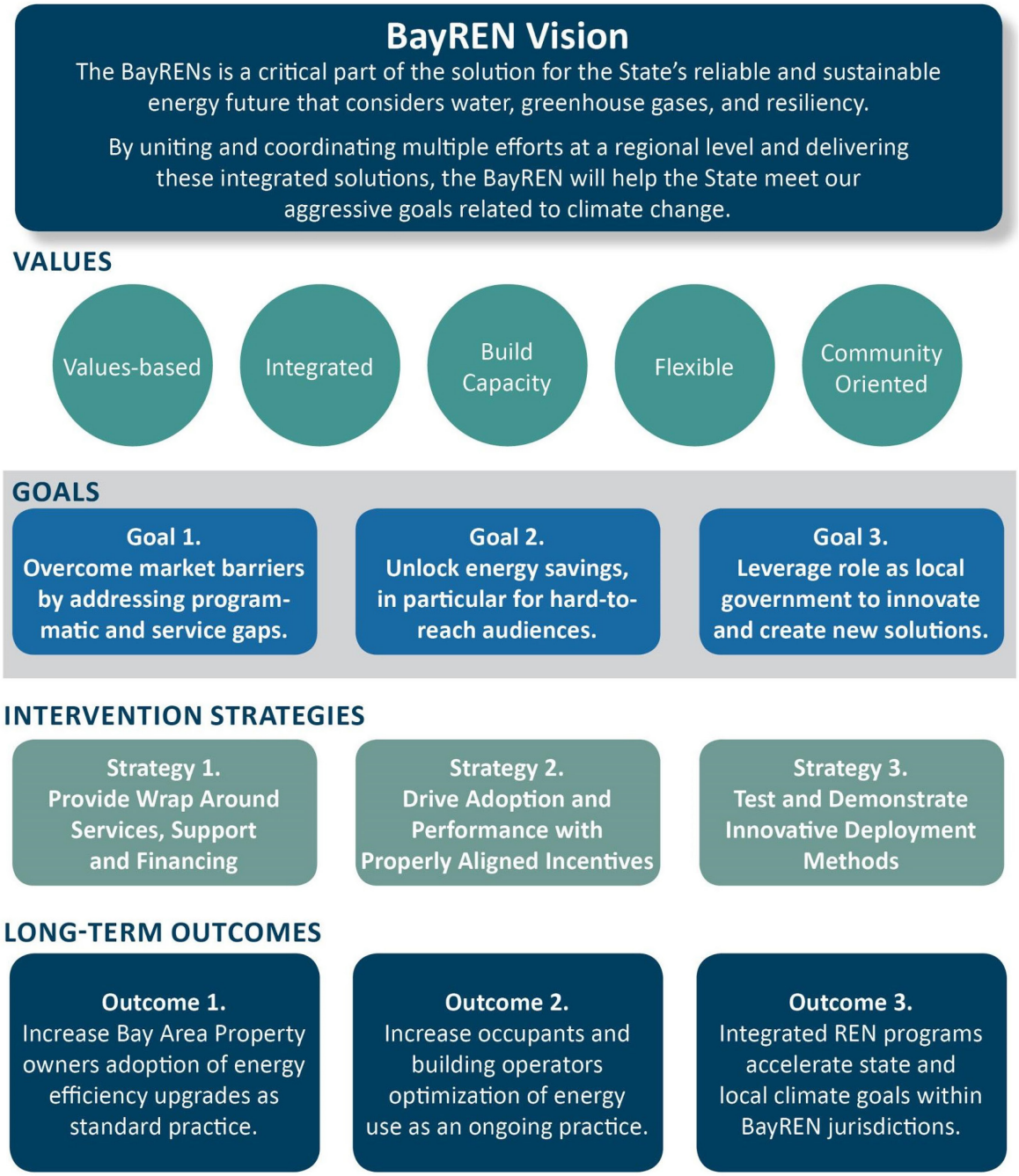
- **Integration** - The future of energy efficiency is the convergence of multiple technologies and approaches that seamlessly incorporate traditional energy efficiency measures with distributed energy sources/renewables, energy storage, demand management technologies, and behavior programs. This integration will expand to address optimization of grid resources, time of use load management, and the potential for shared energy among multiple buildings and owners. ZNE and district approaches will be the focus of this integration.

- **Advance Building Workforce** - The move to ZNE for California's buildings and the drive for deeper and deeper savings in existing buildings requires an expansion and increase in knowledge and capabilities in the building industry. This includes architects and engineers, builders, specialty contractors and raters, and other players in the built environment. Without this capable, performance-oriented workforce, it will be a challenge to meet the state goals. The BayREN must support the need for advanced training and leverage workforce education and training (WE&T) and other statewide workforce and education providers.

Vision and Business Plan Framework

The following Business Plan Framework provides an overview of the BayREN's Vision, Values, Business Plan Goals, and Core Strategies, and the expected Long-Term Outcomes from the proposed BayREN Business Plan. These overarching Goals capture the need and purpose of the BayREN, with Strategies that address key issues common across all of the sectors. The Framework will inform and focus the BayREN's efforts over the next ten years. As such, the Goals and Core Intervention Strategies are reflected in each sector and operationalized with customized and targeted tactics, which will be regularly adjusted and adapted to ensure flexibility and legislative and market responsiveness.

Figure 1.2. The BayREN Vision



Business Plan Tactics

Table 1.1. Business Plan Tactics Summary

Strategy 1. Provide Wrap-around Services, Support, and Financing (non-resource)	Strategy 2. Drive Adoption and Performance with Properly Aligned Incentives (resource)	Strategy 3. Test and Demonstrate Innovative Deployment Methods (non-resource)
RESIDENTIAL: Single Family		
R1. Expand Home Energy Advisor services to enable the customer journey.	R4. Improve equitable access to energy efficiency services and upgrades.	R6. Establish demonstration projects for community approaches for long-term energy efficiency savings.
R2. Provide training and support for contractors, raters, and assessors to increase capabilities and quality of work.	R5. Deploy budget-optimized energy efficiency packages that are affordable for the customer and achieve savings and customer satisfaction.	R7. Integrate Green Labeling Program to increase awareness and information transparency throughout region.
R3. Facilitate access to complementary services that drive leads and support the customer journey.		
RESIDENTIAL: Multifamily		
R8. Build ongoing, long-term relationships with property owners through ZNE investment planning and operational savings.	R9. Continue Bay Area Multifamily Building Enhancements (BAMBE) streamlined technical assistance and rebate program model.	R10. Introduce other market drivers, specifically local government policies, green labeling and access to financing.
COMMERCIAL		
C1. Provide one-stop-shop/single-point-of-contact for energy efficiency and related services and offerings in the 9 county area.		C4. Drive projects and energy savings via Pay-for-Performance incentives paid out over time for metered savings.
C2. Establish co-pay financing for existing rebate/incentives program offerings that leverage existing project delivery infrastructure, marketing, contractors, etc.		C5. Employ portfolio and district approaches for commercial energy efficiency improvements.
C3. Educate and support Commercial-PACE gatekeepers, particularly contractors, to take advantage of PACE financing.		
PUBLIC		
P1. Provide Building Energy Management Systems (BEMS) system design, acquisition, setup, and commissioning.		P3. Provide portfolio assessment and investment support analysis, based on BEMS data.
P2. Provide BEMS training and support groups.		P4. Provide integrated systems analysis to support early adoption of ZNE.

Strategy 1. Provide Wrap-around Services, Support, and Financing (non-resource)	Strategy 2. Drive Adoption and Performance with Properly Aligned Incentives (resource)	Strategy 3. Test and Demonstrate Innovative Deployment Methods (non-resource)
CROSS CUTTING: CODES & STANDARDS		
CS1. Increase the use of existing compliance strategies and electronic compliance tools into local building department practices and permit systems.		CS3. Test and promote advanced energy codes and policies including ZNE.
CS2. Develop and promote energy code and best practice trainings and workshops consistent with state and local energy goals.		CS4. Make energy-related permit data more accessible to industry.
CROSS CUTTING: WATER-ENERGY NEXUS		
WE1. Expand the number of participating municipal utility partners to scale on-bill market and service delivery.		
WE2. Facilitate adoption of model tariffs and on-bill program design for market consistency.		
WE3. Provide technical assistance to refine program components to meet efficiency needs specific to target customer classes.		

Portfolio Changes

The BayREN has had a very limited portfolio to date. Building on successful elements and experience from the last three years will add more sectors and program areas over the next ten years. Specifics about changes and details from the current portfolio are provided in each sector chapter. Briefly, the BayREN is making the following changes:

Residential Sector

- Transitioning out of the Home Upgrade Whole House Program and creating a new Single Family Residential suite of programs targeted at moderate income homeowners and renters that will encourage whole house savings over time, engaging and leveraging existing Home Upgrade contractors as much as possible.
- Continuing the successful Multifamily program and developing new market drivers.
- Making the Home Energy Advisor Program a standalone program.
- Expanding green labeling activities in addition to Home Energy Score.

Commercial

- Expanding into the Small and Medium Commercial Sector, incorporating our existing Commercial PACE program.

Public Sector

- Expanding into the Public Sector, serving unfilled niches and building on successful strategies by the SoCalREN but with refinements based on the Bay Area public sector market.

Cross-Cutting: Codes & Standards

- Expanding and enhancing the ability of building professionals and building department staff to use electronic permitting and compliance tools to increase permitting rates and streamline enforcement.
- Increasing the transparency and accessibility of permit data to better validate energy code compliance.

Cross-Cutting: Water-Energy Nexus

- Expanding the on-bill program design options to include a regional program model to increase access to capital and facilitate streamlined participation by municipal water utilities.

Portfolio Budget Overview

The following budget is a summary of each sector's budget and is estimated based on the proposed activities. It is anticipated that as the BayREN moves forward, this budget will be adjusted to respond to market changes, increased or decreased needs in particular areas, and the potential to scale particular approaches.

The BayREN's Portfolio Budget summarizes each sector's budget and overarching costs, including the actual budget for 2016 and the proposed budget for 2017, as submitted to the CPUC for approval on September 1, 2016. The proposed budgets for 2018-2025 presented below represent the expansion and modification of the BayREN portfolio and activities outlined in this Business Plan. The budget also shows Administration costs, BayREN EM&V budget,[8] and spending breakdowns for Program Implementation, Program Marketing, and Incentives. With this Business Plan, the BayREN proposes to reallocate Administrative costs from Sector Program budgets to the overall BayREN Portfolio budget. As a result, starting in 2018, Administrative allocations have been removed from Sector Program budgets. This is discussed further in Accounting Protocols below.

In this Business Plan, BayREN also proposes to work with CPUC and PG&E to establish a process by which BayREN is authorized to make a quarterly request for anticipated funds to be invoiced to PG&E. This would allow BayREN to speed payment to County Agencies and subcontractors for approved invoices.

[8] Current EM&V formula is based Program Budgets and associated Administrative Costs as directed by CPUC Decision D. 16-08-019, August 18, 2016.

Table 1.2. Portfolio Budget

	2016*	2017*	2018	2019	2020	2021	2022	2023	2024	2025
Residential	15,673,139	14,649,849	16,537,000	16,595,000	16,707,000	15,170,000	15,084,000	15,279,000	14,924,000	15,134,000
Commercial	431,578	251,505	2,883,000	4,544,000	5,401,000	5,762,000	6,259,000	7,077,000	7,558,000	8,229,000
Public	-	-	450,000	701,000	1,157,000	1,715,000	2,296,000	2,365,000	2,436,000	2,349,000
Codes & Standards	1,492,087	1,274,500	1,788,000	1,918,000	1,983,000	1,954,000	2,096,000	2,166,000	2,136,000	2,291,000
Water-Energy Nexus	401,718	361,146	1,051,000	944,000	831,000	824,000	811,000	842,000	941,000	996,000
BayREN Program Admin**	**	**	1,348,000	1,400,000	1,429,000	1,393,000	1,448,000	1,492,000	1,501,000	1,547,000
BayREN EM&V***	-	275,617	400,950	435,033	458,467	446,967	466,567	487,017	491,600	509,100
Total	**17,998,522**	**16,812,617**	**24,457,950**	**26,537,033**	**27,966,467**	**27,264,967**	**28,460,567**	**29,708,017**	**29,987,600**	**31,055,100**
Program Administration	*1,072,772*	*933,570*	**	**	**	**	**	**	**	**
Program Implementation	*5,735,523*	*5,595,897*	*10,566,000*	*12,003,000*	*13,069,000*	*13,465,000*	*14,138,000*	*15,067,000*	*15,809,000*	*16,673,000*
Program Marketing	*1,740,227*	*1,157,533*	*1,853,000*	*1,869,000*	*1,910,000*	*1,960,000*	*2,058,000*	*2,062,000*	*2,136,000*	*2,151,000*
Incentive	*9,450,000*	*8,850,000*	*10,290,000*	*10,830,000*	*11,100,000*	*10,000,000*	*10,350,000*	*10,600,000*	*10,050,000*	*10,175,000*

** 2016's actual budget and 2017's proposed budget are included for reference.*
*** Starting in 2018, Administrative costs from Sector Program budgets to the overall BayREN Portfolio budget.*
**** EM&V request represents proportional share of the evaluation funds based on BayREN total program budget and associated Administrative costs, as authorized in D.16-08-019.*

Accounting Protocols

The California State Auditor's Report regarding accounting protocols has yet to be released, thereby precluding a discussion of how the BayREN intends to comply with the Report's recommendations. Until that time, the BayREN will continue to be consistent with local government accounting protocols, the CPUC's Energy Efficiency Policy Manual, and Generally Accepted Accounting Principles. Starting in 2018, the BayREN proposes to follow the Energy Efficiency Policy Manual protocols and reallocate Administrative costs for Sector Programs to the overall BayREN Portfolio budget. The BayREN believes this revised approach is consistent with discussion of allowable costs in the Policy Manual and the BayREN's experience for how administrative activities impacted BayREN and County Agency staff during implementation of the BayREN's Programs from 2013-2016. This approach will help BayREN continue to maintain budget allocations under the CPUC's 10% cap on administrative costs. In the Business Plan Budget, all Administrative allocations have been removed from Sector Program budgets.

EM&V Roadmap

The BayREN will continue to interact with the CPUC to advise on the development of CPUC EM&V Roadmaps and participate in CPUC EM&V studies and working groups. This work will be supplemented through BayREN's use of its own EM&V budget to conduct evaluations. In each sector chapter, a chart shows potential studies that have been identified. These studies will be prioritized and aligned with other CPUC and utility activities to ensure the highest impact and benefit from any new studies. BayREN-led

EM&V efforts are proposed to verify the non-resource benefits of programs such as the Small and Medium Commercial Building Performance Advisor, Moderate Income Residential, and Codes & Standards Program efforts to promote energy code best practices. In addition, future studies will help to identify processes and procedures that would allow current non-resource programs (e.g., Water-Energy Nexus, C&S electronic tools) to transition to resource programs. BayREN will work with staff at the CPUC during all phases of the studies. A summary of BayREN proposed EM&V efforts is below.

Table 1.3. BayREN Proposed EM&V Summary

Study Title/Topic Focus	Objective	Timeframe
Residential Sector		
Home Energy Advisor	Determine impact of the Advisor program.	Short-term Long-term
Moderate Income Participation/ Demand	Understand moderate income market.	Short-term
Multifamily Market Share	Determine whether incentive amounts can be reduced or redesigned.	Mid-term
Multifamily Technical Assistance Process Evaluation	Track conversion rates to gain insights to improve TA design.	Mid-term
Commercial Sector		
EM&V practices are well established; the BayREN does not proposed additional Commercial EM&V Study Needs at this time.		
Public Sector		
Municipal Building Stock and Controls	Understand and track municipal market.	Mid-term
Municipal Energy Use/Intensity	Target on highest needs in municipalities and track program performance.	Short-term
Energy Efficiency Activity	Track program performance.	Mid-term
ZNE Adoption	Track program performance.	Mid-term
Codes & Standards		
Impact of E-Permitting	Understand the value of e-permit systems to expand their use.	Short term
Impact of Local Ordinances	Inform the further development of advanced energy policies.	Mid-term
Compliance Improvement Control Trials	Evaluate the cost-benefit of specific compliance tools/services.	Mid-term
Water-Energy Nexus		
Efficiency as a Utility Service	Understand the market demands to effectively extend efficiency services to customers as part of utility service.	Mid-term

Evaluation and Benefits Framework

"By identifying all program benefits—not only to the utility, but also to customers and society—utilities (and policymakers) can conduct more complete benefit cost analysis, can develop programs that improve service to customer by maximizing benefits from programs, and can emphasize the benefits of those services to customers."[9]

The BayREN, in line with the SoCalREN and the 3C-REN (proposed REN), are adopting a two-part approach to establish an effective and comprehensive evaluation framework for the associated benefits that their Business Plans and subsequent programs provide. This approach is designed to measure and evaluate the value of the RENs' offerings and provide a common framework, in lieu of cost-effectiveness, total cost resource (TRC), and program administrator cost (PAC) calculations required for the traditional investor owned utilities (IOUs).[10]

The first part of the approach is to clearly articulate the **measurable value that RENs provide to ratepayers, their communities, and the State through the operation of energy efficiency programs**. The second part of the approach is to actively participate in ongoing **discussions at the CPUC regarding cost-effectiveness frameworks**, including the ongoing IDSR Proceeding (R.14-10-003). The current cost-effectiveness approach is too limited in its consideration of non-energy benefits, and underestimates the importance of local government efforts in enabling increased energy savings over time and in reaching underserved audiences. Further, the current EM&V and cost-effectiveness calculators do not align to the State's increasingly aggressive climate change goals and emphasis on engaging disadvantaged communities.[11]

The RENs' Evaluation Benefits Framework focuses on the following essential principles:

- Recognizing that ratepayers benefit from equal access to services and from more comprehensive approaches than can be offered by utilities alone.
- Valuing and supporting non-energy benefits.
- Calculating and incorporating the value from leveraged resources and dollars not associated with ratepayer funding.
- Asserting that both resource and non-resource programs are essential and have clear value for ratepayers.

[9] Skumatz, Lisa, Economic Research Associates, Inc., Dickerson, Chris Ann, Pacific Gas and Electric, and Coates, Brian, Seattle City Light, "Non-Energy Benefits in the Residential and Non-Residential Sectors - Innovative Measurements and results for Participant Benefits", ACEEE Summer Study, 2000.

[10] CPUC D. 12-11-015, page 18, "the Commission will not set a threshold cost-effectiveness level, either TRC or PAC, for RENs at this time. Rather the dual test for overall portfolio cost effectiveness, taking into consideration passing both the TRC and PAC tests for each service territory and for the entire approved portfolio, including RENs, will continue to govern the CPUC's cost-effectiveness for the energy efficiency programs."

[11] See SB 350 and Scavo, Jordan, Suzanne Korosec, Esteban Guerrero, Bill Pennington, and Pamela Doughman. 2016. "Low-Income Barriers Study, Part A: Overcoming Barriers to Energy Efficiency and Renewables for Low-income customers and Small Business Contracting Opportunities in Disadvantaged Communities." California Energy Commission. Publication Number: CEC-300-2016-009-SD2, page 26.

- Understanding that climate change and the reduction of carbon emissions is a primary objective of energy efficiency programs.
- Recognizing that State goals cannot be met within the current cost-effectiveness framework.
- Integrating demand response and distributed energy resources (including storage) with energy efficiency.
- Addressing water efficiency with energy efficiency as routine practice.

Key Evaluation Benefits and Metrics

The RENs propose two general areas for consideration of the benefits of energy efficiency programs, as well as target metrics that can help measure the progress in reaching goals. These metrics are designed to specifically measure progress in programs that are: (1) designed to serve hard-to-reach populations and/or utility service gaps; and/or (2) focused on creating economic and quality-of-life benefits for communities, including persistent and deep savings and a reduction in the impacts of climate change. These metric categories, described below, are designed as a group of potential areas to measure programs but are not designed to all be used for each program.

1. Effectiveness in reaching hard-to-reach customers and filling utility service gaps
A significant part of the Business Plan's intention is to create better access to energy efficiency programs for all ratepayers, in particular hard-to-reach audiences and those underserved by current utility programs. The BayREN's programs will target these audiences and track success in reaching and converting outreach into actual projects. Local governments operate a variety of housing, economic development, and social programs that can be linked to energy efficiency and hard-to-serve customers, either through marketing and outreach support or direct provision of services, such as earthquake retrofits linked to energy efficiency retrofits.

Target Metrics:

- Number of property owners reached and conversion to projects.
- Number of participating households, businesses, and jurisdictions.
- Number and percentage of hard-to-reach populations served.
- Dollar value and ability to leverage outside resources to supplement and layer onto ratepayer funding (may include other grant funding, local government funding, private capital, property owner investment).
- Number of kWhs, kW, and Therms saved by program activities.

2. Economic Development and Community Impacts
Energy efficiency programs can have substantial economic development and quality-of-life impacts on communities including creating jobs, increasing property values, enhancing the comfort and health of residents, supporting business vitality, and creating discretionary income. The BayREN, coordinating with other RENs and the CPUC, will develop a consistent and measurable methodology to estimate the value of the community impacts using current databases such as community tracking systems, county property values sources, and, where needed, evaluation activities.

In addition to absolute savings, well-designed energy efficiency programs should lead to persistent and deep savings that are needed to achieve State goals. The BayREN will develop metrics to assess a broader measures of savings including proportional savings (savings to baseline) and institutional and policy changes that will drive future changes.

The State of California and local governments have adopted a variety of policies to reduce the impacts of climate change on communities and economy. Carbon related impacts include changes to the built environment, implementation of local climate action plans, capacity building such as training of government staff and integration of climate goals in non-energy programs and policies, and enhancements to community resilience.

Target Metrics:

Dollar value of economic impact created by Business Plan

- Value and number of jobs.
- Increase in property values.
- Business retention.
- Housing stock/neighborhood enhancement.

Near-Term Carbon Metrics

- Permitting rates and compliance and/or permitted projects that exceed Title 24, Part 6.
- Alignment and support in reaching Local Government Climate Action Plan Implementation, including reach code adoption and greenhouse gas (GHG) reduction goals.
- Increase local government capacity building actions (i.e., increasing ability for jurisdictions, particularly small ones, to engage in energy efficiency; streamline and create efficiencies in processes, engagement, and other energy efficiency activities, as well as training).
- Value of pilot programs that have been scaled (to other jurisdictions, utilities, or others, etc.

Long-Term Carbon Metrics

- GHG reductions accomplished.

Portfolio Level Target Metrics

Below is the BayREN's portfolio-level metrics based on the Plan's goals. These metrics represent a high-level summary of all of the sector metrics, detailed in the specific sector sections. The identified benefits represent contributions the BayREN's Resource and Non-Resource programs will make to Bay Area economies, climate action plans, and the PG&E Energy Efficiency Portfolio. Energy savings projections have been developed consistent with current CPUC methodologies and guidance provided to the BayREN. The BayREN will work with CPUC to refine these energy savings, especially for newly proposed programs and for Non-Resource programs. As additional guidance specific to AB 802 is implemented and additional meter data is made available, the BayREN will work with the CPUC to adjust energy savings targets and reporting practices as necessary.

Table1.4. Portfolio Level Target Metrics

Measure	2015 Actuals*	2018-2020 Average**	2021-2024 Average**	2025+ Average**
Budget	$16,748,653*	$26,320,483	$28,855,288	$32,121,244
Effectiveness of Reaching Customers (# of Participants: Customers, Building Professionals, and Jurisdictions)	18,315 Households 82 Non-Res Buildings 850 Building Professionals 78 Jurisdictions***	77,300 Households 340 Non-Res Buildings 1,200 Building Professionals 110 Jurisdictions***	122,600 Households 1,660 Non-Res Buildings 1,950 Building Professionals 155 Jurisdictions***	198,000 Households 10,100 Non-Res Buildings 2,500 Building Professionals 190 Jurisdictions***
Energy Savings (1st year energy savings)	3,987,723 kWh* 349,940 Therms* 1,133 kW*	6,957,000 kWh 900,000 Therms 1,770 kW	21,259,000 kWh 1,927,000 Therms 5,560 kW	27,227,000 kWh 2,577,000 Therms 9,570 kW
CO_2 Avoided	9,993 tons	23,300 tons	54,500 tons	72,000 tons
Community and Economic Impacts	Value ($) of economic impact; Permitting rates and compliance; etc. *Efforts within this section are long-term impacts. The actual methodologies and numbers to quantify these impacts will be developed with mid-term EM&V studies.*			

** 2015 is offered as a reference year. Budget numbers represent final 2015 expenditures. 2015 energy savings are preliminary claimed savings submitted as part of BayREN's 2017 Compliance Filing for the BayREN's Resource Programs.*

*** Short-, Mid-, and Long-Term metrics are aggregated from aligned metrics within the following Sector Chapters. Projected energy savings are program benefits resulting from both Resource and Non-Resource programs consistent with the BayREN's proposed Evaluation and Benefits Framework discussed above.*

**** Number of participating jurisdictions includes a jurisdictions participation in separate programs; as a result the number shown eventually exceeds the number (110) of jurisdictions in within the Bay Area.*

Solicitation Plan

As indicated in the CPUC Decision D.12-11-015, the RENs were established as unique entities with the ability to design and deliver programs in ways that the utilities cannot. The RENs have "the independent ability, within the confines of the approvals of their proposals granted by the Commission, to manage, deliver, and oversee their own programs independently, without utility interference or direction as it relates to the design and delivery of their programs."[12] BayREN leverages the expertise and creativity of local governments for program design and delivery. While the BayREN member agencies oversee, manage, and operate all BayREN programs, consultants are contracted to assist in the design and implementation of discrete elements or entire programs under the guidance and direction of member agencies.

As the BayREN expands programs into the Commercial and Public Sector, additional consultants may be engaged. To that end, solicitations for services to design and/or implement BayREN programs will be issued as programs come online, or as needed. For the benefit of potential bidders interested in providing such services, each Sector Chapter of this Business Plan includes a general outline of proposed BayREN programs and their envisioned implementation timelines. Any solicitation required for programs will be conducted according to the specific local government procurement protocols for the issuing BayREN member agency (ABAG, county, city, or other). All solicitations will be publicly noticed by the issuing agency. Additionally, as requested by California Energy Efficiency Coordinating Committee (CAEECC) stakeholders, the BayREN commits to working with the IOUs to determine how the RENs may utilize common Program Administrator procurement channels such as the IOUs' Proposal Evaluation & Proposal Management Application.

[12] D.12.11-015, at page 11.

Document Organization

The Business Plan is composed of the following sections that are numbered by section and organized to follow the CPUC guidance as well as stakeholder and CAEECC input:

Section 1. Overview
Section 2. Residential Sector
Section 3. Commercial Sector
Section 4. Public Sector
Section 5. Cross-Cutting: Codes & Standards
Section 6. Cross-Cutting: Water-Energy Nexus
Section 7. Appendices

A. Water-Energy Nexus Maps
B. Acronyms and Abbreviations
C. Glossary - Program Administrator Dictionary
D. CPUC Checklist

The CAEECC Issues Tracker is attached separately and will be uploaded to www.caeecc.org.

In each of the Sector sections, the following information is provided:

- Introduction
- Sector Summary
- Evolving Approaches
- Vision, Intervention Strategies, and Objectives
- Budget and Metrics
- Market Characterization and Trends
- Strategies and Tactics
- Coordinating Activities
    - Leverage Resources
    - EM&V Efforts
    - Marketing, Education & Outreach
    - Workforce Education and Training
    - Cross-Cutting Initiatives
    - Key Partners/Coordination

Section 2
RESIDENTIAL SECTOR

BAY AREA Regional Energy Network

Section 2. Residential Sector

Introduction

The BayREN Residential Sector Business Plan addresses single family and multifamily properties. The BayREN residential programs reflect the CPUC directive that the RENs address hard-to-reach markets and address gaps in program delivery from the IOUs. Single family and multifamily programs have proven to be challenging for Program Administrators to engage targeted property owners and achieve desired energy savings while maintaining cost-effectiveness. Still, the residential sector is the focus of recent legislation and is a state policy priority.[1] Despite past program challenges and forecasted increases in energy consumption in PG&E territory,[2] the residential sector has substantial potential for energy savings and a need for new approaches to garner these savings more effectively.

This chapter discusses further developments to existing programs that BayREN has implemented since 2013, with substantive changes and enhancements to the single family program to expand reach, access to participation, and alignment with state legislation and goals.

BUSINESS PLAN VISION, OUTCOMES AND BUDGET

Vision

Residential property owners adopt energy efficiency upgrades as standard practice.

Residential Sector Outcomes

- *Increased participation of single family residents, property owners, and contractors in the BayREN residential programs.*
- *Penetration of hard-to-reach moderate-income market.*
- *Integrated energy efficiency financing, green labeling, and energy transparency.*
- *A robust and accessible whole building customer journey that includes affordable, accessible entry points and can lead to whole building upgrades and ZNE.*

2018-2025 budget (total) *$125.4 M*

The chapter provides an overall summary of the entire BayREN Residential Sector, and provides two separate sections for Single Family and Multifamily initiatives to provide ample information about the intent and direction of the BayREN future programs. The detailed sections offer more comprehensive market analysis for the sub-sectors and more extensive discussion of the associated tactics. Metrics, budget, and a chart of potential programs are also included for each sub-sector. The final part of this chapter is devoted to residential cross-cutting activities including marketing, workforce education, training, and partnerships.

Market Context

The BayREN suite of residential programs, as directed by the CPUC, targets hard-to-reach markets and segments where the utilities cannot or will not develop programs.[3] The BayREN residential programs focus on moving the market toward whole building deep retrofits for single family and multifamily properties. BayREN will move away from Home Upgrade and will shift program design to a more

[1] SB350, AB 758, and AB 805.
[2] CEC, "California Energy Demand (CED) Updated Forecast 2015-2025", December 2014. (upwards of 40,000 GWh by 2026).
[3] CPUC Decision. 12-11-015, Pg. 17.

affordable and incremental approach to whole house for moderate-income single family households, which make up approximately 34% of the Bay Area single family units and are currently underserved. In addition, the BayREN will continue to target multifamily property owners, in particular addressing properties with central systems (roughly 60% of units[4]) that experience the least split incentive and are most likely to participate in a whole building upgrade. The multifamily market is diverse, with 5 to 500 unit properties of most vintages being equally viable candidates for some whole building work. Additional market and specific sector details are provided by sub-program areas.

[4] Residential Appliance Saturation Survey (RASS), 2010. Statewide value.

Sector Summary

Single Family

BayREN's current single family residential efforts are focused primarily on the Energy Upgrade California® Home Upgrade Program, which includes the BayREN Home Energy Advisor Program. The Home Upgrade program was developed with ARRA[5] funding and designed to reach single family residents and incentivize whole house energy efficiency upgrades. The program was intentionally designed to be offered statewide and implemented by all of the IOUs and the two RENs. This chapter details the evolution of BayREN's single family strategies beginning in 2018 and continuing through 2025. While BayREN will transition away from Home Upgrade, the intention is to replace it with a more robust, affordable, and accessible whole house option that will allow moderate-income homeowners to achieve deep energy savings overtime. The Home Energy Advisor, contractor development and support, and incentivized measures will remain central to BayREN's single family approach, with a focus on moderate-income residents.

The BayREN will integrate green labeling within the single family program, and anticipates expanding the effort into multifamily in later business plan years. BayREN will engage, educate, and motivate the Bay Area's real estate, rental, and financing professionals so they can help their clients—single family home buyers and sellers, multifamily property owners and managers, and renters—make better-informed decisions about the buildings they are concerned with and about investments in building upgrades. Building labeling protocols allow property owners, buyers, renters, lenders, and other actors in real estate transactions to better understand how a building with energy efficiency and other green features compares to non-upgraded building. For evaluations based solely on a building's physical characteristics, labels can be useful when occupancy changes. In the multifamily market, green labeling can help overcome the disincentive for property owners to make energy efficiency improvements to their property.

Multifamily

BayREN's current multifamily residential programs include the Bay Area Multifamily Building Enhancements (BAMBE) offerings of no-cost technical assistance and rebates, and Bay Area Multifamily Capital Advance Program (BAMCAP), which offers co-financing from private lenders. The BayREN plans to continue our existing Multifamily offerings in the short- to mid-term, until they reach a substantial share of the market and demonstrate the viability of energy upgrades. In the mid- to long-term, BayREN will target a suite of diverse market drivers that will eventually replace resource-intensive financial incentives. Throughout, the BayREN will focus on fostering long-term relationships with the market actors—property owners, facility managers, builders, and the like. Strategies build upon the EBEE Action Plan for long-term engagement, and include customer-oriented program design, engagement of large

[5] America's Reinvestment and Recovery Act.

property owners at the portfolio level, up-front investment planning of multiple upgrade phases to approach ZNE, and addressing operational savings.[6]

BAMBE provides targeted outreach to multifamily property owners to promote whole building upgrades. Participating property owners receive customized and streamlined no-cost technical assistance and a simple yet flexible per-unit rebate for meeting minimum scope requirements. These interventions are designed to lower barriers to multi-measure upgrades. These efforts have the benefit of improving conditions and access to energy efficiency by tenants who otherwise may not be able to afford or implement the improvements. These multifamily properties likely include low- and moderate-income customers and renters.[7]

The BayREN administers BAMCAP in conjunction with BAMBE, as authorized by D.13-09-044. BAMCAP offers no-interest co-financing to lenders who underwrite and service traditional loans directly with the property owner. It leverages existing lending practices and infrastructure and serves to lower the effective interest rate to the borrower while replenishing its capital pool. The current offering has successfully enabled BayREN to engage in the multifamily lending industry to facilitate several deals and to engage in productive discussion with lenders around energy efficiency (EE) financing. The BayREN plans to continue to facilitate the use of private capital to help fund whole-building upgrades and will adjust its role to meet the market's needs.

[6] CEC, "Existing Buildings Energy Efficiency Action Plan", 2015, Strategies, 2.1, 2.2, 2.2.4 and 3.4.
[7] Scavo, Jordan, Suzanne Korosec, Esteban Guerrero, Bill Pennington, and Pamela Doughman. 2016. "Low-Income Barriers Study, Part A: Overcoming Barriers to Energy Efficiency and Renewables for Low-income customers and Small Business Contracting Opportunities in Disadvantaged Communities." California Energy Commission. Publication Number: CEC-300-2016-009-SD2, page 12.

Evolving Approaches

BayREN plans to evolve its single family and multifamily programs over the next ten years. This chapter lays out a set of approaches for increasing energy savings and non-energy benefits related to water and carbon, expanding the building performance contractor base, and working toward building a stronger single family and multifamily whole building retrofit market. In particular, the BayREN will provide expanded access and engagement for moderate-income residents, including renters, when feasible. To date, the BayREN has trained over 300 contractors and enrolled 130 participating contractors, thereby increasing overall awareness and interest in energy efficiency and supporting an expanding market. The BayREN will continue to build relationships and encourage contractors and raters to expand their knowledge of and skills in building performance. In addition, the BayREN model has allowed local governments to increase their local capacity and apply energy savings from projects to their climate action goals, and report the progress to elected officials.

To support its goals, the BayREN proposes to expand its activities in the Residential Sector. In addition, certain existing efforts will transition to new standalone programs. These includes the Home Energy Advisor program, encouraging the adoption of local government policies for multifamily properties, and Green Labeling. These programs will leverage existing BayREN work with multiple partnerships and strategies to increase energy savings among all Residential sector programs, fill current gaps that are prevalent in the Residential market, and eventually result in a market that does not require incentives and subsidies.

Lessons Learned from EM&V

Current and proposed program efforts build on lessons learned from past program cycles, including feedback from EM&V, contractors, and internal evaluations. Administratively, the BayREN will focus on improved processes, data management, and consistency in reporting to respond to EM&V feedback. (See page 2.48 for additional details regarding EM&V.)

An important element relating to EM&V is the need to develop and agree upon an effective method to conduct EM&V for the BayREN residential programs, given the sector's inherent challenges and the BayREN's unique mandate and structure. Unlike the IOUs, the BayREN's very limited portfolio of programs, by the CPUC's mandate, must address hard-to-reach markets or fill gaps that IOU programs have not met. This impacts the BayREN in two critical ways: (1) it does not have the breadth of programs to balance more expensive whole building efforts with high-saving single-measure activities, and (2) by definition, the hard-to-reach areas have not been addressed by the IOUs precisely because they are difficult and traditionally have a low total resource cost (TRC), especially in early phases of program ramp-up. The BayREN residential programs need to be evaluated based on similar programs rather than on a portfolio basis. As discussed in the Overview chapter, the BayREN proposes continued coordination with the CPUC to enable the evaluation of REN programs to consider—in addition to energy savings and measures costs—the difficulty of addressing more challenging markets and progress in market development and non-energy benefits.

Vision, Intervention Strategies, and Objectives

Vision: Residential property owners adopt energy efficiency upgrades as standard practice.

Table 2.1 provides the Residential tactics aligned with the Business Plan's overarching goals and intervention strategies and the sector vision. The BayREN will deliver a variety of services to address conditions and barriers that impact residents' and property owners' decisions and behavior, including readily available technical knowledge and advice, innovative incentives and use of technology tools, qualified and trained contractors, local government policies and green labeling systems that add transparency to the market, and accessible financing options reducing up-front costs.

Ultimately, this effort will result in residential energy efficiency upgrades becoming a norm, where owners do not consider the upgrade costs as an added expense, but as a standard cost of home or building ownership. Further, private investment in energy efficiency will significantly outweigh ratepayer incentive dollars, allowing limited ratepayer funds to be leveraged strategically to continue pursuing deeper energy efficiency. High volume of uptake will also bring down equipment, labor, and both soft and transaction costs. This long-term vision requires addressing the needs of all kinds of property owners, including resident owners, single family rental property owners, and multifamily building owners. This Sector's Tactics create pathways for each group, in some cases starting with renters, but always with the intent to influence the owner to achieve the deepest retrofit feasible.

Table 2.1. Residential Sector Strategies, Tactics, and Objectives

Intervention Strategy	Tactics	Objective
Single Family		
S1. Provide Wrap-Around Services, Support, and Financing	R1. Expand Home Energy Advisor services to enable the customer journey.	*Homeowners and contractors increase energy savings activities, including participation in BayREN Single Family programs.*
	R2. Provide training and support for contractors, raters, and assessors to increase capabilities and quality of work.	*Establish a robust industry to support whole house upgrades into the future.*
	R3. Facilitate access to complementary services that drive leads and support the customer journey.	*Reduce up-front barriers to deeper savings and whole house upgrades.*
S2. Drive Adoption and Performance with Properly Aligned Incentives	R4. Improve equitable access to energy efficiency services and upgrades.	*Improved penetration of hard-to-reach moderate-income market and overall program accessibility.*
	R5. Deploy budget-optimized energy efficiency packages that are affordable for the customer, and achieve savings and customer satisfaction.	*Combine with trigger activities and/or whole home upgrades to deliver immediate customer benefits, program savings, and support kWh savings goals.*
S3. Test and Demonstrate Innovative Deployment	R6. Establish demonstration projects for community approaches for long-term energy efficiency savings.	*Increase reach and scale of residential upgrades by encouraging energy efficiency within an entire community, neighborhood, or district.*
	R7. Integrate Green Labeling Program to increase awareness and information transparency throughout region.	*Increase real estate professional education, leverage industry communications channels, and increase homeowner upgrades at key trigger events.*
Multifamily		
S1. Provide Wrap-Around Services, Support, and Financing	R8. Build ongoing, long-term relationships with property owners through ZNE investment planning and operational savings.	*Enable multifamily property owners to optimize trigger points and capital resources effectively.*
S2. Drive Adoption and Performance with Properly Aligned Incentives	R9. Continue Bay Area Multifamily Building Enhancements (BAMBE) streamlined technical assistance and rebate program model.	*Expand program uptake until substantial market share demonstrates viability of whole-building upgrades.*
S3. Test and Demonstrate Innovative Deployment	R10. Introduce other market drivers, specifically local government policies, green labeling, and access to financing.	*Adoption of local government policies and presence of other market-based mechanisms that encourage building upgrades.*

Budget

The budget (Table 2.2) will facilitate the forecasted short-, mid-, and long-term metrics targets with the expectation that incentive-based activities decrease over time while other strategies scale and gain traction.

Table 2.2. Residential Sector Budget

Budget ($)	2016*	2017*	2018	2019	2020	2021	2022	2023	2024	2025
Admin**	808,017	690,660	**	**	**	**	**	**	**	**
Implementation	4,291,359	4,299,107	5,462,000	5,441,000	5,466,000	5,138,000	4,954,000	5,102,000	5,375,000	5,536,000
Marketing	1,123,763	810,082	1,285,000	1,324,000	1,391,000	1,432,000	1,530,000	1,577,000	1,624,000	1,673,000
Non-Incentive Total	**6,223,139**	**5,799,849**	**6,747,000**	**6,765,000**	**6,857,000**	**6,570,000**	**6,484,000**	**6,679,000**	**6,999,000**	**7,209,000**
Incentive	9,450,000	8,850,000	9,790,000	9,830,000	9,850,000	8,600,000	8,600,000	8,600,000	7,925,000	7,925,000
TOTAL	**15,673,139**	**14,649,849**	**16,537,000**	**16,595,000**	**16,707,000**	**15,170,000**	**15,084,000**	**15,279,000**	**14,924,000**	**15,134,000**

** 2016's actual budget and 2017's proposed budget are included for reference. 2018 budget is proposed as year 1 of the Business Plan.*
*** With this Business Plan, BayREN proposes to reallocate Administrative costs from Sector Program budgets to the overall BayREN Portfolio budget. As a result, starting in 2018, Administrative allocations have been removed from Sector Program budgets. Additional discussion in Overview.*

Sector Metrics

The Residential Sector metrics in Table 2.3 align with the BayREN residential intervention strategies/tactics outlined in the previous pages and indicate anticipated short-, mid- and long-term targets for each of the subprograms.

The single family metrics and budget allocations reflect the BayREN's strategy for transforming the moderate-income market. Participation will increase dramatically over the planning period. In the early period, increased participation is supported primarily by incentives. As cumulative participation reaches 10-20% of the target market, the incorporation of energy efficiency in product purchase decisions and home improvement projects starts to be the norm for households and contractors, and incentives are reduced relative to other services such as support and financing.

Table 2.3. Residential Sector Metrics

Intervention Strategies	Market Effect Metrics	Baseline	Metric Source	2018-2020 Target*	2021-2024 Target*	2025+ Target*
Single Family						
S1. Provide Wrap-Around Services and Support	Average annual participation (new and repeat participants)	2016 Baseline	Program Tracking Database	5,500 average participants/yr	14,000 average participants/yr	18,000 average participants/yr
Estimated % of annual budget				23%	30%	50%
S2. Drive Adoption & Performance with Properly Aligned Incentives	Expand average annual program energy savings	2016 Baseline	Program Tracking Database	Average: 1,500,000 kWh/yr 300,000 Therms/yr 1,500 kW/yr	Average: 4,000,000 kWh/yr 600,000 Therms/yr 4,000 kW/yr	Average: 8,000,000 kWh/yr 1,000,000 Therms/yr 8,000 kW/yr
Estimated % of annual budget				75%	60%	45%
S3. Test and Demonstrate Innovative Energy Efficiency Deployment Methods	Increase number of residents engaged with a single coordinated effort	20167 Baseline	Program Tracking Database	Efforts likely to begin year 3-4	1 District/ neighborhood annually	2 Districts/ neighborhoods annually
	Increased value of EE existing homes at time-of-sale	2018 property value study	Green building registry empirical study	10% increase in number of properties	20% increase in number of properties	Quantified value for EE existing homes at time of sale
Estimated % of annual budget				2%	10%	5%
Multifamily						
S1. Provide Wrap-Around Services and Support.[8]	Number of units touched by program services	2016 Baseline	Program Tracking Database	Increase to 70,000 units	Increase to 100,000 units	Increase to 175,000 units
Estimated % of annual budget				*35%*	*25%*	*20%*
S2. Drive Adoption & Performance with Properly Aligned Incentives	Energy Savings	2016 Baseline	Program Tracking Database	Average**: 1,500,000 kWh/yr 150,000 Therms/yr	Average**: 1,200,000 kWh/yr 120,000 Therms/yr	Average**: 900,000 kWh/yr 90,000 Therms/yr
Estimated % of annual budget				*50%*	*50%*	*40%*
S3. Test and Demonstrate Innovative Energy Efficiency Deployment Methods	Increased value of EE existing multifamily properties at time-of-sale or lease	2018 rent or property value study	Empirical study	Not implemented until year 4	20% increase in number of units or properties with label	Quantified value for EE existing homes at time of sale or lease
Estimated % of annual budget				*15% (strategy development)*	*25%*	*40%*

** 2018-2020 (Short-term); 2012-204 (Mid-term); 2025+ (Long-term).*

*** Multifamily Strategy 2 energy savings are incentivized work, and do not include additional savings for other proposed activities. BayREN aims to reduce the amount of savings that rely on incentives while increasing the amount of savings generated through other proposed activities.*

[8] The number of units includes those served by technical assistance and those influenced by local government policies. The current plan is to directly incentivize 5-10% of total market, with the rest of the targeted market shares representing units served by technical assistance but not directly incentivized and influenced by other market drivers including local government policies (estimated 5% additional market share served by TA and another 10% influenced by other market drivers, by year 10).

SINGLE FAMILY OVERVIEW

Customer Journey: Offering residents a program that meets them where they are, adapts to their needs and capabilities for energy upgrades, and encourages a lasting relationship. Ongoing interaction will broaden customer participation and drive deeper energy savings over time.

California launched its first whole house program, Energy Upgrade California, during the ARRA phase in 2010. The original program was modified and relaunched in 2013 by the four IOUs and two RENs, and was renamed Home Upgrade. The program focuses on a series of measures that improve the building shell and insulation, HVAC systems, hot water heaters, and various other elements. Overall, the program measures tend to address gas savings at a higher rate than electric savings due to the typical configuration and type of systems for heating and water in California homes. Although the program has succeeded in rapidly increasing participation, recent program and process evaluations have clearly shown that the program must evolve in order to reach the scale that is needed to achieve state and local climate action goals.

In the short term, BayREN will transition out of Home Upgrade and will focus over the next ten years on a program that will be attractive and affordable to moderate-income households. While energy efficiency programs for low-income households currently exist, BayREN's modified program design will target moderate-income households that do not qualify for participation in low-income programs.[9] The BayREN proposes evolving the whole house concept to be better aligned with a consumer's needs and to effectively support a "customer journey," which will incrementally achieve a whole home upgrade over time. The evolution would allow a single contractor with a connected suite of programs to offer a homeowner a range of energy efficiency improvements, building the relationship over time to provide additional services including deeper retrofits, behavior change programs, and eventually ZNE. The BayREN will target this new approach to moderate-income residents in the Bay Area—a component of the housing market that is not well served by current programs and is ineligible for low-income programs. The new model will drive greater overall energy savings and gradually decrease reliance on incentives, enabled in large part by the Home Energy Advisor and the adoption of a "customer journey" approach to replace the single-touch approach.

[9] Energy Savings Assistance Program, Pacific, Gas and Electric. https://www.pge.com/en_US/residential/save-energy-money/help-paying-your-bill/energy-reduction-and-weatherization/energy-savings-assistance-program/energy-savings-assistance-program.page.

Single Family Market Characterization and Trends

BayREN represents 101 cities and nine counties within the San Francisco Bay Area, which equates to 20% of the California's total population. The Bay Area provides a wide diversity of housing options and household configurations in multiple climate zones; it is one of the most expensive places in the world to live. In addition, the Bay Area hosts one of the most environmentally-concerned and climate-friendly populations in the country: 77% support doubling energy efficiency in existing buildings by 2030.[10] These characteristics contribute to the current success of the Home Upgrade program in terms of participation and interest. However, as the Bay Area becomes less affordable, particularly in the housing sector, the success of energy efficiency programs and the outlook of homeowners will be impacted. The following section provides a snapshot of the BayREN single family market, focusing on moderate-income households and on the overall characteristics that may influence and impact the BayREN Single Family programs.

Defining Moderate Income and Hard-to-Reach Market

"On the whole, participants in two of the biggest residential programs (by authorized budget), whole-home retrofit ($100 million budget) and plug load and appliance incentive programs ($141 million budget), were more likely than the comparable general population to be white, English speakers, homeowners, have incomes over $100,000, or have a college degree."[11]

The BayREN Single Family program offerings will target moderate-income households, defined as having incomes between $48,000 and $125,000. This will include both homeowners and renters. This range has been established by taking the following into consideration: (1) Low-end: filling the gap in the lower income range and eligibility for low-income programs, which is just below $48,000 for a family of four; (2) Mid-Range: the U.S. Department of Housing and Urban Development's definition of moderate income is 120% of area mean income, which is an average of $102,720 for the Bay Area; and (3) High-End: Based on California Association of Realtors (CAR) housing affordability index, which indicates an average of $168,000 median income is required to afford a median-priced house.

A recent study that analyzed 66 California energy efficiency programs found a large gap in services, in particular for the moderate-income population. The study determined that 53% of single family whole house retrofit project participants had household incomes over $100,000. If the program benefits had been distributed evenly across the household income spectrum, only 28% of households would have incomes above $100,000. Conversely, only 14% of whole house retrofit program participants had incomes lower than $50,000, while across the general population of the state, 44% of households are in that income bracket.

These findings, which were not limited to whole home programs, found that "segments of California ratepayers were consistently underrepresented in general population programs. They included households

[10] PPIC Statewide Survey, July 2015. http://www.ppic.org/content/pubs/survey/S_715MBS.pdf.
[11] M. Frank and S. Nowak, "Who's Participating and Who's Not? The Unintended Consequences of Untargeted Programs", American Council for an Energy-Efficient Economy, 2016.

that were non-white, lower- and middle-income, non-college educated, or non-English-speaking. Nor were these underrepresented households served by California's low-income programs. Some had incomes too high to qualify for low-income programs."[12]

BayREN, charged with serving hard-to-reach markets, will focus program design and outreach to increase the participation of moderate-income households in energy efficiency programs.

Overall Regional Population Trends and Housing

The Bay Area is currently home to approximately 7.4 million people and is expected to reach 9 million by 2040, with the highest growth in Santa Clara and Alameda Counties. The Bay Area is developing and building new housing units to address this growth, primarily in multifamily housing. Single family construction has experienced a considerable reduction. The region continues to become more diverse with substantial growth in the Hispanic and Asian populations.[13] As shown in Table 2.4, approximately 43.2% of all housing (both single family and multifamily) are rentals while 56.8% are owned. Of the nearly 1.8 million single family houses, it is estimated that approximately 30-40% are rented.[14]

Table 2.4. Household Occupancy

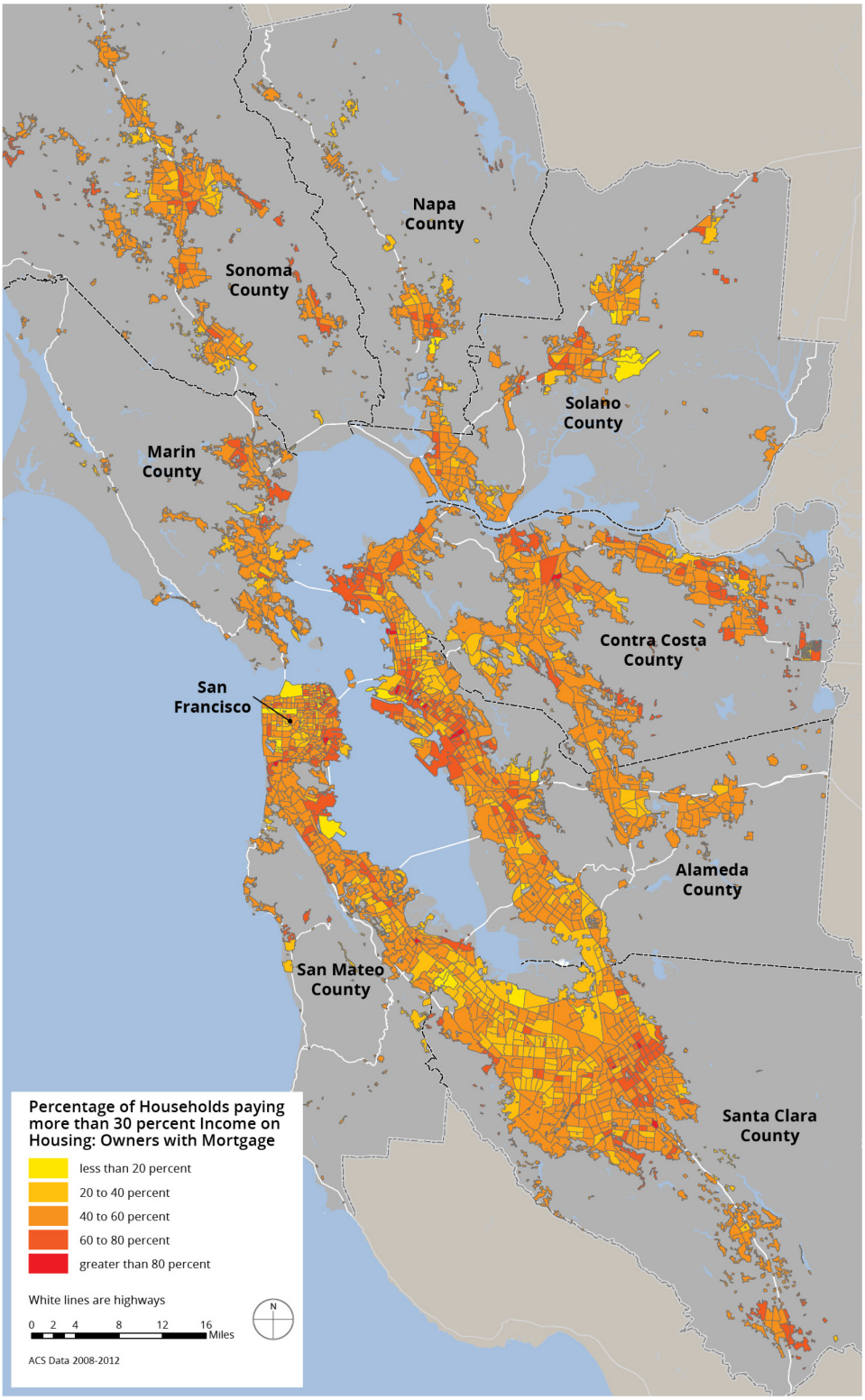
	Renters	Home- owners	Total Households	Single Family Detached	Single Family Attached
BayREN Region	43.2%	56.8%	2,825,512	1,515,755	248,433

The Bay Area's Regional Housing Needs Allocation assesses the housing needs for all incomes and compares that to building permits that are pulled to determine how well these needs are being met. Based on this information, just 28% of moderate-income housing needs are being addressed, while 99% of above moderate housing needs are being met. Paired with this is a transition of affordable housing to market-rate housing.[15]

Figure 2.1 provides a map illustrating where in the Bay Area the highest housing costs are found. A standard measure of affordability is that a household spends less than 30% of their income on housing costs. On average, 41% of Bay Area homeowners spend over 30% of their incomes on housing costs.[16]

[12] Ibid.
[13] ABAG, "State of the Region 2015: Economy, Population and Housing," 2015.
[14] Joint Center for Housing Studies of Harvard University, "America's Rental Housing, Evolving Markets and Needs", 2013.
[15] Op. Cit., ABAG.
[16] American Community Survey, Comparative Housing, 2011-2015.

Figure 2.1. Bay Area and Households paying more than 30% of Income for Housing[17]



[17] ABAG's State of the Region 2015: Economy, Population and Housing.

Nationwide and in the Bay Area, there is a shift in housing types and the number of households that rent. Renters are a diverse group including families and adults of all ages. Moderate-income households represent over a third of renters.

"Offering greater flexibility and requiring less of a financial stretch than homeownership, renting is most common during the young adult phase of life when changes in work and relationships are frequent. But while four out of ten renters are under age 35, renting has appeal for households of all ages. In fact, more than a third are middle-aged (between 35 and 54), similar to that age group's share among all households."[18]

How these trends will impact existing building stock is not clear, however, one result may be higher demand and higher prices for existing single family houses. These trends point to a continued high cost-of-living burden on moderate-income households, indicating a need to pay special attention to this segment. The BayREN's program design recognizes the potential for affordable home upgrades (with financing and incentives) that allow homeowners to tailor solutions to their financial capacity. Additionally, allowing measures to be spread out over time (instead of requiring a one-time complete upgrade) will reduce debt. Equally, the relatively large percentage of renters in the moderate-income bracket will require programs that consider split incentives, landlord engagement, and easy and low-cost measure options paired with behavioral elements.

[18] Joint Center for Housing Studies of Harvard University, "America's Rental Housing, Evolving Markets and Needs", 2013.

Single Family Characteristics

Based on an analysis of the U.S. Census Bureau's American Community Survey, there are over 1.47 million owner-occupied households of a total of 2.8 million housing units (this includes single family and multifamily units). It is estimated that there are approximately 500,000 or 34% of owner-occupied households in the Bay Area that fall within the moderate income range and who own their own home (Table 2.5). Based on national data and surveys, it is estimated that another 30% or about 500,000 of all single family homes are rented.[19] This indicates that the target market for the BayREN will be approximately 1 million households. The BayREN will utilize county property assessor data to map and target these households for its services.

Table 2.5. Bay Area Single Family Housing Characteristics[20]

County	Total Housing Units	Single Family Detached	Single Family Attached	Total Single Family Units	Owner-Occupied Units	% Moderate Income Household	Est. Moderate-Income Owned Units
Alameda	589,858	312,035	47,189	359,224	294,644	34.1%	100,533
Contra Costa	405,001	270,946	30,375	301,321	248,668	35.8%	89,023
Marin	111,990	69,994	9,295	79,289	64,729	27.0%	17,477
Napa	55,180	37,853	3,311	41,164	29,678	39.4%	11,681
San Francisco	383,676	74,433	47,960	122,393	128,698	19.3%	24,839
San Mateo	272,838	155,518	21,009	176,526	153,422	30.1%	46,119
Santa Clara	646,190	345,065	66,558	411,623	352,836	29.2%	103,099
Solano	154,380	109,147	6,638	115,785	86,079	45.0%	38,753
Sonoma	206,399	140,764	16,099	156,863	111,590	42.4%	47,336
BayREN	**2,825,512**	**1,515,755**	**248,433**	**1,764,188**	**1,470,344**	**33.6%**	**493,872**

The California Association of Realtors (CAR) provides an analysis of the affordability of housing throughout the state, which indicates the minimum income required to purchase a house. In the Bay Area, the median housing price is $865,800 with a minimum income of $168,300 (Table 2.6). The median annual income for the Bay Area is an average of $85,600, with a high in Santa Clara of $102,340 and low in Sonoma of $66,674. These numbers indicate that for a moderate-income family, options for purchasing a home will be limited. However, a brief survey in January 2017 of available houses within the Bay Area indicates that there are a wide range of houses for sale between $300,000 and $500,000, which may be affordable to buyers with moderate incomes.[21]

[19] Ibid.
[20] American Community Survey, Financial Characteristics and Comparative Housing Data, 2011-2015.
[21] http://www.zillow.com/homes/for_sale/300000-500000_price/1128-1880_mp/featured_sort/39.073577,-120.581818,36.521776,-123.833771_rect/8_zm/1_fr/.

Table 2.6. CAR Median Home Price[22]

BayREN Counties	Median Home Price	Monthly Payment Incl. Taxes/Insurance	Minimum Qualifying Income	Median Household Income (US Census)
Alameda	$795,400	$3,870	$154,610	$81,717
Contra Costa	$601,510	$2,920	$116,920	$83,104
Marin	$1,185,000	$5,760	$230,340	$100,662
Napa	$639,000	$3,110	$124,210	$75,513
San Francisco	$1,298,000	$6,310	$252,300	$92,094
San Mateo	$1,300,000	$6,320	$252,690	$101,272
Santa Clara	$1,000,000	$4,860	$194,380	$102,340
Solano	$393,000	$1,910	$76,390	$67,443
Sonoma	$580,500	$2,820	$112,840	$66,674
Bay Area Average (rounded)	**$865,800**	**$4,200**	**$168,300**	**$85,600**

Reaching Moderate-Income Residents

"Targeting [low- and moderate-income] customers may require specialized, culturally sensitive marketing, education, and outreach, both as far as the method used (for example, language, medium, and so forth) as well as the substance of the materials."[23]

In the BayREN territory, a significant percentage of homes, particularly low- and moderate-income households, have not been upgraded by utility, local government, or BayREN programs. Data from BayREN's Home Upgrade projects, analyzed since program roll out in 2013, indicate that the program attracts participants from higher income households, who are able to assume the high costs of the upgrades. These costs average over $14,000 for the Home Upgrade and $16,000 for the Advanced Home Upgrade. While program uptake has grown exponentially, more than doubling each year since program launch, the program has reached less than 1% of the available housing stock.

Furthermore, on a statewide basis, the Home Upgrade program has failed to attract moderate-income homeowners. The Frank and Nowak study, for example, found that program participants of whole home programs were not representative of the general population and were also were not eligible for low-income programs. The study found that whole home "[p]articipants differed substantially from the comparable general population on most characteristics. They were disproportionately high-income, college-educated, white, lived in 3-4-bedroom homes, or homes built before 1970."[24]

BayREN's outreach strategy will employ different tactics to reach moderate-income resident than those that were used by Home Upgrade. Indeed, to effectively reach moderate-income households with

[22] California Association of Realtors (C.A.R.) Affordability Index. http://www.car.org/marketdata/data/haitraditional/.
[23] Scavo, et. al. "Low-Income Barriers Study, Part A: Overcoming Barriers to Energy Efficiency and Renewables for Low-income customers and Small Business Contracting Opportunities in Disadvantaged Communities." California Energy Commission. Publication Number: CEC-300-2016-009-SD2, page 48.
[24] M. Frank and S. Nowak, "Who's Participating and Who's Not? The Unintended Consequences of Untargeted Programs", American Council for an Energy-Efficient Economy, 2016.

comprehensive services, both the program marketing strategy and other elements of the program design, such as the incentive and financing, will need to be redesigned. The benefits to the moderate-income ratepayers in terms of both bill savings and non-energy benefits will be substantially greater than current programs allow.[25]

Additional Program Influences

Housing Stock and Vintage

"Older buildings are more likely to have structural or design issues that make energy efficiency and renewable energy retrofits unviable, particularly for people in disadvantaged communities, who are more likely to live in older housing. These structural or design issues are likely to result in remediation costs that increase the cost of making upgrades compared to newer housing. Such costs erect barriers to access to clean energy for low-income Californians."[26]

In the Bay Area, approximately 48% of the housing stock was built before 1969, well before energy codes became law in 1974. In San Francisco, Alameda, Marin, and San Mateo Counties, the majority of homes were built before 1969, (Table 2.7). The prevalence of this older housing stock indicates the likelihood that a majority of the homes in the Bay Area would benefit from substantial upgrades for energy, and probably for other building systems and components as well. Moderate-income households tend to live in older homes as well. The change in the allowable baseline (See CPUC Decision 16-08-019) for existing buildings and the potential to capture savings for to-code upgrades may provide a significant opportunity to more effectively and comprehensively address this large—and largely untapped—segment of households.

Table 2.7. Housing Vintage[27]

Counties	Total Housing Units	Built 1939 or earlier	1940-1969	1969-2000	2000 or later
Alameda	589,858	20.1%	34.6%	36.3%	8.9%
Contra Costa	405,001	4.5%	34.1%	47.7%	13.8%
Marin	111,990	12.4%	46.3%	35.8%	5.5%
Napa	55,180	8.2%	34.1%	43.2%	14.4%
San Francisco	383,676	48.2%	27.1%	16.9%	7.8%
San Mateo	272,838	8.5%	50.9%	34.7%	5.9%
Santa Clara	646,190	4.9%	38.6%	45.5%	11.0%
Solano	154,380	6.6%	22.1%	56.2%	15.1%
Sonoma	206,399	9.2%	25.3%	54.0%	11.7%
BayREN	**2,825,512**	**13.6%**	**34.8%**	**41.1%**	**10.5%**

[25] Drehobl and Ross, "Lifting the High Energy Burden in America's Largest Cities", ACEEE, 2016.
[26] Scavo, et. al. "Low-Income Barriers Study, Part A: Overcoming Barriers to Energy Efficiency and Renewables for Low-income customers and Small Business Contracting Opportunities in Disadvantaged Communities." California Energy Commission. Publication Number: CEC-300-2016-009-SD2, page 34.
[27] American Community Survey, Comparative Housing, 2011-2015.

Climate Zones

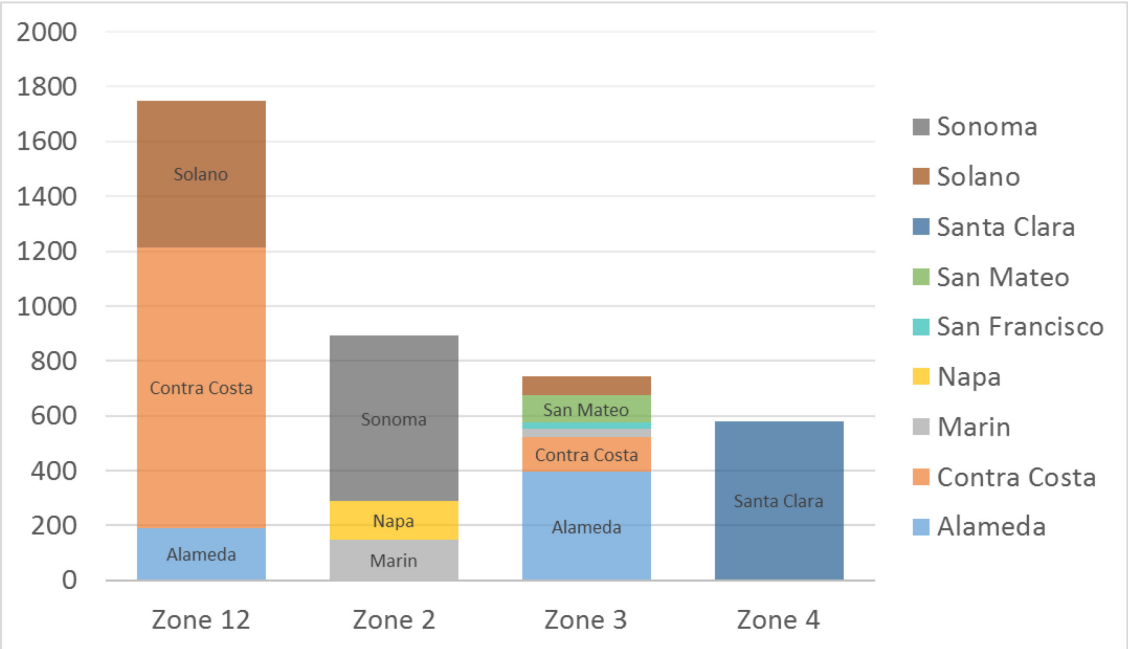
The BayREN territory includes four different climate zones (CZ): 2, 3, 4, 12, and a small area of 5 (Figure 2.2). CZ12 has the warmest and coldest temperatures and reflects the highest project uptake for the Home Upgrade Program, (Figure 2.3). The majority of Bay Area households, approximately 43%, are in CZ3. CZ12 has about 25% of households and CZ4 has 23%. According to PG&E's climate zone design guidelines, the primary energy efficiency issues for CZ3 are heating and insulation and providing for natural ventilation. In CZ12, heating is also a primary concern, however, this zone has more cooling days compared to CZ3. CZ4 has more variation in seasons and requires both heating and cooling.[28]

The new and expanded BayREN Single Family programs will be designed to be attractive and offer energy savings across all of the Bay Area climate zones including those that are milder. This will include considering measures that impact electricity use and plug loads (including home energy management), as well as hot water use. With the assistance of the Home Energy Advisor, and the addition of the neighborhood approach described in the tactics in the next section, the BayREN will work with homeowners to select the most affordable and highest energy-saving options for their climate zones.

[28]http://www.pge.com/includes/docs/pdfs/about/edusafety/training/pec/toolbox/arch/climate/california_climate_zones_01-16.pdf.

Figure 2.2. Bay Area Climate Zones

Figure 2.3. Historic Whole House Project Uptake by Climate Zone



Potential Energy Savings

The BayREN's Home Upgrade program saw significant uptake in projects during the first three years, however, the savings achieved were lower than expected. The same was true statewide for all Program Administrators. The 2013-14 focused impact evaluation estimated average participant savings for the BayREN Home Upgrade program at 163 kWh and 158 therms. The BayREN has incorporated feedback from this and other evaluations into program modifications. For example, recognizing that higher savings were realized in older vintages of homes, BayREN changed the Home Upgrade program requirements to ensure older vintage homes were targeted. The results have been promising: 2016 Home Upgrade program estimates of savings per home are 577 kWh and 163 therms.

Looking ahead to a moderate-income program, BayREN has incorporated Home Upgrade experience, evidence from other residential programs and, to a more limited extent, the latest Potential and Goals study to estimate energy savings potential. Home Upgrade focuses primarily on therm-saving measures related to the shell and major systems, not kWh savings. The potentials study and other programs suggest that expansion to lighting and plug load measures will yield greater kWh and overall energy savings. Many such measures will be relatively low cost, such as LED lamps, advanced power strips, and home energy management tools, offering cost-effective energy savings, particularly in the milder Bay Area climate zones. The shift in focus, both in terms of measure mix and target market, brings the projected savings per participant to 444 kWh and 56 therms, shown in the single family program metrics.

The current Potential and Goals study by Navigant is designed with the IOUs in mind. As such, savings are not indicated by County, but by utility service area. This information can provide some insights for BayREN programs, but because savings cannot be filtered by climate zone or geography, it is not possible to have accurate information upon which to base programs. In addition, CPUC Decision 16-08-019 provides new direction and rules for determining the baseline for energy savings and how the Potential and Goals savings will be determined. This new study and particulars related to this substantial change are not anticipated until late 2017-2018. It is the BayREN's intention to participate in the discussions relating to this new study and to incorporate any changes as necessary. Ideally, as part of this new study, data will be more finely parsed to provide more accurate and useful data for the BayREN programs.

A significant finding in the Navigant 2013 Potential and Goals study is the importance of non-energy benefits from the whole building market: *"Non-energy benefits are highly valued by EUC participants; however, no policy framework exists to monetize these non-energy benefits for the purposes of cost-effectiveness screening or potential study modeling."*[29] The Home Energy Advisor has been a successful element of the current program and will be an important mechanism to garner more energy savings and non-energy benefits. As of August 2016, the Energy Advisors have assisted over 4,000 Bay Area homeowners, of which over 1,110 homeowners qualified, yielding a 69% conversion rate.[30] In addition, the advisors provided over 4,000 referrals to more than 100 different complementary programs. Significantly, homeowners that worked with the Advisor had a 25% increased overall energy savings from

[29] Navigant, "2013 Potential and Goals Study", page 144.

[30] This is the "Any upgrade conversion rate" which is the percent of qualified accounts that move forward with any energy efficiency improvements even if they are not Home Upgrade or Advanced Home Upgrade projects.

those that did not use the Advisor. The strategies presented in this plan will yield additional non-energy benefits that will also be measured and assessed, such as Home Energy Advisor metrics, contractor development metrics, and leveraged program data.

Contractor Market

Contractors are a critical component of the single family program, leading the effort to scope and sell upgrade projects, as well as serving as the primary face of the program. The Bay Area is fortunate to have a robust and varied workforce. A statewide industry survey by the Advanced Energy Economy Institute identified approximately 65,000 jobs focused on building energy efficiency. The majority of these workers are in the Oakland/San Francisco area, with about 25% in San Jose, and 10% in the other counties.[31] Evaluation of the California State License Board (CSLB) database identified over 23,000 General Contractors and 1,600 HVAC contractors. There are also 161 insulation contractors, and active low-income weatherization specialists that can be engaged. The new program design will offer a broader spectrum of opportunities to engage all of these segments and expand the active contractor base in home performance with both specialty and general contractors. Within the Bay Area, there are:[32]

- 23,572 General Contractors (B License)
- 1,617 HVAC Contractors (C-20 License)
- 161 Insulation Contractors (C-2 License)

At the same time, the residential energy efficiency workforce has been characterized as far less able to ramp up services to meet the need, gain the required technical skills and knowledge of home performance, and maintain a steady, well-compensated workforce compared to the commercial contractor market.[33] The CPUC with Home Upgrade, made a ten-year commitment to contractors, in large part to provide some assurance that there would be a viable and ongoing program to justify the development of a business model for home performance. With most of the Program Administrators changing or moving away from the Home Upgrade model, it will be essential to address participating contractors' needs to achieve alignment with new programs.

BayREN currently has 125 participating contractors actively[34] submitting projects, with 103 of those contractors holding C-20 HVAC licenses and 114 holding multiple licenses. BayREN will continue to provide training to contractors to expand their skills and certifications, including sales and business training as well as technical trainings. In December 2016, BayREN offered Building Performance Institute (BPI) training to ten participating contractors. Registration was full within one day and a wait list was established. All eight of the contractors who immediately took the test for BPI certification passed. The success of this training implies that participating contractors want more training and will likely later incorporate more building performance jobs into their business models. The BayREN will continue to

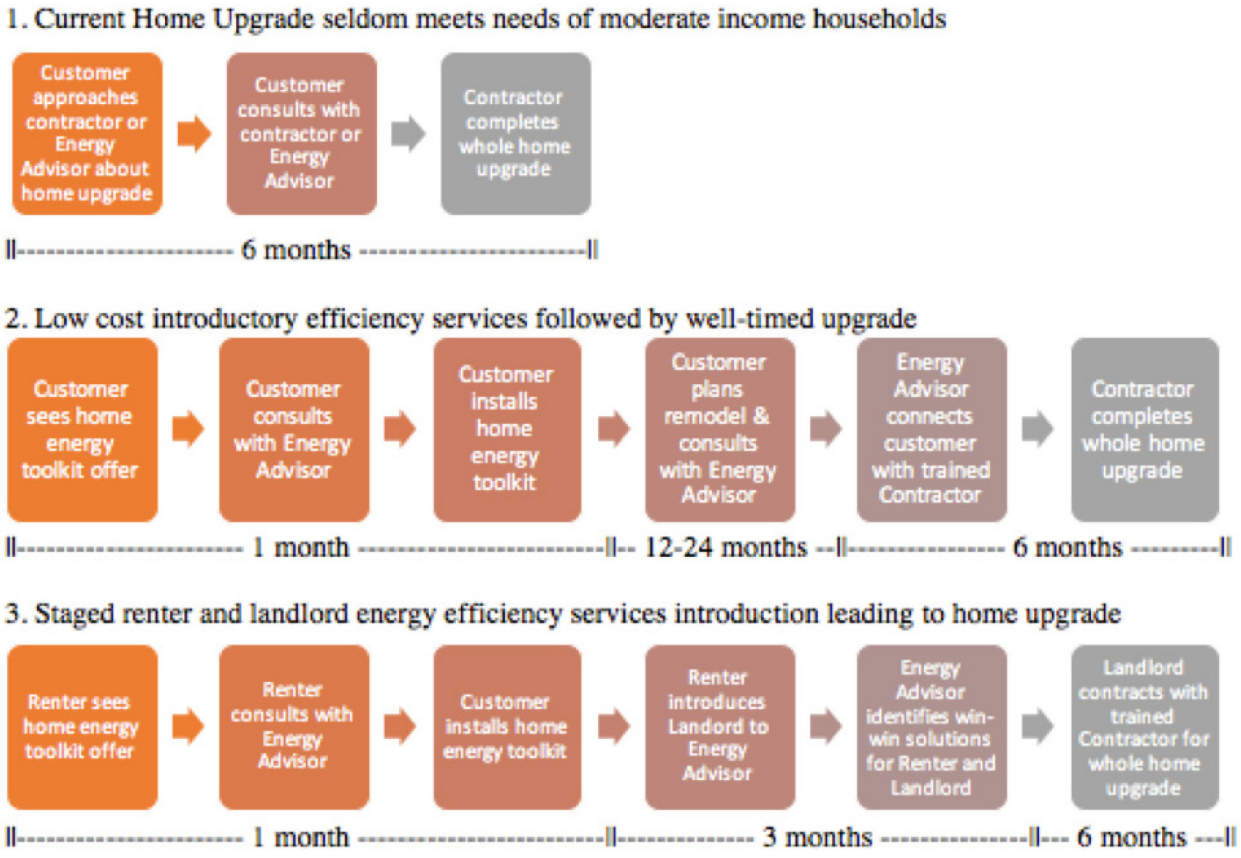
[31] BW Research, "California Advanced Energy Employment Survey", prepared for AEEI, December 2014.
[32] Contractors State License Board, May 2014.
[33] Don Vial Center on Employment in the Green Economy, "California Workforce Education and Training Needs Assessment," 2011, page 103.
[34] Active contractor status is dependent on contractors submitting a minimum of 1 project per year.

offer a variety of education and training programs in support of its single family residential program, as well as leveraging PG&E Energy Training Center programs as appropriate.

Single Family Strategies and Tactics

While the Home Upgrade Program experienced increased uptake and opened the whole home energy efficiency market to specialty contractors, a new approach is needed to increase scale and broaden participation to moderate-income households. BayREN will build on the success of energy advising, and training and development of contractors, and focus efforts on the moderate-income market, while still allowing participation from other market sectors. The end goal for these households will remain a comprehensive, whole home efficiency improvement, but with more flexibility for the varied needs and capabilities of these customers, which will allow a suite of improvements to occur over time, rather than at one point. Facilitated by the Home Energy Advisor, an increasingly better-trained and energy-savvy contractor workforce, customers will more easily navigate their own journey toward high-performing houses and, when possible, ZNE.

Figure 2.4. Illustrative Customer Journeys [35]



[35] These sample customer journeys are not meant to prescribe program elements. Those will be addressed in implementation plans.

These sample journeys show that to deliver energy efficiency to targeted audiences will require dynamic program design and management. This includes providing various pathways that allow:

1. An all-in-one upgrade option that helps moderate-income households finance and navigate upgrades.
2. Incremental upgrades beginning with low-cost toolkits and advice, moving to deeper packages of savings.
3. Products or toolkits that help renters address their energy needs, while providing a channel to reach landlords to offer the deeper retrofits.

These elements will need to be closely coordinated with contractors to make sure that the program and contractor business evolve together to increase both demand and supply of home efficiency services. This approach builds on the EBEE Action Plan Strategy 3.1.1 Sustainable and Effective Program Delivery, as well as Strategy 2.2.1 Enhanced Program Design and Marketing Education and Outreach (ME&O).

Figure 2.5 illustrates the three Business Plan Intervention Strategies and the associated Tactics to implement the strategies. Table 2.8 maps these Strategies and Tactics to a summary of the identified sector problems and market barriers.

Figure 2.5. Business Plan Intervention Strategies & Single Family Tactics

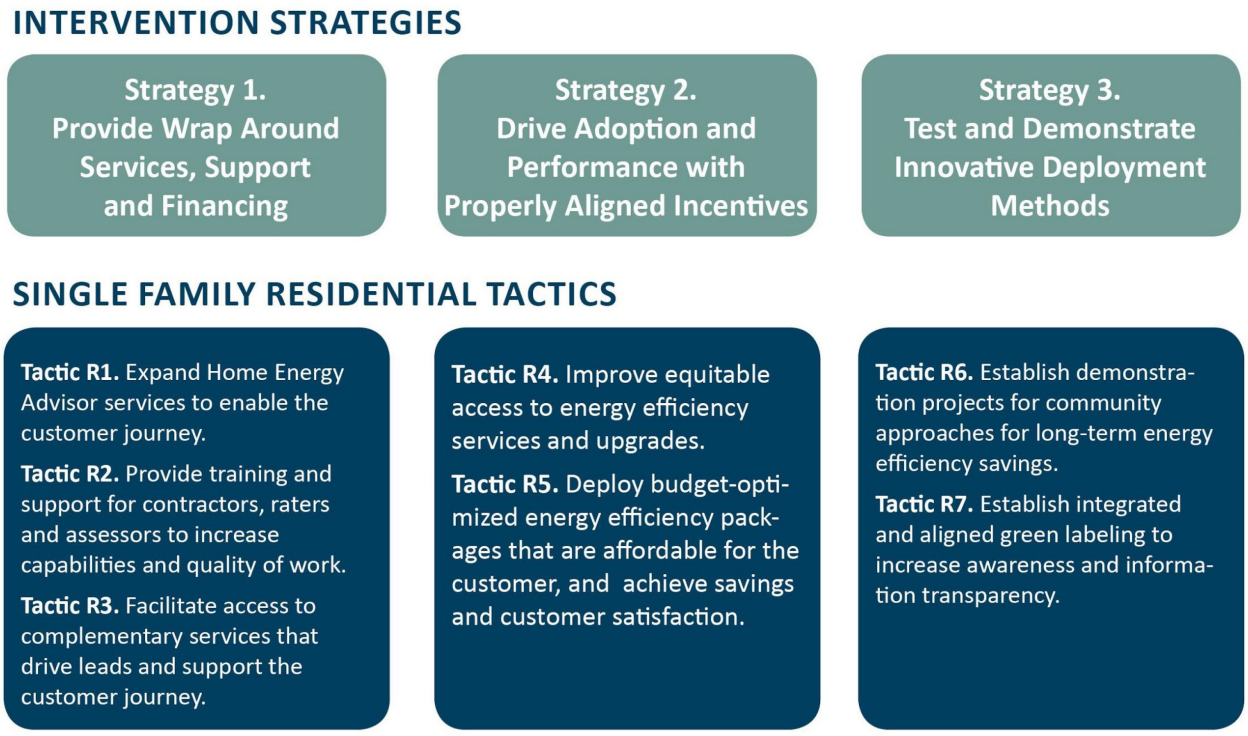


Table 2.8. Residential Strategies (S1-3) and Single Family Tactics (R1-7) Aligned to Problem Statements and Market Barriers

Problem	Market Barrier	Solution Summary	Strategy/ Tactics
Many single family homeowners and renters, in particular moderate-income residents, are unable to participate in comprehensive upgrades.	Homeowners are not able to afford the high up-front cost of whole house improvements and the payback is not attractive.	Offer "on-ramp" solutions to begin with low cost improvements and increase program accessibility while ensuring consumer education and ongoing support eventually leads to whole home upgrades.	S1/R1, R3 S2/R4, R5
	Renters are not willing or cannot afford to make costly whole home upgrades to a rental home.	Home Energy Advisor to educate renters on energy saving behavior and inexpensive, easy to install measures with immediate ROI. Utilize renters as a conduit to reaching the homeowners and educating future homeowners.	S2/R1, R5
Single family homeowners and renters do not understand the need or value of energy efficiency and whole home upgrades.	Homeowners are not educated on the benefits of energy efficiency and whole home upgrades.	Home Energy Advisor to target moderate-income homeowners, renters and owners to educate them on the value of energy efficiency, whole home upgrades and other program offerings.	S1/R1
	The value and timing of whole house energy efficiency improvements are not aligned to the homeowner's needs and interests.	Home Energy Advisor to introduce on-ramp solutions as well as complementary services, such as financing products, Home Energy Score, smart home products, and other innovative offerings to improve uptake.	S1/R1, R3 S2/R4, R5 S3/R7
	All or nothing home upgrade programs are not cost effective for implementers, contractors or homeowners, particularly for moderate-income occupants.	Provide a more flexible customer journey focused approach to upgrading homes, tying small improvements and behavior change to Advisors enrollment, and progressively encouraging deeper whole house upgrades as timing and resources allow.	S1/R1, R2, R3 S2/R4, R5
There are insufficient numbers of whole house, building performance contractors to market, support, and complete the work.	Contractors are not educated on the benefits of whole home upgrades as a business model.	Personalized support and one-on-one trainings from Contractor Services specialists and Advisors to assist and educate contractors on the value of a whole house approach and support to overcome operational and business model barriers associated with the transition to home performance.	S1/R1, R2
	Slow engagement among specialty contractors.	Assist specialty contractors to expand their services to full building performance and/or partner with other firms to achieve a better business model that supports deeper whole house upgrades.	S1/R2 S2/R4
	Reluctance to participate in government/IOU programs due to training requirements and administrative burdens.	Make gradual program improvements that increase energy savings and decrease incentives while transforming the market and maintaining strong relationships with participating contractors.	S1/R1, R2 S2/R4
The path to ZNE for existing homes is largely unknown and unproven.	Customers and contractors require proof of concept.	Partner with leading contractors and communities to design, test and deploy a ZNE existing homes path.	S3/R6

Problem	Market Barrier	Solution Summary	Strategy/ Tactics
Real estate agents are typically buyers' most trusted source of information about property purchases, rentals and upgrades, but most agents are unable to communicate the value of green and energy efficiency features.	Buyers spend significantly more money on building improvements in the first two years after buying a property than in subsequent years.	Train real estate agents so they can help clients' make better-informed decisions about investments in energy and green upgrades.	S3/R7
	Buyers are unaware of energy efficiency-related incentives or financing programs.	Train and support real estate agents, appraisers and mortgage lenders so they can connect clients with appropriate resources.	S3/R7
Lack of transparency and standardized data means that energy efficiency features are largely invisible to buyers and real estate professionals.	Buyers and renters who want information about energy efficient and green buildings do not know where to turn or which sources are credible.	Increase access and awareness of green labeling programs, increase use of green fields in MLS listings, and partner with 3rd party platforms to improve transparency and credibility.	S1/R1 S3/R7
	It is difficult for real estate agents, appraisers and lenders to have confidence in claims about a property's green and energy efficiency features.	Expand real estate professional training, use of green labels, and use of green fields in MLS listings.	S3/R7
	Current home energy evaluation and rating services are cost prohibitive in the context of home transactions or improvement projects.	Test the use of low cost, accessible options for home energy labels.	S3/R7

Strategy 1. Provide Wrap-Around Services, Support and Financing

Tactic R1. Expand Home Energy Advisor services to enable the customer journey

Objective: Homeowners and contractors increase energy savings activities, including participation in BayREN Single Family programs

The Home Energy Advisor (Advisors) will be expanded to become a standalone program and serve as a central tool to expand the effectiveness of BayREN's single family services. Advisors interact directly with customers and contractors and perform a wide range of services to advance energy efficiency in Bay Area homes. Generally, these services fall within the following areas:

- **Expert Efficiency Resource** – Advisors are a source of information for all aspects related to home efficiency. They help homeowners and contractors understand topics ranging from best energy efficient practices and building science to program requirements and financing products.

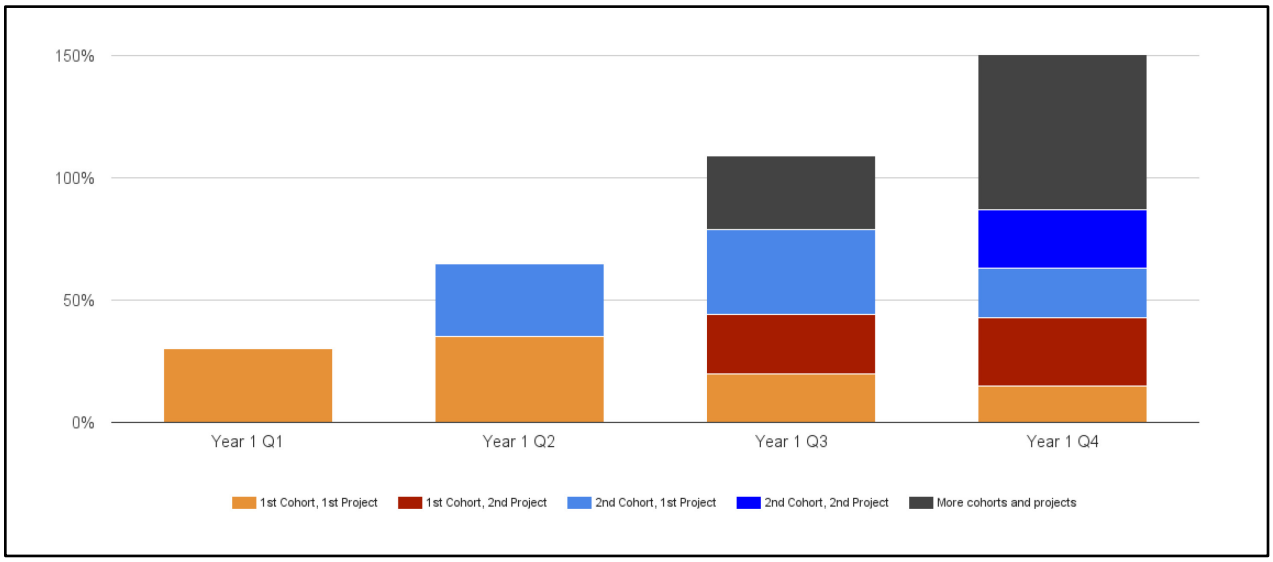
- **Facilitating the Customer Journey** – Advisors build trust with customers, help define and document their goals, and track progress toward those goals. The Advisor service will utilize a Customer Relationship Management software platform to follow up and continue the relationship,

so that anticipated projects that were deferred can be recaptured, ultimately enabling a flexible customer journey and deeper retrofits.

Advisors have successfully supported the BayREN Home Upgrade implementation and will continue to provide many of the same services to support participation in the BayREN's new incentive offerings. In addition, they will expand their engagement with homeowners and contractors to include such topics as behavior change practices, smart home applications, and tools that can reduce electricity consumption. Perhaps the most important change is that Advisors will facilitate a longer-term customer journey by providing long-term engagement with homeowners to help them move along a path to deeper energy savings as envisioned in the EBEE Action Plan Strategy 2.2, Customer-Focused Energy Efficiency. Further, the Advisors will expand their referrals to all relevant IOU, Community Choice Aggregation (CCA), or LGP programs, low-income programs, as well as local jurisdictions, financing, and other complementary energy and water programs.

Fostering relationships with customers leads to a myriad of benefits as detailed in the EBEE Action Plan and experienced under the current BayREN program. These include, but are not limited to, increased likelihood of participation, larger projects, increased engagement, ability to effectively capture customer concerns and identify areas for improvement, repeat participation, etc. Figure 2.6 illustrates that Advisors' customers take from a few months to over a year to complete their first energy saving project, and then go on to complete their second project (or more) over time. Customers who initially engaged with an Advisor in 2013 are still completing projects two and three years later. Customers who engage with Advisors also achieve deeper savings. Historically, customers working with an Advisor have seen, on average, a 25% increase in overall project savings compared to those who did not engage with an Advisor. With the planned expansion of the Home Energy Advisor, the BayREN expects to leverage both existing relationships and develop new relationships to further drive participation and deeper savings through the program.

Figure 2.6. Percent of 2015 Q1 Home Energy Advisor customer cohort completing projects over time



Home Energy Advisors are also BPI-certified and serve as a support resource and lead generation tool for participating contractors.[36] They follow up on leads generated from outreach efforts and provide one-on-one support to both contractors and homeowners throughout the upgrade process, and in so doing, support EBEE Action Plan Strategy 3.1 Streamlined and Profitable Industry.

Tactic R2. Provide training and support for contractors, raters, and assessors to increase capabilities and quality of work

Objective: Establish a robust industry to support whole house upgrades into the future

"A sustainable and robust marketplace for efficiency solution providers and contractors is central to the success of maximizing long-term energy efficiency outcomes."[37]

Increasing participation of contractors, raters, and assessors in home efficiency upgrades will increase both supply and demand for home efficiency services. Trained contractors participating in the home energy market provide supply. Raters and assessors increase the quality and visibility of efficiency improvements, thereby driving demand. To develop the industry in this way, the BayREN will recruit, train, and provide ongoing support to both of these groups.

Recruiting

Today, 125 participating contractors support a volume of about 2,500 home upgrades per year. As shown in the single family metrics, the BayREN aims to increase the annual project volume to 18,000 over the next decade. While the changing program design means the typical project will be smaller in scope, the increase in volume suggests the number of participating contractors must also increase several fold. The BayREN will recruit new contractors through a variety of methods, including working with Building Departments and partnering with local business organizations to conduct outreach to contractors.

Training

The BayREN's approach to contractor training will evolve with the needs of the market and opportunities provided by Single Family programs. As an example, Tactic R4 describes the programmatic introduction of lower cost on-ramp measures to broaden participation. BayREN will offer contractor training on the on-ramp measures, thus opening the door to participation by more contractors. These contractors will then be provided with opportunities to train on other home energy efficiency services or to partner with other participating contractors to gain those capabilities. In addition, the BayREN will work with participating contractors to determine how they can deliver a greater number of jobs and deeper savings.

Raters and assessors are also important stakeholders whose services will be essential to support the journey toward more efficient homes (EBEE Action Plan Strategy 1.2). BayREN intends to align future program

[36] Definitions and qualifications for "participating contractors" will be updated in the Implementation Plan.
[37] CEC, "EBEE Action Plan", Goal 3, Strategy 3.1 Streamlined and Profitable Industry, page 69.

offerings with their services, and provide training to ensure robust growth of this group. Their understanding of BayREN's programs and contributions to growing market awareness will be essential. Through Home Upgrade program implementation, BayREN has demonstrated the ability to deliver programmatic and subject-specific trainings. Moving forward, the BayREN will provide training resources for contractors, raters, and assessors and leverage the existing IOU Workforce, Education, and Training (WE&T) offerings related to building a home performance business, sales training, and other similar offerings that help contractors become more successful and profitable. This will include increased Home Energy Advisor support and additional technical trainings to expand the skills of the workforce, and to help reach deeper energy savings.

Ongoing Support

In order to support continued development and success of participating contractors, the BayREN will leverage a consultative and analytical approach to identifying participating contractor priorities, needs, barriers, and areas for improvement in order to maximize effectiveness of subsequent workforce education and training. The BayREN plans to host working groups with participating contractors in order to solicit feedback and forecast impacts as new program offerings are designed, thereby maintaining strong relationships and allowing for an iterative and dynamic process with key stakeholder input. Advisors (Tactic R1) will provide a key link to contractor activities, helping to identify development needs and track contractor performance over time.

Tactic R3. Facilitate access to complementary services that drive leads and support the customer journey

Objective: Reduce up-front barriers to deeper savings and whole house upgrades

Tactic R3 is to provide complementary services that facilitate moderate-income household participation and to develop methods for stimulating the uptake of those services by the BayREN's single family customers. The BayREN will use these additional services as tools to remove barriers to participation. The BayREN will not duplicate successful existing financing, data access, or other support programs. Instead, through the Advisor, BayREN will increase awareness of these services and facilitate access to appropriate target audiences and/or offer BayREN sponsored services, as needed. BayREN, acting as a local and trusted advisor, will help contractors and customers understand, navigate, and realize value from these programs. Three such complementary services that have already been identified are financing, energy management technology deployment, and home energy scores.

Financing

Financing is the most obvious complementary service to leverage for BayREN's Single Family offerings. Given the high cost of upgrades and the slow return on investment, financing is a key to increasing access. BayREN has already been helping Home Upgrade participants navigate offerings by using Go Green Financing tools and by making PACE more easily accessible to Bay Area jurisdictions. Other types of financing services that may increase access to home efficiency improvements include energy savings accounts that reward customers as they save energy, and interest rate buy-downs that offer an attractive

alternative to cash incentives. The BayREN intends to further examine and test some of these complementary financing services, structure their integration in the single family program and ultimately streamline the presentation and adoption of complementary finance services as a part of the customer journey. The Advisors will play a key role in facilitating participation.

Energy Management Technologies

Improving access to Energy Management Technologies (EMT) has been mandated by AB 793, and the California IOUs have developed marketing, outreach, and investment plans to support EMT deployment. The availability of these energy information and management tools will help homeowners and their Home Energy Advisors make choices about the best next step in their energy efficiency journey. As such, BayREN seeks to leverage and aid PG&E's deployment of EMT. Options for supporting PG&E's deployment include, Advisor outreach to customers and homeowner organizations to educate them on the benefits of EMTs and/or incorporation of EMTs in toolkits that will represent some customers' first step on their journey (Tactic R4). BayREN and PG&E have had preliminary discussions on these options and will continue conversations as a potential area of collaboration.

USING ENERGY MANAGEMENT TECHNOLOGIES TO DEEPEN UPGRADES

The Bay Area is uniquely set in one of the most technology driven regions of the country. Use of smart home technology can help households to actively participate in saving energy inside their home and realize a quicker benefit than they might with only a whole home upgrade. Disconnected homeowners do not understand the value of whole home upgrades and prefer to make cosmetic upgrades to their homes that have already been proven to yield a high return on investment. While it may take several billing cycles to see a reduction in energy costs, smart home products when combined with whole home upgrades can show immediate benefits. This tactic will deliver immediate customer benefits and aligns with the objectives of AB 793 to promote the adoption of energy management systems.

The BayREN plans to utilize the U.S. Department of Energy's (DOE) Home Energy Score (HES) for customer education and motivation within the broader suite of BayREN Single Family programs and services. BayREN will expand the pool of contractors, raters, and home inspectors that can deliver the score throughout the region. HES provides a "miles-per-gallon" score of 1 to 10, based on the relative efficiency of a home. Advisors and BayREN contractors will translate customers' low scores into customer education on potential deficiencies in their home and building performance approaches to address those deficiencies. Thus HES will help drive demand for energy upgrades.

Strategy 2. Drive Adoption and Performance with Properly Aligned Incentives

"Moving forward, energy efficiency programs should provide effective, modular approaches to customer engagement by addressing each customer's needs and situation with a common sense, straightforward suite of options. . .. Implementers can help to make energy efficiency improvements more attractive by allowing for phased improvements and providing technical assistance and guidance about how to sequence improvement over time, keeping in mind the importance of building science and best practices."[38]

In order to penetrate hard-to-reach markets, increase overall participation, and deliver a customer-centric program that allows homeowners and contractors to phase improvements, a re-evaluation of the current delivery model has been conducted that informs the anticipated redesign of BayREN's Single Family programs. BayREN will focus on providing an easier point of entry for moderate-income households and encouraging adoption of a wide range of efficient behaviors and upgrades over time. The following two Tactics offer distinct approaches to overcoming market barriers and providing affordable and accessible upgrade options. Tactic R4 focuses on a series of on-ramp measures that help to convert initial engagement, utilizing low-cost toolkits, into a longer-term path to energy efficiency. Tactic R5 focuses on providing incentives for affordable bundles of measures that address multiple needs and offer an incremental path to a whole house upgrade.

Tactic R4. Improve equitable access to energy efficiency services and upgrades

Objective: Improved penetration of hard-to-reach moderate-income market and overall program accessibility

BayREN's vision of a customer journey recognizes that not all customers can start with a $10,000+ comprehensive home upgrade. It is important to provide these customers with an entry point and a way to make progress as their time and resources allow. The objective of on-ramp measures is to provide every moderate-income household, both owners and renters, with a place to start. The specific set of on-ramp measures will be detailed in the Implementation Plan, but may include a subsidized home efficiency toolkit (e.g., LEDs, weather stripping, low-flow showerhead, communicating programmable thermostat, or even duct sealing). On-ramp measures will provide an affordable and widely applicable place to start the home efficiency journey.

An essential component of this Tactic is linking the access of on-ramp measures and toolkits to the Home Energy Advisor service. Customers will be enrolled in the Service, given high-level information about their home and its efficiency (such as HES), and asked to share data and to start a conversation about longer-term energy efficiency improvements. In addition, education materials and ongoing behavior information will be provided.

[38] CEC, "Existing Buildings Energy Efficiency (EBEE) Action Plan", page 63.

A number of participants engaged by the on-ramp measures will be renters. The BayREN intends to create a process to engage the owner and develop a path that will encourage them to make whole building upgrades, linking to packages in Tactic 5. That process will be managed by the Advisor. An Advisor will support a renter in initiating the conversation with an owner and can then engage directly with an owner to understand their goals and interests in an upgrade. Identifying aligned interests, the Advisor helps move the project forward.

Tactic R5. Deploy budget-optimized energy efficiency packages that are affordable for the customer, and achieve savings and customer satisfaction

Objective: Deliver incentivized, accessible packages of improvements that provide customer and program benefits and mark progress toward a long-term goal of ZNE homes

BayREN will create budget-optimized energy efficiency measure packages to meet the distinct needs of the BayREN's market segment. Based on the broad spectrum of income that falls under "moderate income," the condition of the housing stock will be varied. These packages will be designed and incentivized serve a customer's unique financial needs; consider the building vintage, climate, and condition; convert a "trigger" (e.g., HVAC or hot water replacement) activity to deeper energy savings; address comfort and health; and other considerations. It has been determined, particularly in low-moderate-income housing, that there are often additional health, safety, and basic improvement needs on top of energy efficiency.[39] The package design will need to consider and address this potential barrier.

The packages will be designed to offer incremental steps toward a complete whole house retrofit and, when possible, move customers toward ZNE. While the details of these budget-optimized packages will be defined in Implementation Plans, Table 2.9 provides some examples of what they may contain. Behavior and operational measures will be part of some if not all packages, as well as other building shell and HVAC measures based on the customer segment.

Table 2.9. Potential measures for budget-optimized packages

Common measures	Variable measures
• Efficient lighting • Enhanced HVAC & lighting controls • Behavior change • Plug load management tools • Hot water flow restrictors	• Seal and insulate attic • Duct repair/replacement/sealing • Efficient HVAC unit • Ceiling Fans • Wall insulation • Efficient hot water heater

The delivery method for these packages, which will also be an important factor in promoting adoption and achieving reasonable costs, will help define the package ingredients. The packages can be offered

[39]Scavo, Jordan, Suzanne Korosec, Esteban Guerrero, Bill Pennington, and Pamela Doughman. 2016. "Low-Income Barriers Study, Part A: Overcoming Barriers to Energy Efficiency and Renewables for Low-income customers and Small Business Contracting Opportunities in Disadvantaged Communities." California Energy Commission. Publication Number: CEC-300-2016-009-SD2, page 21.

alongside other program offerings (such as those described in Tactic 4), and facilitated through the help of the Home Energy Advisors (Tactic 1).

ZNE - The Long-term Goal

Over the next ten years, as the market for residential energy efficiency transforms and whole house upgrades are more routine, the BayREN will test and consider the best way to help customers achieve ZNE or zero-ready homes (ZRH).[40] During the customer journey, homeowners will be introduced to ZNE and offered packages and/measures to achieve ZNE/ZNR, as part of the educational component to undertaking upgrades. This will provide the opportunity to reduce and simplify incentives, while portraying the ZRH or ZNE home as the ultimate objective of the Bay Area homeowner's journey.

Strategy 3. Test and Demonstrate Innovative Deployment Methods

Tactic R6. Establish demonstration projects for community approaches for long-term energy efficiency savings

Objective: Increase reach and scale of residential upgrades by encouraging energy efficiency within an entire neighborhood or district

Historically, the residential energy efficiency market has not been cost-effective, especially for deep energy retrofits, the whole house approach, or ZNE. The BayREN will test alternative delivery methods to find higher savings and increased scale through community, neighborhood, and district approaches. This effort will be designed to benefit from economies of scale, local government planning processes, and the long-term relationships developed with the Home Energy Advisor.

Neighborhood or district approaches offer ways to address a number of homes, both new and existing, to achieve more comprehensive and longer-term results. This approach may have even greater effectiveness when applied to moderate-income neighborhoods, where up-front costs and lack of trust in contractors and utilities could be overcome with peer engagement and local government involvement. Several local governments within the BayREN are already conducting municipally-focused ZNE pilots that integrate deep energy efficiency, renewable generation, energy storage, electrical vehicle charging, and related microgrid approaches to support this vision. Some of these pilots encompass multiple buildings and sites. These efforts are being driven by a powerful combination of energy innovation at the local level; a desire to demonstrate "community resiliency," or the ability to serve critical constituent needs after disruptions caused by external forces such as natural disasters; and the collaborative spirit of public agencies that the BayREN works to foster. The EBEE Action Plan provides several areas for this approach including in Strategy 1.7 Local Government Leadership and the development of Energy Performance Districts.[41] The BayREN will work with member agencies to identify potential districts and choose 1 to 3 to test to demonstrate this approach and its capability to achieve goals.

[40] Zero-ready home is a defined as home that is high performing with a level of energy efficiency to allow it to move to Zero Net Energy with the addition of renewables.
[41] Ibid, page 56.

Tactic R7. Establish integrated and aligned green labeling to increase awareness and information transparency

Objective: Increase real estate professional education, leverage industry communications channels, and increase homeowner upgrades at key trigger events

The BayREN will expand the existing Green Labeling program element to become a standalone initiative to support and increase savings in the single family and eventually multifamily programs. The Green Labeling program will build upon and expand its work in the single family sector, where greater potential for energy savings remains untapped—single family homes account for 75% of the Bay Area's housing units. Research has documented the value of green labels for single family homes, which is likely to help green labeling gain acceptance among homeowners, buyers, and the real estate and financing[42] industries. The BayREN will offer incentives to homeowners who have their home rated with the Home Energy Score and will refer them to the whole house program and Home Energy Advisors, single family upgrade programs, and financing as a solution to increasing their home's rating. The California Energy Commission anticipates that a new Energy Rating Index will be available by 2020, at which time BayREN could participate in a pilot program. These goals will be accomplished through the following activities.

Educate and Motivate

Engage, educate, and motivate the Bay Area's real estate, rental, and financing professionals so they can help their clients—single family home buyers and sellers, multifamily property owners and managers, and renters—make better-informed decisions about the buildings they are concerned with and about real estate and building upgrade investments.

Educational information will address various labels, assessments, and ratings that may be available for a building, such as Energy Star, HERS, or Home Energy Score. However, the BayREN's focus is on professionals who serve the existing building market, as opposed to new home builders, because older housing stock is the primary target for energy upgrades.

Green Fields in MLS

BayREN will support statewide and national efforts to consolidate information about energy efficient homes and enable automated data transfers to Multiple Listing Services (MLS) systems and other industry platforms. It will promote the use of green fields in the Bay Area's MLS in coordination with the Real Estate Standards Organization data protocols and will promote third-party platforms for home sales and apartment rentals that convey the value of green and energy efficiency features.

The BayREN is tracking the emergence of applications, such as UtilityScore, that provide estimated utility bill costs for homes on consumer-oriented websites (i.e., Trulia, Zillow, HotPads). These private sector

[42] A 2012 study by researchers at UC Berkeley and UCLA, "The Value of Green Labels in the California Housing Market," found that homes in California labeled with Energy Star, GreenPoint Rated or LEED sell for a premium compared to non-labeled homes. The report is available at www.stopwaste.org/about/news/homes-green-labels-sell-more

tools are coming to market at a much faster pace than the "Greening of the MLS," and may become freely accessible to consumers by the end of 2017.

Test affordable, accessible options for green labeling

The BayREN will leverage efforts with the Home Energy Score and will test affordable, accessible options for green labeling to drive demand for energy efficiency upgrades among homeowners and buyers, multifamily property owners and managers, renters, building contractors, and the real estate and financial professionals who facilitate transactions. Table 2.10 lists the suite of Single Family programs BayREN anticipates.

Table 2.10. Single Family Anticipated Programs

Program Title	Focus	Timeframe	Existing or New	Resource (R) Non-Resource (NR)
Home Energy Advisor	Expand existing Home Energy Advisor Program.	Short-term	Existing, expanded	NR
Single Family On Ramp Program	Direct Install/Home Toolkits to move engagement of residents.	Short-term	New	R
Single Family Package Measures	Targeted Packages of Measures to meet customer needs.	Short-term	New	R
Community EE Program	Implement energy efficiency for a group of homes at one time.	Mid-term	New	R
Green Labeling	Establish HES and Green Labeling Bay Area Wide.	Mid-term	New	NR

MULTIFAMILY OVERVIEW

The Bay Area Multifamily Building Enhancement (BAMBE) program provides multifamily property owners with a range of services aligned to their business needs and capital resources to promote adoption of energy efficiency upgrades. The program is designed to serve the full range of diverse multifamily market, including individually and master metered, individual and central system properties, and common area and in-unit end uses. BAMBE addresses the whole building regardless of whether the property owner or tenant is responsible for the utility bill related to particular end uses. The property owners enroll in a technical assistance program designed to lower barriers to multi-measure, whole building upgrades by providing technical and financial assistance. BAMBE serves as a complement to utility rebate and direct-install programs, such as single-measure rebates, comprehensive whole-building programs, and low-income direct-install programs. BAMBE encourages multiple measure upgrades but is accessible to property owners that do not have the interest or ability to do a comprehensive audit and retrofit. BAMBE serves properties that are inhabited by residents of all income levels, including moderate-income.

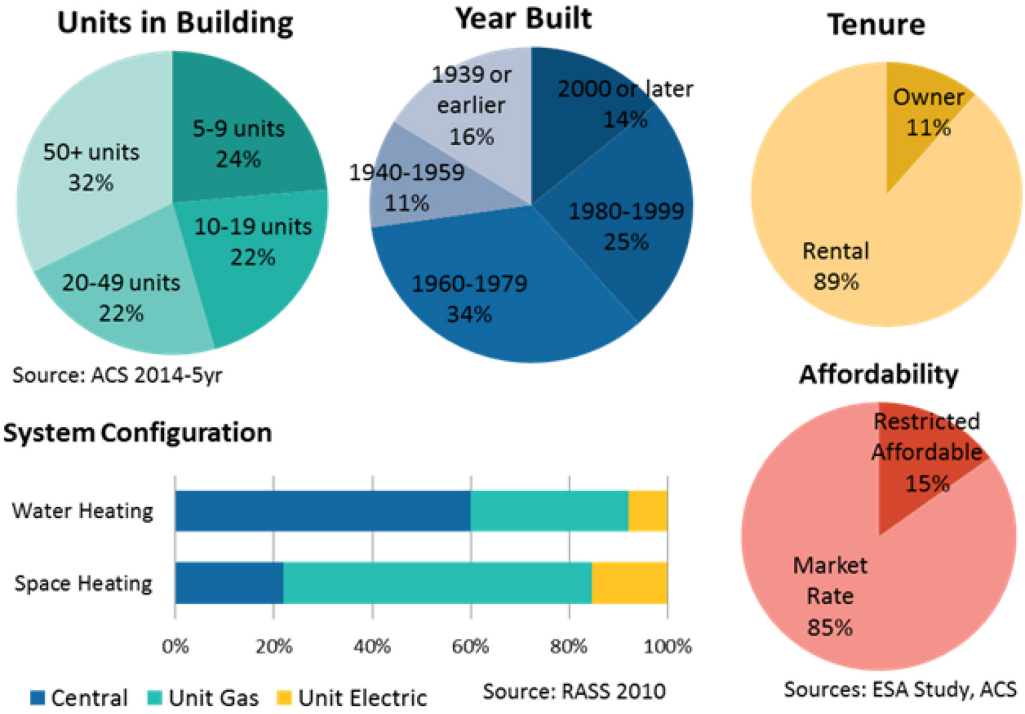
Multifamily Market Characterization and Trends

In the Bay Area, there are over 700,000 housing units in multifamily buildings with 5 or more units (Figure 2.7). This represents 25% of the Bay Area housing units and almost a quarter of statewide multifamily units.[43] The building stock is diverse in size, age, ownership, and energy system and metering configuration.

Serving a diverse multifamily sector requires a customized, flexible offering and multiple market drivers. Because program designs that work in other sectors have not found similar uptake in the multifamily segment, the sector has been considered hard-to-reach. Yet programs customized to the sector have the opportunity to realize significant savings. Nationally, "programs have shown that comprehensive retrofits can cost-effectively improve the energy efficiency of multifamily buildings by 30% for natural gas and 15% for electricity, which would translate into annual utility bill cost savings of almost $3.4 billion".[44] The diversity of the building stock means that each case is unique and requires a flexible approach that fits the building's existing condition and needs, and speaks to its core business motives. While direct financial incentives may be attractive across the sector, other market drivers are most salient to specific sub-sectors.

[43] American Community Survey, 2014.
[44] ACEEE (American Council for an Energy-Efficient Economy) 2013. The Multifamily Energy Savings Project. American Council for an Energy-Efficient Economy.

Figure 2.7. Bay Area Multifamily Sector [45,46]



According to the EBEE Action Plan, within California multifamily housing stock the highest energy uses are space heating (22%) and water heating (39%). While on average only about 500 kWh is used for space conditioning and water heating, electric fuel for space and water heating is more common in multifamily than in single family. The average multifamily household in California uses 3,700 kWh a year, the lowest among housing types, with the majority being baseload energy use.[47] BayREN lacks data on the split between common area and in-unit energy usage. However, BAMBE is designed to serve all end uses and configurations.

The target decision maker in a multifamily whole building upgrade is the property owner or delegated manager. In rental properties, which constitute the majority of the multifamily housing stock, the property owner/manager operates their property as a commercial asset and evaluates investment decisions based on financial impacts. Yet the end uses are distinctly residential, resulting in different savings opportunities than commercial properties. Property owners typically undertake building improvements during certain trigger events and develop capital investment schedules over time. They require a minimum return on their investments and demonstrated financial value to their net operating income in the form of lowered operating expenses or increased revenues. The market is still relatively new to energy efficiency, and

[45] Owners of rental properties include individuals, corporations, nonprofits, and other entity types. While only 15% are restricted affordable housing, statewide 37% of multifamily units are occupied by low-income households. Sources: EBEE Action Plan and Energy Savings Assistance Program Low-Income Market Segment Study, Cadmus.
[46] Although data on central versus individual metering configurations are unavailable, almost all units must be individually metered for electricity. Gas metering usually depends on system configuration and master metering is more common than for electricity. Sources: 2014 Census, Cadmus Multifamily Market Segment Study for Energy Saving Assistance Program, Residential Appliance Saturation Survey (CEC, 2010).
[47] California Energy Commission, "Residential Appliance Saturation Survey (RASS)", 2010.

conversations with program participants have revealed a preference for simple procedures. Streamlining the participation process and offering ample customized, hands-on assistance helps participants engage in a whole building upgrade. Assisting owners in integrating energy efficiency into their long-term plans aligns energy efficiency with their existing business practice and creates an opportunity for ongoing engagement.

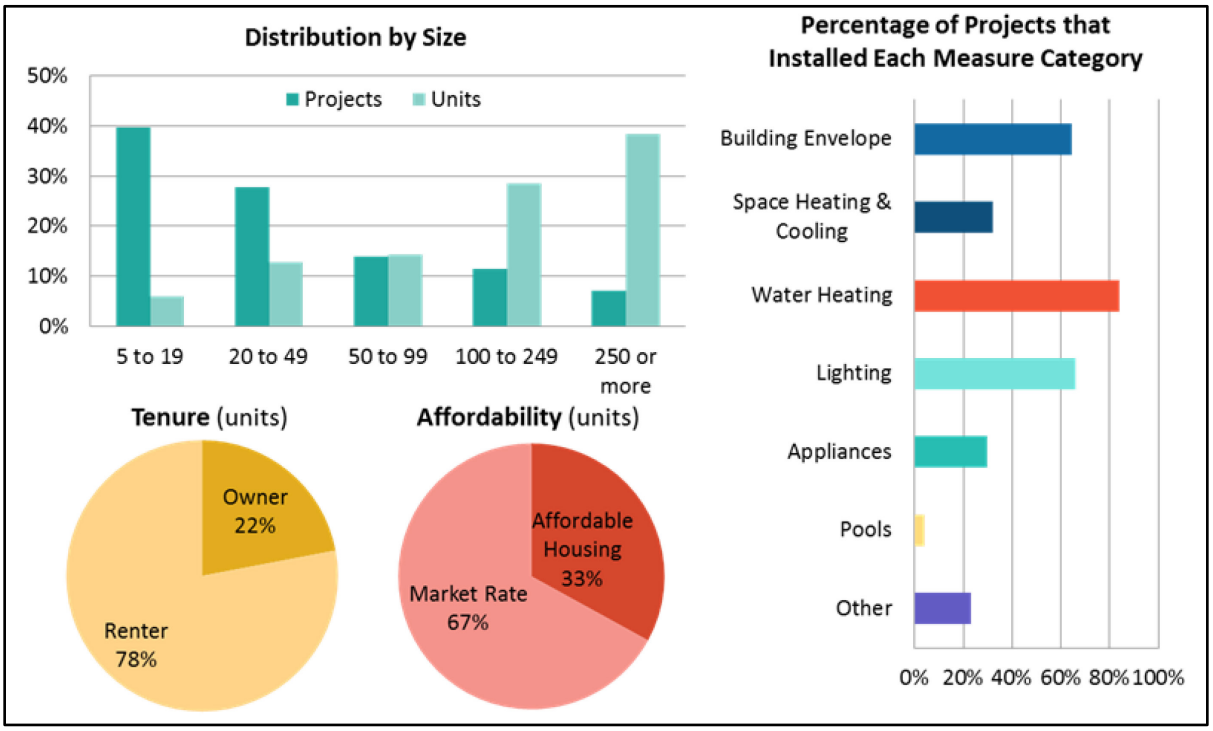
BAMBE served properties with both central and individual systems. The participation of projects with individual systems and metering indicates the program's ability to overcome the split incentive barrier. Of completed units for which the heating system details were recorded, 27% had central space heating, 44% had individual gas, and 29% had individual electric. Central water heating was more common, as is the case in the housing stock; 85% of completed units with recorded domestic hot water (DHW) details had central systems, while 14% had individual DHW systems.

BAMBE was designed to target more than one upgrade to encourage a range of building systems to be addressed at the same time. The program data show that BAMBE participants in 2013-2015 upgraded an average of 4.5 measures in 2.5 categories, demonstrating that the project scopes are successfully upgrading multiple measures across building systems. Figure 2.8 shows completed projects and measures for the 2014-15 timeframe.

The BAMBE model appears to have addressed the market's diversity through its flexible and customized offering. The portfolio of completed projects is as diverse as the housing stock. The program has struck a balance between incentivizing large properties that yield a high volume of units and savings, and reaching a good representation of smaller buildings. Consistent with the housing stock, the majority, 78% of completed units, were renter-occupied. The participation of owner-occupied properties (22% of units) is a notable accomplishment because they have previously been difficult to serve due to their complicated and distributed decision making. The program served both market rate (67% of completed units) as well as affordable housing (33%).

While BAMBE has completed approximately one hundred sites per year within its constrained one-year program cycles, it could more effectively engage larger retrofits and a larger segment of the sector with a longer program cycle. Large retrofit projects are typically developed and installed over 18 to 36 months. BAMBE has addressed the longer timeframes of large retrofit projects by offering technical assistance over several program cycles, but it has not been able to promise rebates on timelines exceeding each program cycle. Multi-year program cycles, as is envisioned by the ten-year Rolling Portfolio, will allow more effective engagement with this sub-sector.

Figure 2.8. BAMBE Completed Projects (2014-2015)[48]



[48] *Source: Program tracking metrics.*

Multifamily Strategies and Tactics

"The multifamily housing sector is different from other sectors in fundamental ways. Energy saving goals cannot be accomplished by expanding single family or modifying commercial building approaches."[49]

The following section provides detail on the key tactics for the multifamily sector aligned with the Plan's Intervention Strategies. Figure 2.9 illustrates the Business Plan Intervention Strategies and the associated Tactics to implement the strategies. Table 2.11 maps these Strategies and Tactics to a summary of the identified sector problems and market barriers.

Figure 2.9. Business Plan Intervention Strategies & Multifamily Tactics

Table 2.11 is a summary chart outlining how identified market problems and barriers discussed in the previous section will be addressed. Some issues will be covered by multiple tactics, which are identified by number.

[49] CEC, "EBEE Action Plan", 2015, page 11.

Table 2.11. Multifamily Problem Statements and Market Barriers

Problem	Market Barriers	Solution	Strategy/ Tactic
The multifamily sector is diverse in building, occupancy, and ownership characteristics making it difficult to efficiently target and address the sector.	Unique and multiple needs and requirements. Multiple market drivers influence decision making.	Customized technical assistance and flexible scopes qualifying for rebates. Facilitate policies, green labeling, and diverse financing products.	S2/R9 S3/R10
The multifamily is residential in occupancy but operated like commercial, and property investment decisions are based on financial motives.	Low tolerance for up-front transaction costs. Requires short ROI or payback period. Capital investment occur over time. Reduced operating expenses or increase revenue must be demonstrated. Multifamily owners will not engage if perceived as a competitive disadvantage.	Simplify program process and requirements and offer no-cost up-front technical assistance. Offer incentives until substantial portion of market has adopted energy efficiency.[50] Align energy upgrade recommendations with long-term capital improvement schedules by developing multi-phase deep energy savings (or ZNE) investment plans. Introduce green labeling as a mechanism to make energy efficiency visible and valuable in the market. Flatten the playing field by assisting local government to adopt policies in a regionally coordinated manner.	S1/R8 S2/R9 S2/R9 S1/R8 S3/R10 S3/R10
There is limited incentive for rental property owners to invest in energy efficiency.	Prospective renters do not have information on an apartment's energy usage or environmental attributes. Financial underwriting criteria for income properties (e.g., net operating income and debt service coverage ratio) do not currently value utility savings or revenue increases to due to energy efficiency.	Increase use of green labeling by rental property owners and on rental listing platforms to improve transparency and credibility. Educate lenders about financial benefits of energy efficiency. Create a body of research to demonstrate financial benefits.	S3/R10 S3/R10

[50] "Substantial" will be determined through EM&V activities to assess market penetration.

Strategy 1. Provide Wrap-Around Services, Support, and Financing

Tactic R8: Focus on building on-going, long-term relationships with property owners through ZNE investment planning and operational savings

Objective: Enable multifamily property owners to optimize trigger points and capital resources effectively

The multifamily sector typically undertakes building improvements over time, prompted by certain trigger events and as capital resources become available. To align with this practice, the BayREN program will focus on building on-going, long-term relationships with property owners through excellent customer service, ZNE investment planning and operational savings. Extending program cycles beyond one year authorizations will allow the program to assure the property owner of future assistance and facilitate trust building between the program and property owner.

ZNE investment plans include phases of upgrade scopes that are planned to occur sequentially to result in the deepest energy savings possible. The plans will be used as schedules for re-engaging the property owners when the planned date for the next phase is approaching. The program currently offers ZNE planning for interested property owners. The BayREN will continue this offering through Technical Assistance (TA) services and will build a portfolio of 20-40 projects with ZNE plans, to establish the model of following up over time. As the timing for the next phases of ZNE plan scopes approaches, the program will introduce an incentive structure specifically for the second or third phase. Within the ten-year horizon, the program aims to incentivize its first projects to complete their full ZNE plans.

The core of a long-term engagement strategy is relationship building. The BayREN has already establishing lasting relationships with property owners and portfolio owners. Portfolio owners in particular have the potential to undertake multiple upgrade projects over time. Ongoing relationships also allow for conversations about operational savings, which are currently left on the table. While engaging with hundreds of property owners through BAMBE technical assistance, we have gained insights into how to evolve the program offerings to target deep energy savings over time to meet state and local energy efficiency and climate goals.

Strategy 2. Drive Adoption and Performance with Properly Aligned Incentives

Tactic R9. Continue BAMBE streamlined technical assistance and rebate program model

Objective: Expand program uptake until substantial market share demonstrates viability of whole-building upgrades

The 2013-2015 BAMBE program far exceeded its initial enrollment and completion goals. It demonstrates an effective model for achieving multiple-measure upgrades in every segment of this hard-to-reach sector. BAMBE offers streamlined, program-provided technical assistance and a flat per-unit rebate for any scope that meets the minimum savings and measure count requirements. The program was designed to address several aspects of the defined problem statement. Specifically, it addresses the sector requirements for a customized, flexible offering; low transaction costs by offering no-cost up-front technical assistance and simplified program participation requirements; and sufficient incentives to make the project financially justifiable. The offering was designed based on property owner input and aligns with the Multifamily Home Energy Retrofit Coordinating Committee (MF HERCC) recommendations.

The BayREN's first strategy is to continue the popular BAMBE streamlined technical assistance and rebate program model to reach substantial market penetration (5-10%). The industry seeks best asset management practices, and BAMBE aims to reach a significant enough market share to demonstrate the viability of multiple-measure upgrades, highlighting diverse case studies.

Strategy 3. Test and Demonstrate Innovative Deployment Methods

Tactic R10. Introduce other market drivers, specifically local government policies, green labeling, and access to financing

Objective: Adoption of local government policies and presence of other market-based mechanisms that encourage building upgrades

Once a substantial market share has demonstrated the viability of whole-building upgrades, BayREN plans to shift its focus to supporting market-based mechanisms that ultimately require less ratepayer funding. Specifically, BayREN plans to advance local government mandatory policies, green labeling initiatives, and access to private-sector financing. This market-focused strategy could be broadened to encompass other market mechanisms that are identified to be potentially effective and meaningful to the market. We anticipate adjusting the existing technical assistance and incentive offerings to complement these drivers. For example, the multifamily effort seeks to align technical assistance with requirements of local government policies or private lenders, or to support green labeling through an aligned incentive design.

Local Government Policies

The BayREN will assist local governments to pass appropriate policies to require multifamily property owners to disclose their energy usage or system characteristics (e.g., through an audit report) and/or undertake upgrades. The type of policy will depend on each jurisdiction's goals and political dynamics. Policies may require benchmarking, audits, or upgrades. They may apply to all or a portion of the multifamily housing stock based on variables such as size or age. They may be triggered by certain events like sale or rental of a property, or may apply to all applicable properties by a certain compliance date. The BayREN members will begin in the short-term with recognition of the many successfully completed BAMBE projects and build a case for normalizing energy efficiency practices in the industry. At the same time, the BayREN will develop policy tools for the multifamily sector, which will be used in the mid-term to support local governments in adopting policies. Technical assistance services and incentives will be continued and aligned to support property owners with policy compliance.

Green Labeling

In the mid- to long-term phase of this Business Plan, the Green Labeling program will build on the experience and lessons learned in the single family sector and expand to include multifamily properties. The green labeling strategy aims to increase market value for energy efficiency properties and green operating and maintenance practices. The BayREN will engage real estate brokers and partner with green labeling programs and industry platforms, such as tenant-oriented sites and apps. Success will be measured by an increase in the number of green labeled properties and studies that demonstrate a tangible "value add" for having a green label attached to the property.

There is currently no standardized way for owners of existing multifamily properties to convey an apartment's green or energy efficiency features to tenants or prospective renters. A standardized green label that is affordable and relatively easy to provide could benefit multifamily property owners in many ways, including increasing tenant retention and potentially receiving higher rents for energy efficient units.[51] A multifamily green label could make it easier for renters to identify healthier, more comfortable, and more energy efficient homes. Recent real estate and apartment industry surveys reveal trends indicating that the renter population is more permanent and likely to grow compared to single family homeowners.[52] If today's renters remain renters for longer periods than previous generations did, they may increasingly seek amenities that offer longer-term benefits, such as green and energy efficiency features.

Multifamily Financing

Financing is a mechanism to bring more private capital into funding energy efficiency projects, allowing programs to reduce direct incentive expenditures. There is potential to leverage financial trigger events, such as refinancing and recapitalization events, and insert energy efficiency work scopes. Financial underwriting criteria for income properties (e.g., net operating income and debt service coverage ratio) do

[51] Eighty-nine percent of renters are willing to pay $25 or more in rent per month for a green apartment (Strata Research, "Green Renter Survey Executive Report," 2011).

[52] See for example Apartment List Survey *Millennials and Homeownership 2016* and Fannie Mae National Housing Survey *Millennials Look to Income Improvement as Key to Unlocking Homeownership* which cite economic hurdles to ownership.

not currently value utility savings or revenue increases to due to energy efficiency. Part of this effort may include using program participant data to demonstrate reliable financial benefits that may enable lenders to include efficiency in their underwriting considerations.

The multifamily lending industry is diverse like its housing stock, and successful strategies need to address this diversity. With this in mind, BayREN introduced BAMCAP, which was designed to be flexible and work with existing industry lending practices. BAMCAP has successfully closed loans in a sector where other products have struggled to gain a foothold, however, the program is resource intensive and its overall capital pool is insufficient to fully test the market potential for the program design.

Since 2013, when BayREN originally designed BAMCAP, the private sector has made significant progress toward offering energy efficiency financing products to the multifamily sector. Small and large portfolio lenders have introduced products since then, including Fannie Mae and several regional banks. BayREN will leverage these new products by engaging the lenders to establish referral protocols from the BayREN pipeline to appropriate financing products. BayREN continues to focus on its role of filling gaps in the market, and will refine BAMCAP to target market segments that remain underserved by existing and emerging public and private lending products.

The BayREN also offers its Water Bill Savings Program (formerly BayREN PAYS®—see Chapter 6) in partnership with participating water utilities to deliver water efficiency improvements as part of water utility service. This allows certain cost-effective energy measures to be installed and paid back through the water bill surcharge mechanism.

Additionally, BayREN multifamily technical assistance is able to provide program referral to financing products offered by other entities, such as PG&E On-Bill Financing (OBF), PACE products, and Master-Metered Multifamily On-Bill Repayment (OBR) when available. Projects may be directed to the Go Green Financing website resource as appropriate. Program technical assistance will likely provide more detailed direction toward specific financing mechanisms depending on the project characteristics.

Table 2.12. Multifamily Anticipated Programs

Program Title	Focus	Timeframe	Existing or New	Resource (R) Non-Resource (NR)
Bay Area Multifamily Building Enhancements Rebates	Continue to offer per-unit rebates for multiple measure scopes	Short-term	Existing	R/NR
Technical Assistance	Continue TA services to support rebates and refine TA service scope to support other program elements	Short to Mid-term	Existing	NR
Multifamily Financing	BAMCAP and referral to multifamily EE financing products	Short-term	Existing	NR
Green Labeling	Promote use of green labels in multifamily rental and owner markets	Long-term	New	NR
Local Government Policy Assistance	Advance local government initiatives to adopt multifamily energy disclosure or upgrade policies	Long-term	New	NR

Coordinating Activities

Leveraged Resources

The BayREN, as a collaboration of local government implementers, is uniquely positioned to address the needs of homeowners, renters, and contractors. This can be accomplished through our marketing, education, and outreach and through partnerships and collaborations with other agencies and providers. The public's perception of the BayREN as a trusted, independent messenger underpins these activities.

As a local government entity, the BayREN can leverage other programs and agencies to expand benefits to residents, which may not be available for an IOU-only program. The BayREN will leverage LGPs, Community Based Organizations, and member agencies to expand outreach efforts and connect with homeowners in its role as a trusted messenger. The BayREN also offers its Water Bill Savings Program, in partnership with participating water utilities, to deliver water efficiency improvements as part of water utility service. BayREN is developing stronger relationships with other agencies such as the ABAG resiliency program and the Bay Area Air Quality Management District to create new cross-promotional products such as the "Resilient Home," which will leverage the whole home program and pair it with earthquake retrofits. Similarly, the BayREN is investigating testing approaches for community-scale retrofit programs that integrate water, waste, and alternative transportation. The intent is to continue to innovate with small-scale efforts, testing the feasibility to scale innovations into a mainstream effort that can be adopted throughout a REN or Utility territory.

Home Energy Score (HES)

In 2015, after analyzing various alternatives, BayREN member StopWaste began offering HEScore, a DOE program, in the Bay Area, through an official partnership with the DOE. The HEScore report provides a critical link between information and action. HEScore uses a simple metric similar to a vehicle's mile-per-gallon rating. Single family homes are scored on a scale from 1 to 10 relative to other homes in the same climate zone, with 10 representing a highly efficient home and 1 representing a low efficiency home. The score reflects expected energy usage based on the home's building energy efficiency characteristics. The cost of delivering a standalone Home Energy Score in the Bay Area is on average $250 per home.

BayREN has funded the recruitment and training of HEScore qualified assessors, development of HEScore program protocols, and the creation of a customized energy efficiency upgrade recommendations report that aligns with the Home Upgrade program or future whole home program. Along with the score and customized report, BayREN's single family program provides homeowners with associated energy and cost-saving estimates, and referrals to home upgrade programs, incentives, and financing tools.

EM&V Efforts

BayREN Responses to EM&V Studies and Recommendations

- **Single Family Data Quality and Tracking:** BayREN feels that a better platform for communication of expectations regarding reporting should be implemented to enhance consistency. BayREN is working to ensure our data sources are aligned to CPUC standards. We have set up an internal process to conduct data quality checks on a quarterly basis including running data through the Cost Effectiveness Tool (CET) for quarterly reporting. The single family sector will cooperate in tracking costs associated with both resource and non-resource activities.

- **Multifamily Data Collection:** The multifamily sector currently lacks access to whole building aggregate energy usage data due to IOU technological limitations or policy restrictions. The BayREN will cooperate with efforts under AB 802 compliance to obtain this meaningful level of utility billing data. These data will allow for a reconciliation of modeled savings as well as monitoring actualized savings over time.

- **Multifamily Internal Performance Analysis:** The BayREN's Multifamily program is designed specifically to respond to continuous internal performance analysis and be adjusted accordingly. The primary metrics the program will track include: kWh and therm savings per incentive dollar, dollars of private participant investment per incentive dollar, participant satisfaction and feedback, and how well the portfolio of participating buildings reflects the housing stock in variables such as geography, size, affordability, and vintage.

- **Multifamily Net-To-Gross:** CPUC evaluations produced recommended NTG values for the multifamily programs. Net energy savings and TRC have incorporated these recommended values. To improve up-front assessment of potential free ridership, the multifamily technical assistance offering will begin to include some of the EM&V survey questions during initial technical assistance. While it will be difficult to exclude participation of free riders, this information will inform program design adjustments to reduce the percentage of free ridership, for example by changing the eligible measures list to exclude measures that most frequently observe free ridership.

- **Multifamily Scalability:** CPUC has initiated a study of the scalability of REN and CCA multifamily programs. The findings from that study may inform program design as well as provide insights into the market characterization of the Bay Area multifamily housing stock for targeted outreach. Future BayREN EM&V activities may build upon this study to assess whether "substantial" market share has been reached in future years.

Table 2.13 summarizes EM&V study and data needs.

Table 2.13. Potential EM&V Study and Data Needs

Study Title/Topic Focus	Research Question	Objective	Timeframe
Home Energy Advisor	Do customers working with an Advisor save more energy than those that do not?	Determine impact of the Advisor program.	Short-term Long-term
Moderate Income participation/ demand	How many moderate-income households with other targeting characteristics (tenure, vintage, home value, etc.) are in BayREN territory and what is their energy use?	Understand moderate-income market.	Short-term
Multifamily Market Share	Has BAMBE reached a substantial portion of the market and increased the prevalence of EE? What is a "substantial" portion of the market, or a tipping point, for multifamily EE?	Determine whether incentive amounts can be reduced or redesigned.	Mid-term
Multifamily TA Process Evaluation	What share of projects that receive TA complete an upgrade through BayREN or other programs, including low-income programs?	Track conversion rates to gain insights to improve TA design.	Mid-term

Marketing, Education, & Outreach

BayREN's unique organizational structure as a collaboration of the nine Bay Area counties has enhanced the success of its programs through our perception as trusted messengers. As local governments, we are known and trusted by the communities we serve, and have a long record of delivering successful programs and services. Local governments may also leverage marketing and outreach strategies with other local programs, providing a full offering to consumers and contractors. There are 101 cities within the nine BayREN counties that can serve as program partners and further customize the message of energy efficiency and the whole home concept. Furthermore, local governments may leverage partnerships with community-based organizations and other sustainability and energy-related local initiatives. BayREN also works closely with the Statewide ME&O Energy Upgrade California program and coordinates marketing efforts where possible. Table 2.14 summarizes ME&O approaches and coordination.

Table 2.14. Marketing, Education, & Outreach Approaches and Coordination

Marketing Need	Approach	Objective	Timeframe
Identify moderate-income target areas	County members to use local Assessor's data and GIS mapping to identify target areas to deploy marketing tactics.	Optimize marketing resources in target areas.	Short-term
Local Marketing Plans	County members to develop marketing plans and identify tactics to tailor to their community.	Optimize marketing resources in target areas.	Ongoing
CBO and strategic partnerships	Utilize partnerships with Community Based Organizations and community partners.	Leverage local government resources.	Ongoing
Brand Recognition	Leverage Statewide Energy Upgrade California ME&O to develop trust among target market.	Build trust and awareness of program.	Ongoing
Develop Relationships with Multifamily Portfolio Owners	Engage corporate and non-profit portfolio owners in BayREN TA, beginning with one property and expanding to others or beginning with a portfolio-level analysis. Develop ZNE investment plans to facilitate ongoing engagement over time.	Achieve large volumes of upgrades by engaging key property ownership entities with multiple large complexes.	Ongoing
Reach Small Independent MF Property Owners	Target a portion of outreach to independent property owners that own one or a few small to medium sized properties. Develop case studies specific to this asset group, and use channels such as direct mail and local government outreach that are likely to reach this audience.	Enroll underserved or hard-to-reach property types into rebate programs and maintain a program portfolio that reflects multifamily sector's diversity.	Ongoing
Local Government Multifamily Recognition	Formally recognize and commend property owners that have undertaken upgrades through the BayREN program (or otherwise, if data available).	Build awareness and show sector examples of success stories, build relationship between local governments and the MF sector.	Mid-term
Green Labeling Awareness in Multifamily	Promote use of green labels in the multifamily market (including rentals) and the recognition of labels by prospective buyers and renters	Increase awareness and perceived value of green labels in multifamily market	Mid-term

Workforce Education and Training

As discussed earlier, BayREN offers a Core Contractor Training program and specific online training to educate contractors about the particulars of the BayREN programs. Moving forward, training resources may expand or leverage existing Workforce Education and Training (WE&T) offerings related to building a home performance business, sales training, and other similar offerings that will help contractors become more successful and profitable. This will include increased Home Energy Advisor support to contractors and additional technical trainings to expand the skills of the workforce, and to help reach deeper energy

savings. BayREN will leverage an approach that provides individualized and customized trainings for participating contractors, which may include in-field job and installation shadowing and mentoring, company-specific trainings, and process and business model consulting. This approach will leverage historical and real-time program and savings performance data in order to maximize the potential impact to the program. In addition, BayREN will offer larger group trainings as necessary, as well as communicate other training and development opportunities to contractors.

The Multifamily program does not provide direct workforce training. It allows property owners to select their own licensed contractors because the sector typically has established relationships with specific contractors. The open market model has been described by participants as a key attractive feature of the program.

Cross-Cutting Initiatives

The BayREN coordinates Residential Sector tactics with BayREN Cross-Cutting initiatives for Codes & Standards and the Water-Energy Nexus. Residential Tactics are in line with local government permitting requirements consistent with SB 1414, and promote local government financing options. Finally, BayREN coordinates Residential Tactics at the design and implementation levels with other Program Administrator activities, leveraging Home Energy Advisor and Technical Assistance services to make referrals and provide participants with information on aligned IOU, low-income, CCA, local jurisdiction, financing, and other energy and water programs. Cross-cutting coordination between the Residential Sector and other BayREN activities includes:

- **Commercial Sector**
    - Cross-educate aligned contractor groups for residential and small commercial projects to increase program participation.
    - Use Energy Advisors to educate program participants about similar financing mechanisms used by residential and small commercial projects and their associated benefits.
    - Engage participating commercial contractors who may also serve Residential programs.

- **Codes & Standards**
    - Require proper permitting and code compliance for program projects, including incorporation of SB 1414 regulations.
    - Integrate proper permitting and code compliance into program specific training and QA/QC.
    - Use Energy Advisors to educate program participants about the value of proper permitting and code compliance.
    - Increase feedback loops between participating residential contractors and code development processes.

- **Water-Energy Nexus**
  - Use Energy Advisors to educate program participants about water efficiency upgrades, rebates, and on-bill financing mechanisms.
  - Cross-promote on-bill service offerings to participating residential contractors.
  - Increase BayREN engagement in water-energy nexus proceedings and use of water-energy nexus calculator.

Key Partners/Coordination

The BayREN will work, partner, and coordinate with a number of state, regional and local government agencies, as well as Bay Area-specific groups related to energy and climate change. Key groups are listed in Table 2.15 and will be added to over time.

Table 2.15. Key Partners/Coordination

Partner	Single Family Coordination	Multifamily Coordination
Bay Area Cities and Counties	Outreach partner	Outreach partner
PG&E Coordination	Leverage program offerings	Leverage program offerings
PG&E Local Government Partnership Programs	Leverage program offerings	Leverage program offerings
California Solar Initiative	Leverage program offerings	Leverage program offerings
Community Service & Development Weatherization and Low Income Programs	Leverage program offerings	Leverage program offerings
Community Choice Aggregation energy efficiency programs	Leverage program offerings Outreach Partner	Leverage program offerings Outreach Partner
Municipal utility programs	Leverage program offerings Outreach Partner	Leverage program offerings Outreach Partner
Water Utilities	Leverage program offerings Outreach Partner	Leverage program offerings Outreach Partner
Financing Programs	Leverage program offerings Outreach Partner	Leverage program offerings Outreach Partner
Other government demand side energy programs (EE, DG, EV, etc.)	Leverage program offerings	Leverage program offerings
Local Trade and Real Estate Associations, Workforce Investment Boards, Retailers, Suppliers	Outreach Partner	Outreach Partner
Green Building Labeling Organizations	Outreach Partner	Outreach Partner
Community Based Organizations, Religious Institutions, Educational Institutions	Outreach Partner	Outreach Partner

Section 3
COMMERCIAL SECTOR

BAY AREA Regional Energy Network

Section 3. Commercial Sector

Introduction

The BayREN Commercial Sector Business Plan will serve all sizes of businesses and commercial real estate market, from large to micro, in the region. First, the plan serves large commercial sites and businesses with PACE and program referrals to existing utility Energy Efficiency (EE) programs. Next, it targets Small and Medium Commercial Buildings (SMCB) and Small and Medium Business (SMB)[1] customers with easy-access technical assistance, efficient service delivery, and comprehensive, cost-effective measures to lower energy costs and improve their facilities. Similarly, the Business Plan offers micro-businesses easy-access technical assistance and program referral to existing "hard-to-reach" programs, such as Energy Watch and other utility-sponsored "Business Solutions and Rebates." Thus, the Business Plan strategies leverage existing and new offerings and coordinates closely with local governments, Local Government Partnerships (LGPs), energy efficiency finance providers, and an array of cooperative public agencies and programs that provide SMCB customers, including the Hard-to-Reach[2].

BUSINESS PLAN VISION, OUTCOMES AND BUDGET

Vision

Decision makers in the Bay Area's SMCB sector will increase engagement in energy efficiency behaviors and equipment upgrades as a matter of regular practice.

Commercial Sector Outcomes

- *10% of Bay Area SMCBs in target market to receive comprehensive upgrades, achieving minimum 20% energy savings.*
- *$60 million in leveraged private capital invested into SMCB energy efficiency as a result of BayREN offerings.*

2018-2025 budget (total) *$47.7 M*

A multi-level strategic approach will be offered to the SMCB sector with trusted information and a range of solutions delivering energy savings recently enabled by legislation and new technology (e.g., AB 802, SB 350, AB 793). Innovative financing models, both publicly supported and 100% private, will play a key role in program delivery and will complement existing and new energy efficient incentive structures. BayREN activities are designed to meet SMCB customers and building owners where they are, while promoting comprehensiveness, market-based solutions, deep energy reduction, and long-term energy management goals.

BayREN's approach to the commercial sector, especially the new work contemplated for the SMCB market segment, is informed directly by our firsthand experience administering and implementing the San Francisco Energy Watch Direct Install (DI) program and Strategic Energy Resource (SER) projects. Additional experience comes from our support for other LGPs throughout the Bay Area, BayREN's commercial PACE program, our close collaboration with multiple SMB-focused implementers and innovators assisting with these efforts, and from the unique perspective local governments have on the needs of small business and building owners in our communities.

[1] For this Business Plan, "SMCB" is used as a reference to small-to-medium sized commercial building owners and the tenants and business that occupy those buildings.
[2] CPUC "Energy Efficiency Policy Manual, Version 5", 2013, page 15.

Market Context

The BayREN Commercial Sector Business Plan places an emphasis on the small and medium segment of the Bay Area commercial real estate market. This effort intends to complement existing LGPs and IOU programs, and to develop and test new models of delivering energy efficiency value to this challenging but important customer class. The BayREN SMCB sector is defined by the following characteristics:

1. Energy Usage: <500,000-kWh or <250,000 therms or <200-kW demand
2. Number of Full Time Equivalent (FTE) Employees: <20
3. Building Square Footage: <50,000 sq-ft conditioned

BayREN's commercial initiative is intended to address remaining barriers for delivering energy efficiency support and services to SMCB owners and customers in order to drive deeper savings per site and per dollar invested while supporting a robust, primarily private vendor/contractor-driven energy efficiency marketplace for small and medium commercial customers. As discussed in more detail in the "Market Characterization" section, most current energy efficiency programs and services within the commercial sector target two categories: (1) micro-sized businesses (often categorized as hard-to-reach under the CPUC's definition); and (2) large commercial sites with more than 500-kW demand / >50,000-sq-ft. As a result, small and medium commercial sites that do not fall under the hard-to-reach definition remain largely underserved. In summary, BayREN intends to offer programs and services to address the gap between micro and large commercial sectors.

Table 3.1. Commercial Market Summary

Market Segment	Typical Characteristics	Market Barrier	Solution
Micro and "Hard-to-Reach"	• <20-kW demand • <10 Employees • Primary Language Other than English • Leased Space	• Lack of capital (for deemed incentives). • Lack of Time, Capacity, Information.	• Co-pay Microloans. • SMCB Performance Advisor • Continue to refer to applicable Utility Programs (e.g., Energy Watch).
Small	• >20-kW to 100-kW demand • <20 Employees • <40,000-kWh or <10,000 therms • Leased Space • < 10,000 SF	• Lack of capital (for deemed incentives). • Lack of Comprehensiveness. • Lack of Time, Capacity, Information.	• Co-pay Microloans. • BayREN Pay-for-Performance Pilot; cross-promote with applicable financing (e.g., CHEEF and private). • SMCB Performance Advisor.
Medium	• 100-kW to 500-kW demand • 40,000 - 500,000-kWh or 10,000 - 250,000 therm • Leased/owned Spaces • <50,000 SF	• Lack of capital (for existing incentives). • Lack of Comprehensiveness. • Lack of Time, Capacity, Information.	• Co-pay Microloans. • BayREN Pay-for-Performance Pilot; cross-promote with financing (e.g. CHEEF, commercial PACE). • SMCB Performance Advisor.
Large	• >500-kW demand • >500,000-kWh or >250,000 therms • Leased/multi-tenant/owned spaces • >50,000 SF	• Lack of financing options.	• BayREN Commercial PACE; cross-promote with financing (CHEEF). • Continue to refer to applicable Utility Programs (e.g., TradePro and Savings by Design).

Sector Summary

The following is a brief overview of initial program approaches that will be advanced in separately filed Implementation Plans and support the Business Plan intervention strategies. These concepts will evolve over time, informed by internal evaluation, third-party EM&V, and stakeholder feedback.

SMCB Performance Advisor

The BayREN's SMCB Performance Advisor is the primary marketing and enrollment mechanism for BayREN's Small and Medium Commercial Programs. Modeled after BayREN's successful residential Home Energy Advisor, the SMCB Performance Advisor is a business support resource and a link between local governments, small businesses, and energy efficiency service providers and contractors. It is intended to be a "one-stop-shop" to:

1. Qualify and enroll sites into the BayREN Pay-for-Performance Program.
2. Promote and link existing utility programs when desired (e.g., direct install programs offered by PG&E) and financing programs.
3. Provide expert technical assistance and customer and contractor engagement, one-time and/or ongoing.

The SMCB Performance Advisor will be tailored to this segment by providing simplified access, a streamlined process, and easily understood information of relevance to small and medium commercial customers. Offerings will be bundled and optimized to match the site-specific and energy needs of the customer to streamline the delivery process and provide a positive customer experience. In addition, contractors will have access to expert technical assistance services and advice on how to develop and sell successful projects.

The SMCB Performance Advisor will offer a range of advisory services to busy small and medium businesses and property owners, their contractors, and service providers, to help them participate in multiple clean energy solutions. Services will include water conservation, distributed energy resources (e.g., demand response, electrical vehicle charging, energy storage), integrated financing, and other implementation support offerings.

SMCB Pay-for-Performance (P4P)

SMCB Pay-for-Performance seeks to first identify the "low-hanging fruit," leveraging existing energy efficiency programs to capture measure-level savings and rebates. Next, it identifies custom measures and provides incentives based on actual, metered savings. This approach is suggested in the Existing Buildings Energy Efficiency (EBEE) Action Plan in Strategy 3.2 Performance Driven Value,[3] as well as the express language of AB 802:

[3] CEC, "Existing Buildings Energy Efficiency Action Plan", 2015, page 75.

> *"the Commission… shall, by September 1, 2016, 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. Those programs shall include energy usage reductions resulting from the adoption of a measure or installation of equipment required for modifications to existing buildings to bring them into conformity with, or exceed, the requirements of Title 24 of the California Code of Regulations, as well as operational, behavioral, and retro-commissioning activities reasonably expected to produce multi-year savings."*

Capturing savings, enabled by AB 802, points to small- and mid-sized commercial buildings that have more complex systems than simple tenant spaces, and therefore present greater opportunities through a comprehensive whole building approach and finance-based solutions to obtaining savings. Technologies and approaches ranging from advanced metering infrastructures (AMI) to third-party aggregators have evolved and are offering reliable data analytics that result in greater accuracy in measured savings. As a result, incentives can now be set and adjusted to closely match normalized, realized savings. Careful consideration will be given to identifying appropriate segments to target, setting baseline and rebate payment amounts, timing of payments, savings validation methodologies, how financing is integrated, contractor participation requirements, and mitigating program risks. The Implementation Plan (IP) will outline the P4P program design in greater detail.

Co-pay Financing for Existing Incentive Programs

This financing approach identifies "good capital" (i.e., that which can bear a very low or sometimes no financial return) and works with local mission-driven lenders to provide very low cost or zero percent interest loans, specifically for small businesses to fund co-payments for energy efficiency projects that utilize existing incentives, thus helping to spend down existing direct install rebate budgets and obtain additional savings from mature program infrastructure.

Small and micro businesses are often challenged by co-payments for energy efficiency projects. Based on experience gathered from Bay Area LGPs, many such businesses cannot contribute even relatively small co-pays for high-impact energy efficiency projects because of their tight operating budgets. Indeed, even amounts less than $500 are unaffordable and represent a very real barrier to program participation and savings. Other than high-interest credit cards, options to borrow money for such small loan amounts are very limited. This is especially true for funding energy efficiency projects that are integrated with other processes to make an attractive offer (e.g., rebates for quality products supported by contractor oversight, robust QA/QC, etc.).

Commercial PACE

BayREN's existing Commercial PACE Financing initiative is designed to increase uptake in commercial PACE financing available through a variety of PACE program administrators and capital providers in the Bay Area. A tremendous amount of public and private investment has already been made to establish PACE programs throughout the state, yet for commercial property owners, much of the potential has yet to be realized. BayREN will continue to support this effort with ongoing advanced contractor training,

education, and project development support services that are responsive to the priorities of the entire range of PACE “gatekeepers”: building owners, capital providers, mortgage holders, and most of all, energy efficiency contractors who are key to identifying and implementing projects. The program will also expand its current efforts to improve field coordination with PG&E and other program administrators to ensure all available incentives are leveraged for eligible projects and to streamline the process of combining rebates with (private) financing.

Vision, Intervention Strategies, and Objectives

Vision: Decision makers in the Bay Area's commercial sector will increase engagement in energy efficiency behaviors and equipment upgrades as a matter of regular practice.

This vision is supported by a cascading set of activities. Owners, tenants, and businesses will undertake a range of actions from a menu of approaches—upgrades, financing, information, and behavior. These options will increase energy and business performance and, in allocating and pricing risk among program participants, will increase transparency, align interests, and increase confidence. Readily available technical knowledge and advice, standardized formats for developing investor-ready projects, and a variety of financing options will facilitate these decisions, being specifically designed to meet SMCB customers where they are. Since energy efficiency upgrades and supporting activities and services have become a sector norm, owners/tenants will not consider the upgrade costs as an added expense, but rather as a new value stream to increase business health, as well as increasing the attractiveness and marketability of real estate and business assets. Private investment in energy efficiency significantly outweighs ratepayer incentive dollars in terms of potential impact, however, limited ratepayer funds can be leveraged strategically to continue pursuing deeper and ongoing energy efficiency that incorporates the time and locational value of energy, savings measured at the meter, the increasing influx of various types of distributed energy resources, as well as the establishment of a framework for capital markets to invest in and securitize real energy savings as a utility and public resource.[4]

[4] See TURN May 15, 2015 IDSM comments in R.14-10-003, page 9: "To move beyond the inherent limitations of the current customer-centric approach to bundled efficiency, new transaction structures are needed to value "bundled efficiency as energy" for capital markets. "Bundled efficiency" is site-specific, persistent, correlates well to circuit and substation loads, and is measurable at the meter. Preliminary data suggest that it may be possible to reduce building loads by 25-40% by creating long-term investment opportunities in bundled efficiency. Building energy savings of this magnitude can be valued for investment purposes as the difference in load and energy requirements pre- and post- the implementation of energy efficiency, DR, ES and distributed resources. The energy reductions are used as to create new transaction structure opportunities to attract the capital markets to invest in building bundled efficiency over 20-30+ years."

Table 3.2. Commercial Sector Strategies, Tactics & Objectives

Intervention Strategy	Tactics	Objective
S1. Provide Wrap-Around Services, Support, and Financing	C1. SMCB Performance Advisor – Provide one-stop-shop/ single-point-of-contact for energy efficiency and related services and program offerings in the nine county area.	*Increase customer, contractor, and building owners knowledge, comfort, and understanding of the benefits of energy efficiency upgrades.*
	C2. Specialty Financing for micro and small projects – Establish small dollar financing for existing rebate/incentives program offerings that leverage existing project delivery infrastructure (e.g., local government partnership programs), marketing, contractors, Quality Assurance (Q/A), etc.	*Reduce remaining up-front cost barriers and increase participation in partner and regional commercial energy efficiency programs.*
	C3. Commercial PACE for larger projects – Educate and support Commercial PACE gatekeepers, particularly contractors, to take advantage of PACE financing.	*Expand use of PACE financing to reduce up-front costs and barriers to comprehensive, multi-measure upgrades, especially in SMCBs.*
S3. Test and Demonstrate Innovative Deployment Methods	C4. Pay-for-Performance – Drive projects and energy savings via Pay-for-Performance incentives paid out over time for metered savings.	*Enable long-term energy savings in the SMCB sector.*
	C5. Portfolio and District Approaches – Employ portfolio and district approaches for commercial energy efficiency improvements.	*Increase participation and scale of efforts, including creating effective paths to ZNE for existing SMCB.*

Commercial Sector Budget and Metrics

Budget

This budget will facilitate the forecasted short-, mid-, and long-term metrics targets with the expectation that increased participation and project volume is achieved as initial efforts scale and gain traction.

Table 3.3. Commercial Sector Budget

Budget ($)	2016*	2017*	2018	2019	2020	2021	2022	2023	2024	2025
Admin**	41,874	36,800	**	**	**	**	**	**	**	**
Implementation	201,705	201,705	1,928,000	3,126,000	3,748,000	3,974,000	4,115,000	4,729,000	5,075,000	5,610,000
Marketing	187,999	13,000	455,000	418,000	403,000	388,000	394,000	348,000	358,000	369,000
Non-Incentive Total	**431,578**	**251,505**	**2,383,000**	**3,544,000**	**4,151,000**	**4,362,000**	**4,509,000**	**5,077,000**	**5,433,000**	**5,979,000**
Incentive	-	-	500,000	1,000,000	1,250,000	1,400,000	1,750,000	2,000,000	2,125,000	2,250,000
TOTAL	**431,578**	**251,505**	**2,883,000**	**4,544,000**	**5,401,000**	**5,762,000**	**6,259,000**	**7,077,000**	**7,558,000**	**8,229,000**

** 2016's actual budget and 2017's proposed budget are included for reference. 2018 budget is proposed as year 1 of the Business Plan.*
*** With this Business Plan, BayREN proposes to reallocate Administrative costs from Sector Program budgets to the overall BayREN Portfolio budget. As a result, starting in 2018, Administrative allocations have been removed from Sector Program budgets. Additional discussion in Overview.*

Sector Metrics

The following Sector metrics align with the BayREN Commercial intervention strategies outlined in the previous pages and indicate anticipated short-, mid- and long-term targets for each program area.

Table 3.4. Commercial Metrics

Intervention Strategies	Market Effect Metrics	Baseline	Metric Source	2018-2020 Target*	2021-2024 Target*	2025+ Target*
S1. Provide Wrap- Around Services and Support **Estimated 25% of annual budget:**	Expanded small commercial energy efficiency workforce empowered to deliver integrated and attractive SMCB solutions	Program start will establish baseline at 0	Program Tracking Database	50 participating BayREN SMCB Contractors Completing 10+ Projects/Year	Increase 5% over previous year	Increase 5% over previous year
	Increase SMCB participation in comprehensive solutions to adopt pathways to zero net energy (or ZNE-ready) retrofits	Program start will establish baseline at 0	Program Tracking Data	Annual # of customers enrolled: 190; Number of Projects: 77 Co-pays financed: $1,200,000 Leveraged private financing: $8 million	Number of leads: 400; Number of Projects: 160 Co-pays financed: $4.6 million Leveraged private financing: $22 million	Number of leads: 540; Number of Projects: 200 Co-pays financed: $5.7 million Leveraged private financing: $22 million
S2. Drive Adoption and Behavior with Properly Aligned Incentives **Estimated % of annual budget: 50%**	Widespread interest in energy efficiency solutions where incremental cost is no longer a major barrier and customers act on projects based on high confidence in financial benefits of energy efficiency investment		Program Tracking Database	# Projects (average/yr): 115 P4P incentives paid (average/yr): $500,000 kWh savings (average/yr): 2,600,000 kWh Gas savings (average/yr): 300,000 therms	# Projects (average/yr): 300 P4P incentives paid (average/yr): $1,600,000 kWh savings (average/yr): 8,450,000 kWh Gas savings (average/yr): 500,000 therms	# Projects (average/yr): 400 P4P incentives paid (average/yr): $2,295,000 kWh savings (average/yr): 10,575,000 kWh Gas savings (average/yr): 750,000 therms
S3. Test and Demonstrate Innovative Energy Efficiency Deployment Methods **Estimated % of annual budget: 25%**	Increase number of SMCB engaged with a single coordinated effort via portfolio or district engagement		Program Tracking Database	Efforts likely to begin year 3-4	2 Districts or Portfolios annually	3 Districts or Portfolios Annually

** 2018-2020 (Short-term); 2012-204 (Mid-term); 2025+ (Long-term).*

Market Characterization and Trends

"In the United States, the commercial building sector—of which more than 90 percent are small buildings—consumes about 20 percent of all U.S. energy. According to studies by the Department's Pacific Northwest National Laboratory and the National Renewable Energy Laboratory, small buildings have tremendous potential to save energy and improve their bottom lines."
– U.S. Department of Energy, June 2013

The Bay Area is home to an abundance of small and medium businesses that are vital to the economic health of the region, provide crucial goods and services, and collectively represent an underserved market segment with robust opportunities to realize vast energy savings. Additionally, reducing energy consumption in SMCBs is essential to meeting emissions reduction targets and requirements set by local governments, California's AB 32 and SB 350, and related policy mandates. Therefore, the BayREN Commercial effort targets the small and medium business while using existing programs such as Energy Watch and IOU programs to serve the hard-to-reach, micro-businesses, offering new support services and innovative program structures that leverage technology, new policy direction as set by the CPUC and the state legislature, and private capital. As a REN, our directive is to serve the hard-to-reach sectors with programs in areas that utilities cannot, will not, or have not had success in deploying comprehensive energy retrofits. To that end, the BayREN commercial programs focus on whole building, multi-phase, comprehensive retrofits for the SMCBs.

SMCB Market Share

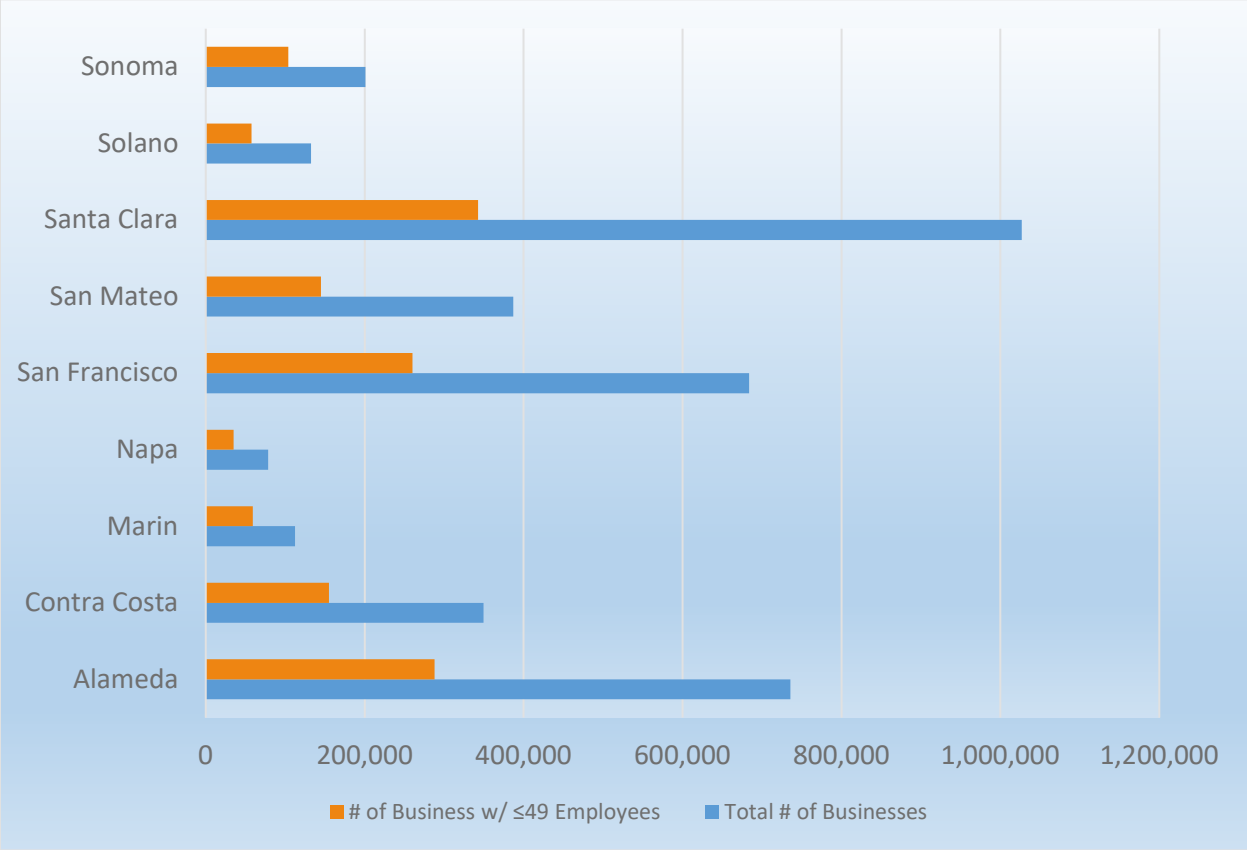
In 2015, the nine Bay Area counties were home to 3,707,220 businesses, of which 351,064 hired an average of 10 to 19 full-time employees[5] and 508,502 hired an average of less than 10 full-time employees. In other words, nearly 23% of businesses in the region may be classified as "small businesses" under criteria, ranging from annual property tax/payroll to gross receipts. Sector growth is trending upward because this region continues to expand economically and attract entrepreneurs, despite high business costs such as rent, licenses, and labor. This is because the Bay Area is a mass market of more than 7 million people, in 101 cities,[6] with comparatively high household incomes. As such, "the number of small businesses in this region is projected to grow, with an estimated 64% of Bay Area small businesses planning to hire in the coming year (2016), an increase from 42% a year ago. Additionally, 77% of area businesses plans to grow their business over the next 5 years, a 16% increase from last year, and 71% are confident their revenue will increase in the coming year, a 17%-point jump from a year ago."[7]

Collectively, small and medium businesses represent a powerful economic engine whose presence has a huge impact on not just the Bay Area, but the State. The Bay Area's 2014 Gross Domestic Product is $721 billion, making it the leader in California and the United States.[8] According to the California State Employment Development Department (EDD), Bay Area businesses with less than 20 employees hire 5%

[5] California Employment Development Department, Labor Market Information Division, Data by Counties, 2015.
[6] MTC-ABAG Library, "Bay Area Census Data," 2010.
[7] Bank of America, "Small Business Owner's Report," Fall 2015.
[8] US Bureau of Economic Analysis, 2014.

of the total number of employed persons in the State, with an annual payroll exceeding $305 million.[9] As Figure 3-1 shows, most of these businesses are clustered in the three major metropolitan areas of San Francisco, Oakland-Alameda, and Santa Clara.

Figure 3.1. Number of Businesses with <20 Employees by County[10]



In summary, the Bay Area small and medium business sector is robust and growing. In addition, it provides vital goods and services to the area's population and is a powerful economic force that attributes to the State's continued economic well-being. Thus, this sector remains a large potential market segment for delivering innovative, effective, comprehensive energy-efficiency solutions and energy savings.

SMCB Energy Usage and Building Characteristics

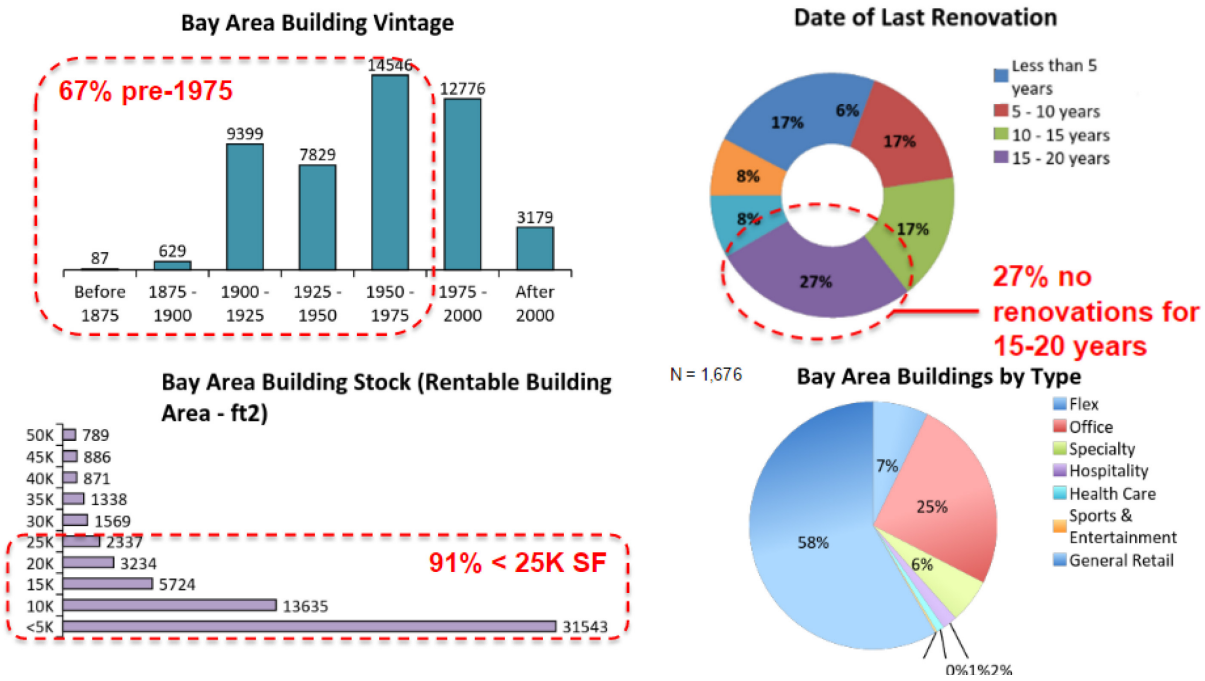
Nationally, in 2014, the SMCB sector was responsible for 47% of building sector energy consumption in the United States and represented 51% of total floor area. Of the approximately 4.8 million commercial buildings in the United States (of which 98% are less than 100,000 square feet in size), fewer than 10% have Building Automation Systems (BAS). In light of new technological advances in advanced metering, the granular insight and data analytics BAS provide, and the ability to participate in automated Demand Response programs, this is an area of significant opportunity to create new channels for SMCBs to participate in and benefit from energy efficiency solutions. Further, *"more than 50% of commercial*

[9] California Employment Development Department, Labor Market Information Division, Size of Business Data, 2015.
[10] California EDD, Labor Market Information Division, Business Data by Counties, 2015.

buildings nationwide are less than 5,000 square feet, and 82% of those contain only one business. Another 36% of commercial buildings are between 5,000 and 25,000 square feet, with 74% containing one business. Only 10% of commercial buildings are more than 25,000 square feet. This indicates the importance of addressing the small- and medium-size building sector and potentially focusing on the single tenant instead of the larger buildings with multiple tenants."[11]

As illustrated in Figure 3.2, of the Bay Area's 61,926 office, retail, hotel, and industrial buildings, 91% (56,473) are less than 25,000 ft^2, 51% are less than 5,000 ft^2 and 70% were built prior to 1990.[12] In addition, San Francisco and Berkeley are currently leading implementation of commercial building benchmarking and energy audit ordinances that apply to more than 1,620 SMCBs each year,[13] offering the BayREN unique insight into owner performance patterns, and opening unique pathways to engage with and support SMB owners and stakeholders to manage and improve energy efficiency over time.

Figure 3.2. Bay Area Building Stock Characteristics[14]



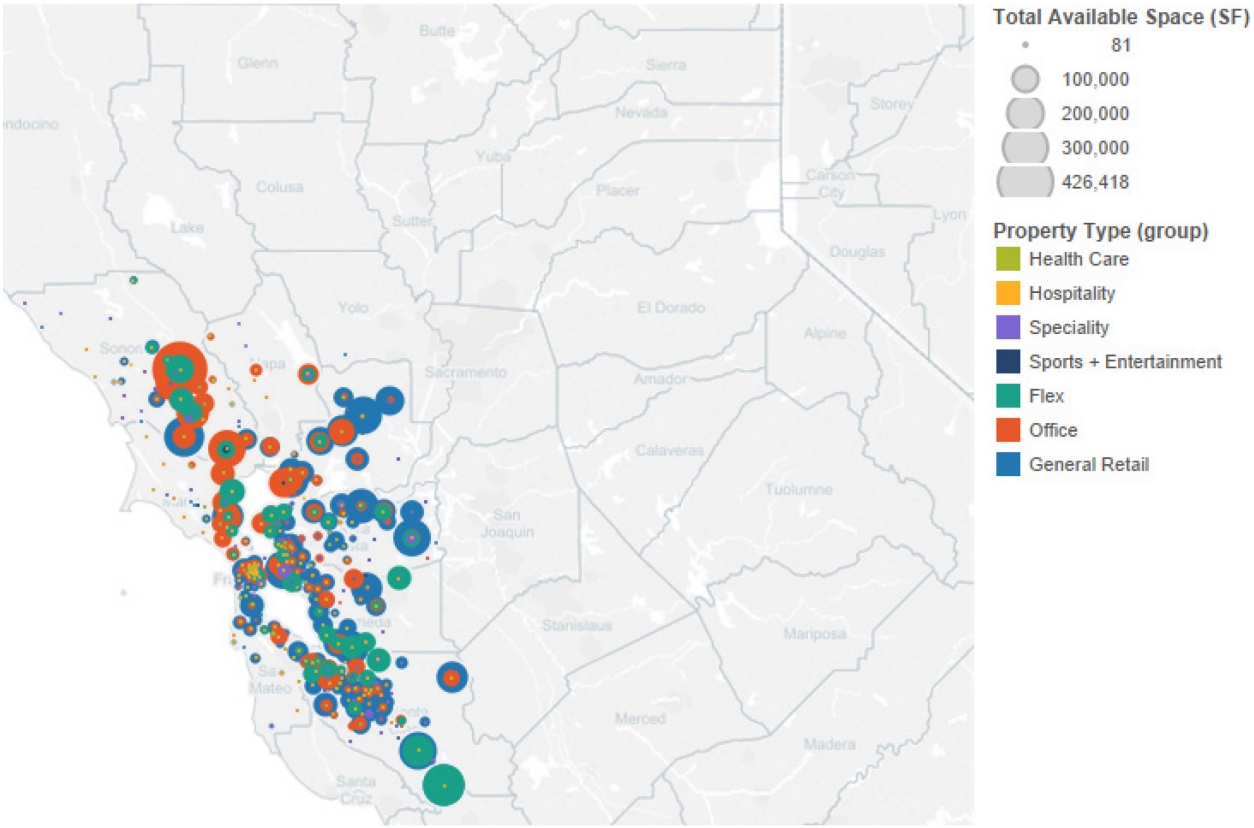
Furthermore, Figure 3.3 shows the concentration of commercial buildings, by size, located in the Bay Area. The dense clusters of small dots represent commercial buildings with <100,000 sq-ft, around the region. Flex type commercial buildings dominate the landscape. As defined by CoStar Group, a national commercial real estate information and marketing provider, a flex building is "*a type of building(s) designed to be versatile, which may be used in combination with office (corporate headquarters), research and development, quasi-retail sales, and including but not limited to industrial, warehouse, and distribution uses. At least half of the rentable area of the building must be used as office space. Flex*

[11] Navigant Consulting, "California Potential and Goals Study", 2013.
[12] BayREN, Commercial Building Data Gather and Cleaning Tool, 2014.
[13] Data provided by Cities of San Francisco and Berkeley, 2015.
[14] BayREN Commercial Building Screen Tool, 2014.

buildings typically have ceiling heights under 18', with light industrial zoning. Flex buildings have also been called Incubator, Tech, and Showroom buildings in markets throughout the country."[15]

Few are single-tenant occupied, and many are comprised of leased spaces occupied by medium, small, even micro/HTR businesses. In other words, flex buildings represent an opportunity, further supporting the assertion that the region is home to many small- and medium-sized commercial properties.

Figure 3.3. Commercial Buildings Location and Square Footage by Type[16]



Moreover, the SMCB sector may be divided into segments based on annual energy usage and type of commercial activity. This type of segmentation will allow BayREN to effectively target our marketing activities and customize the implementation tactics to best suit each segment's particular needs.

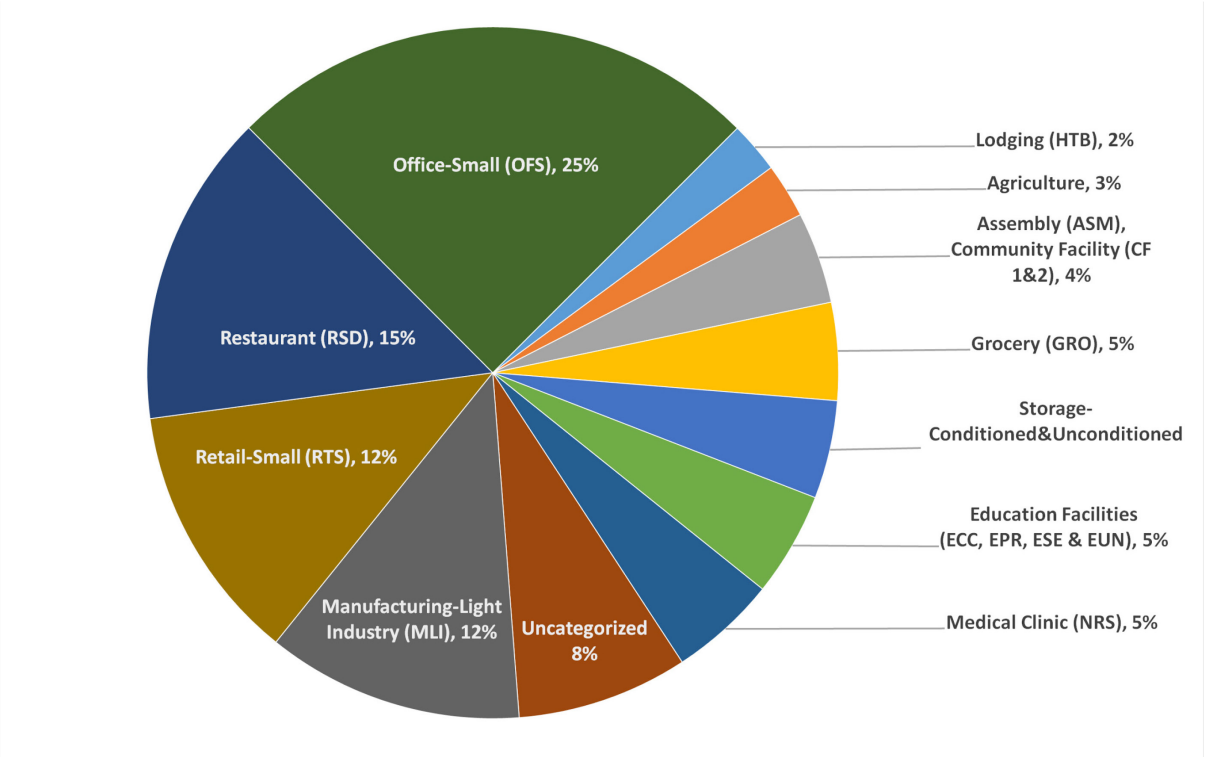
Specifically, this sector is very diverse and thus requires specialized, tailored solutions. Formulating such solutions requires identifying the segments and their specific needs to achieve deeper and more sustained energy savings. As discussed later, the "one-size-fits-all" approach to the entire commercial sector has resulted in stranded savings in the SMCB sector. Screw-in lamps and basic refrigeration and food service equipment replacement are becoming saturated in the Bay Area region, resulting in the need for more

[15] CoStar Glossary, http://www.costar.com/about/costar-glossary#go_f.
[16] BayREN Commercial Building Screening Tool, 2014.

creative, comprehensive solutions.

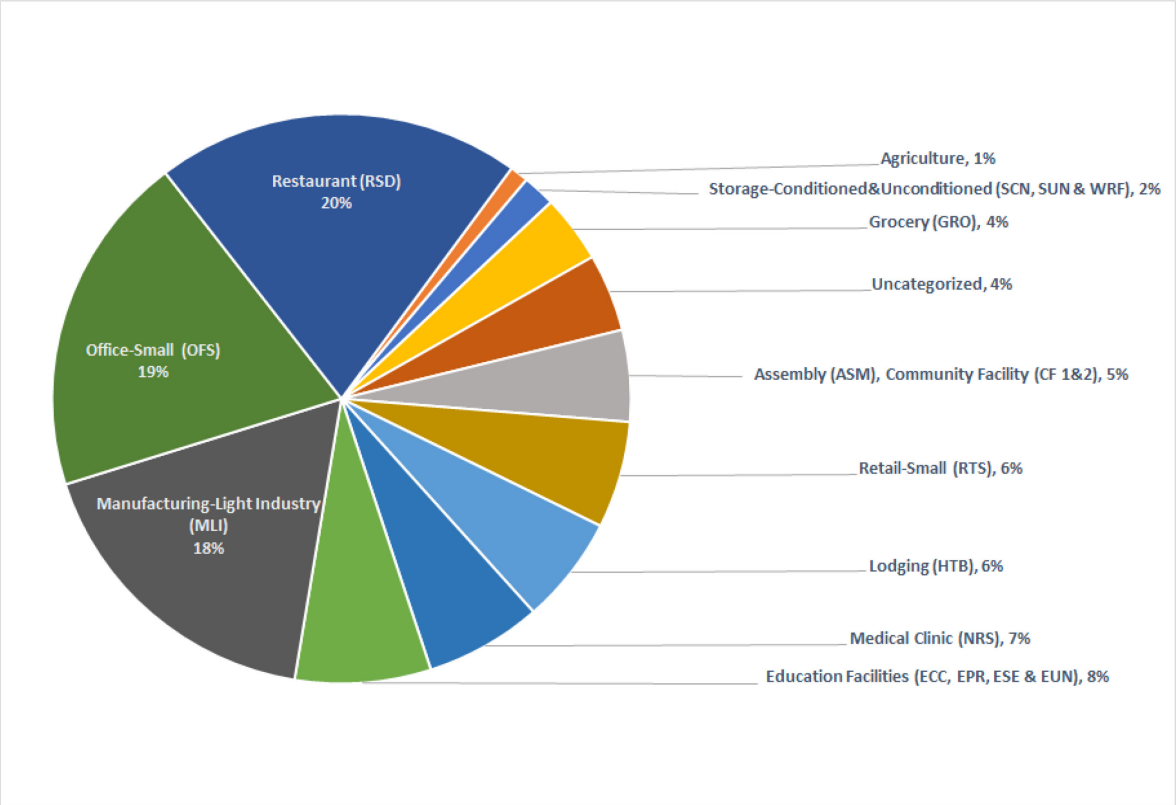
Figures 3.4 and 3.5 show that light manufacturing, offices, and restaurants (both sit-down and fast-serve) consume more than half of the electricity and therms in SMCB sector. These sub-sector analyses will shape BayREN's offerings, messaging, and solutions accordingly, with more detail provided in the Implementation Plan.

Figure 3.4. Percent of kWh Usage by SMCB (<500,000-kwh) Segments in Bay Area, 2015[17]



[17] Internal PG&E Data Requests, 2016.

Figure 3.5. Percent of Therms Usage by SMCB (<250,000 therms) Segments in Bay Area, 2015



SMCB Participation

Research reveals that many programs that offer comprehensive retrofits experience relatively low participation rates due to the ***complexity and costs*** of programs and projects.[18] SMCB stakeholders typically lack the time, money, and expertise to address energy efficiency improvements that would benefit their businesses.[19] As a result, traditional small business programs historically have relied heavily on lighting improvements because these offer quick paybacks and are relatively simple to implement. Although rebates for major systems and appliance such as HVAC, refrigeration, food service, and laundry equipment and controls are offered, they are limited in comparison to lighting and associated rebates, which address a fraction of the overall upgrade cost. Moreover, the larger systems and equipment upgrades require more technical and financial assistance, and are often beyond what small business owners can take on. Thus rebates and incentives have a limited impact in influencing the business decisions of small business owners.

Whole building retrofits that include lighting, refrigeration, HVAC, and high-cost replacement represent the greatest source of energy savings potential in California,[20] however, the SMCB sector is well recognized as "hard-to-reach" because of customer skepticism that energy efficiency can lower operating costs; bias toward conservative risk metrics (simple payback) instead of business health metrics (cash

[18] ACEEE, "The Promise and Potential of Comprehensive Commercial Building Retrofit Programs", May 2014.
[19] CEC, "Existing Buildings Energy Efficiency Action Plan," 2015, page 19.
[20] Ibid, page 16.

flow); lack of the knowledge and technical information to implement cost-effective energy efficiency measures/projects; lack of capital and credit required for conventional financing;[21] and the belief that existing equipment is adequate. Energy costs are perceived as fixed and absolute, while energy efficiency improvements are often perceived as an inconvenience and are thus not a priority. Further, energy-related investment decisions are typically in the hands of small business stakeholders who have little time to be concerned or informed about energy management.

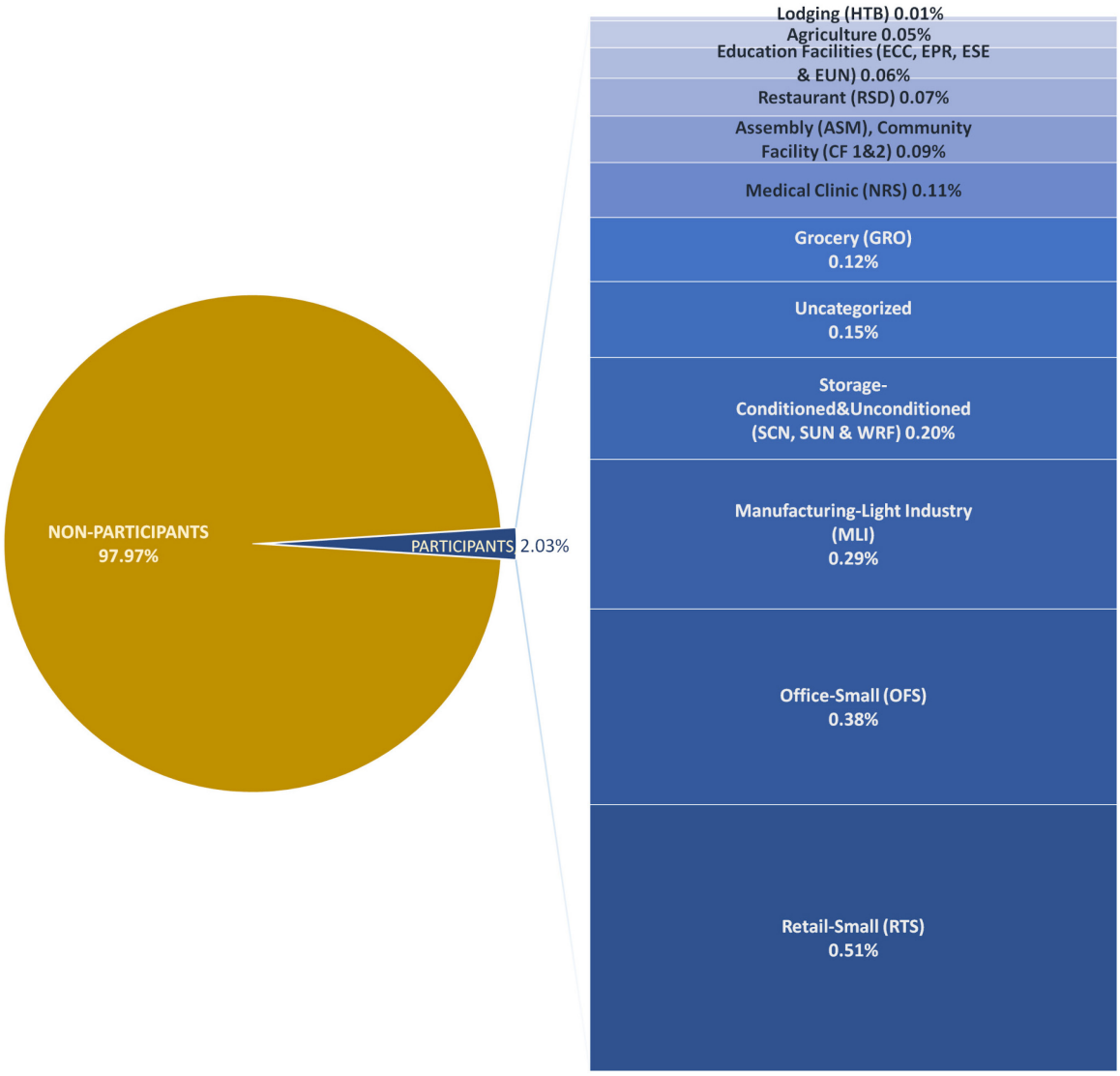
According to the American Council for an Energy-Efficient Economy (ACEEE), annual participation rates of surveyed SMCB programs were typically in the 1 to 2% range.[22] However, the savings and economic benefit potential is too significant to be ignored: one study by NREL estimates that well designed small business energy efficiency initiatives could result in ***1.07 quadrillion Btu of site energy savings, or $30 billion in energy cost-savings every year in the United States.***[23]

As discussed above, traditional "widget-based" rebates and incentive programs, with savings based on deemed values, have been successful only in reaping the "low-hanging fruit," such as lighting and refrigeration upgrades. However, there has been less success in developing and implementing comprehensive energy efficient projects, which typically require sophisticated evaluation techniques and more engineering. In addition, due to a limited definition of "hard-to-reach" by the CPUC, many small Bay Area businesses are excluded from IOU programs targeting this sector.[24] As a result, efficiency program participation from this sector is low compared to the number of small businesses.

Figure 3.6 shows that just over 2% of SMCB (based on site kWh usage of SMCB participants, by sector versus the total kWh usage of SMCB non-participants) participated in small/medium commercial programs in 2015, despite 474 active programs in the nine Bay Area counties. Of those who did participate, 51% were projects completed at small retail, followed by 38% in small offices, and 29% in light manufacturing. These percentages are consistent with the segments identified in Figures 3.4 and 3.5.

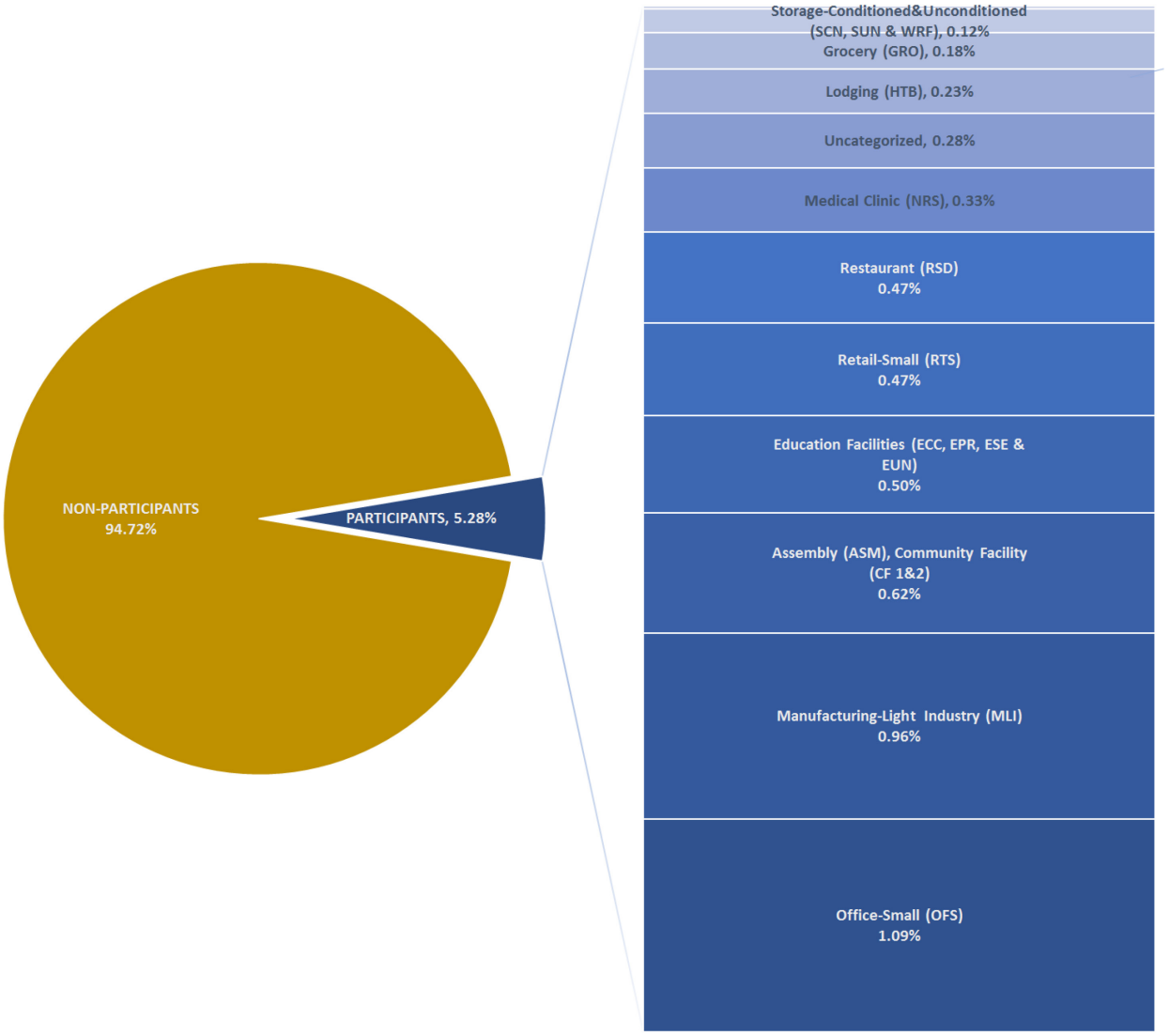
[21] Navigant Consulting, "California Potential and Goals Study", 2013.
[22] ACEEE, "Growing the Energy Efficiency Pie," 2015, p. 49.
[23] NREL, "Small Buildings = Big Opportunity for Energy Savings", December, 2013.
[24] Draft CPUC Resolution G-3497 http://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M143/K573/143573160.PDF

Figure 3.6. Percent of Bay Area's SMCB (<500,000-kWh) Participation in PG&E Energy Efficiency Programs in 2015



Similarly, Figure 3.7 represents the percentage of site natural gas usage of SMCB participants per sector versus the total natural gas usage of SMCB non-participants in 2015. Only 5.28% of SMCB natural gas consumers participated in an energy efficiency program in 2015, led by Offices and Light Manufacturing and followed by Community and Education facilities. These data are surprising because restaurants, the SMCB segment with the highest gas usage, ranked 6th in resultant savings. As a result, food service remains a challenging sector to serve using a conventional, widget-based approach, despite dedicated technologies and rebate programs.

Figure 3.7. Percent of Bay Area's SMCB (<250,000 therms) Participation in PG&E Energy Efficiency Programs in 2015



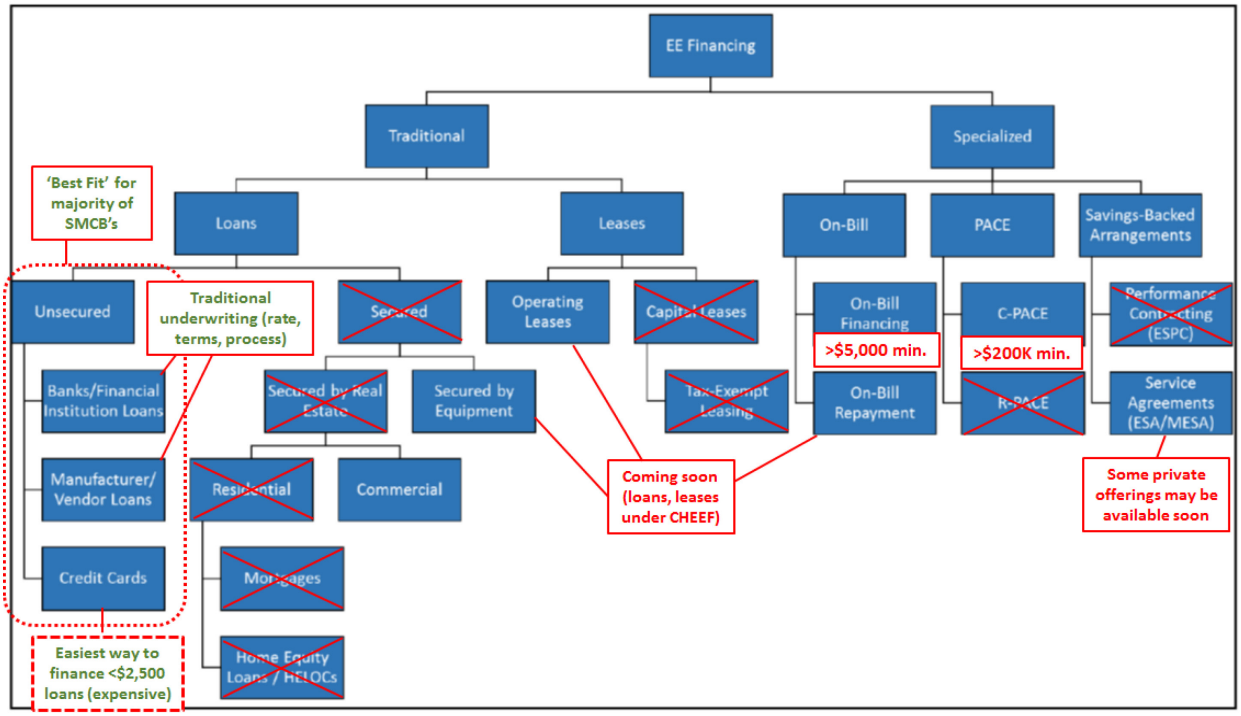
Data from 2015 for the San Francisco Direct Install program indicate a 16% participation from the commercial sector.[25] Most of these sites are micro, not small, businesses, as indicated by their kWh usage. Comparatively, the latest information indicates that of the 80,433 businesses in San Francisco and San Mateo Counties, 72,481 (90%) have <20 employees. This finding supports the need to focus on this segment.[26]

[25] City of San Francisco, Direct Install Program Data, 2012-9/16.
[26] California Employment Development Department, Data for Metropolitan Areas, San Francisco & San Mateo Counties, 2015.

Capital and Financing Gaps for SMCBs

Like other sectors, SMCB faces many barriers for participation in energy efficiency offerings; one of the most persistent challenges is limited access to capital to pay for energy upgrades. Small and medium commercial building owners and business customers, many of whom are tenants, usually do not have particularly strong credit ratings. Specialty products are needed to fill the gaps left by traditional (i.e., bank) financing for lessees and smaller owners who are difficult and expensive to underwrite, and who are typically required to make off-putting down payments on loans offered at high interest rates or come with other unattractive terms. Upcoming California Hub for Energy Efficiency Financing (CHEEF) pilots will fill gaps with credit enhancements, contractor support, and ME&O for loans, leases, and energy service agreements (ESAs). BayREN will refer customers to these offerings, as well as On-bill Financing (OBF)/OBF_AP, private financing options, PACE, and specialty financing for existing incentives. Figure 3.8 highlights the financing products that are appropriate for the SMCB segment in comparison to traditional offerings for larger businesses.

Figure 3.8. Energy Efficiency Financing Options for SMCBs[27]



[27] Adapted from "Current Practices in Efficiency Financing: An Overview for State and Local Governments," LBNL-1006406, 2016.

Small Commercial Contractors and Energy Service Providers

New initiatives that will effectively reach this latent market must address not only customer barriers, but also barriers faced by contractors. *"The residential and small commercial market segments are together, because, technical considerations aside, these markets share many characteristics. The small commercial and single-family residential market segments are highly competitive and price-driven. Consumers in these segments have difficulty distinguishing contractors on the basis of quality, because many of the attributes that contribute to energy efficiency—such as unit sizing, duct sealing, air flow, and refrigerant charge—cannot be easily appraised by most consumers. Barriers to entry for firms in these market segments are fairly low, but an estimated 25 percent of all HVAC firms go out of business in a given year."*[28]

Addressing contractor barriers is critical for increasing program participation. Typical barriers include high transaction costs, lack of functional alternatives to building energy modeling,[29] limited financing options for customers, and a lack of sales and marketing skills to sell multi-measure projects. Several of BayREN's suite of commercial offerings (such as the existing Commercial PACE sub-program) emphasize the need to support contractors, specifically smaller firms that have participated in traditional direct install programs, in order to expand the workforce needed to serve SMCBs with holistic, comprehensive energy solutions. Table 3.5 shows differences between large and small contracting firms.

Table 3.5. Difference in Large and Small Commercial Contractors Markets[30]

	High Road	Low Road
Market Segments	• Large owner-occupied commercial • Public Buildings	• Residential • Small Commercial
Wages	$14 to $22/hr.+ entry wage for apprentices Prevailing wave average $37/hr. (plus benefits)	$10-$15/hr. Maximum around $25/hr.
Turnover	Low	High
Training	5-year apprenticeship, comprehensive, funded by employer/employee contributions averaging $1.15 per journey hour worked.	On the job, skills specific, paid for by worker or public subsidy.
Certifications	*Common* Journey Card NATE UA STAR TABB	*Rare* NATE HVAC Excellence ICE

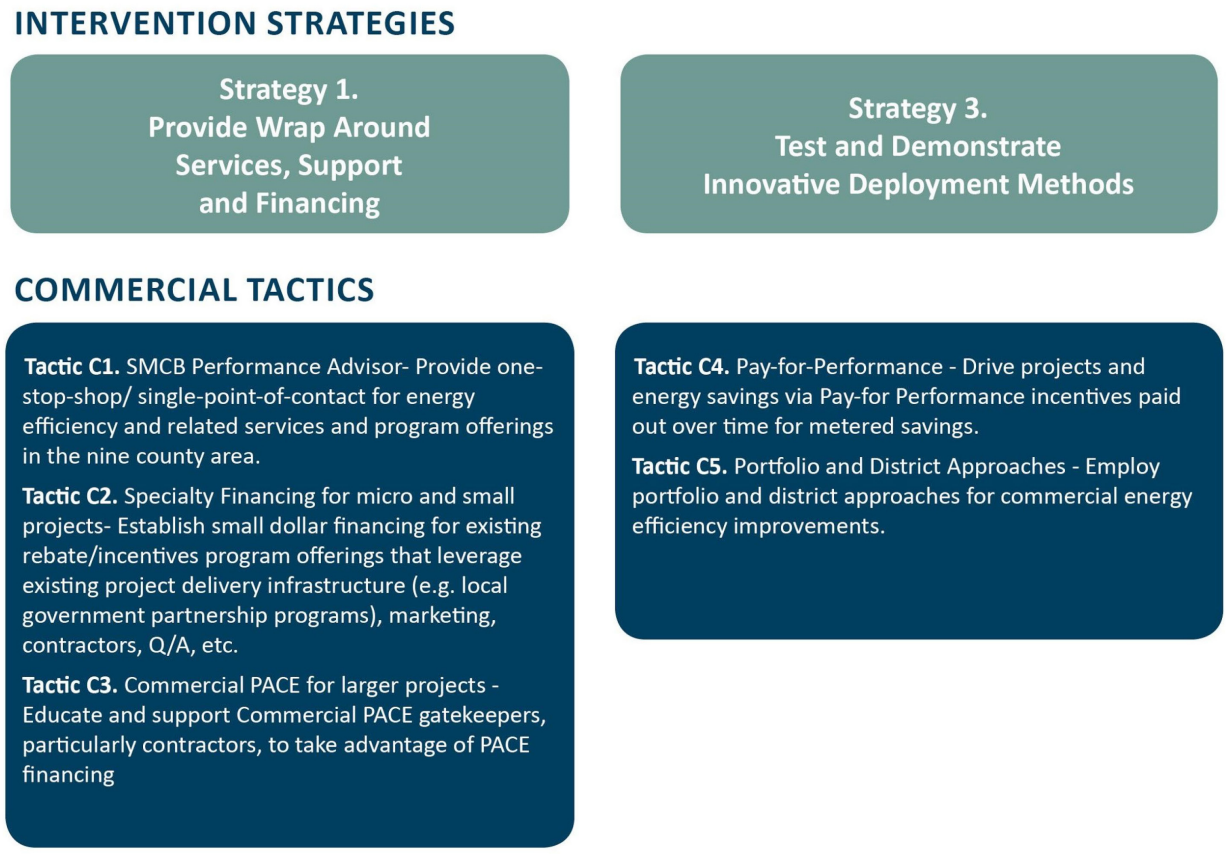
In summary, the proposed BayREN SMCB programs are structured to specifically serve a Bay Area target market, characterized as growing and vital to the economic health of the region, yet also underserved resulting in stranded opportunities especially in HVAC and other integrated whole building solutions. Past programs have resulted in lighting and refrigeration improvements at scale, but persistent barriers, such as lack of time, technical capacity, financing, and the right contractor incentives, remain.

[28] Don Vial Center on a Green Economy, "California WE&T Needs Assessment", 2011, page 93.
[29] NEEA, "Existing Building Renewal: Deep Energy Renovation Planning Workshop Summary Report," 2010.
[30] DVC, Needs Assessment, Page 99.

Commercial Sector Strategies and Tactics

The BayREN SMCB Business Plan was informed by lessons learned from the BayREN Home Upgrade Program, Multifamily Program, and current commercial efforts within the Bay Area, among others. These activities illustrate the critical need for a strong contractor training and engagement program, the effectiveness of technical assistance and "one-stop" shop resources, as well as aligned incentives and other mechanisms to engage property owners and help move them to action. Figure 3.10 illustrates the Business Plan Intervention Strategies and the associated Commercial Tactics to implement the strategies.[31] Table 3.6, maps these Strategies and Tactics to a summary of the identified sector problems and market barriers.

Figure 3.9. Commercial Sector Tactics



[31] The commercial sector does not address Strategy 2.

Table 3.6. Commercial Market Barriers and Problems

Problem	Market Barriers	Solutions	Strategy/ Tactic
SMCB customers lack the capacity and capital resources to engage in comprehensive program offerings and solutions, causing low or static participation rates, "stranded savings," and missed opportunities to reduce energy costs and maintain savings over time.	• Fragmented sector, diversity of building ownership structures. • SMCB customers focus on immediate business operations and near-term finances. • Specialized and often changing offerings make it challenging to engage SMCB customers.	Provide technical assistance, build long-term engagement and relationships with property owners, as well as tailored financing mechanisms.	S1/C1 S1/C2 S1/C3
Contractor base is limited in size and constrained by current programs that favor single measure projects, leading to unrealized value. Lack of transparency standardization in energy efficiency project proposals.	• Contractors lack access to usable alternatives to energy modeling and other project analysis tools. • No standardized language and process to develop proposals with numbers that customers trust. • Lack of adequate sales and marketing skills to move multi-measure projects.	Engage contractors via the SMCB Performance Advisor, assisting with knowledge and training resources, leads, and C-PACE training.	S1/C1 S1/C3
Limited capital and tailored offerings for SMCB sector to complete comprehensive projects, and maintain savings over time.	• Lack of accessible financing options to pay for projects. • High project transaction costs. • Skepticism of savings projections and economic value of projects. • Split incentives (landlord-tenant).	Provide incentives and tailored offerings that lower barriers-to-entry and create and plan for long-term savings.	S3/C4
It is time consuming, expensive, and resource intensive to reach out to individual SMCB owners to successfully engage them and drive deeper energy efficiency upgrades.	• Lack of time and awareness of benefits. • Perception about costs and available financing. • Distrust. • Hard to identify and engage quality contractors who understand needs and can implement effective, timely services.	Establish program offerings that address a single property owner with multiple buildings or address a defined district with multiple owners who have similar buildings.	S3/C5

Strategy 1. Provide Wrap-Around Services, Support, and Financing

Tactic C1. Provide one-stop-shop/single-point-of-contact for energy efficiency and related services and program offerings in the nine county area

Objective: Increase customer and building owners knowledge, comfort, and understanding of the benefits of doing energy efficiency upgrades

SMCB decision makers often lack capacity and technical knowledge to exercise energy efficiency-related decisions because their focus is strictly on keeping the businesses going. Many are confused by the ever-changing and complex array of program offerings, and need a trusted source for information to increase confidence and participation.

This sub-program provides a one-stop-shop or single-point-of-contact of expert technical assistance, training, and customer and contractor engagement to enable a wide range of savings opportunities and activities. Recent ACEEE research confirms that program administrators are increasingly turning to this model as a way to "provide customers with a single point of contact to access a full array of services and incentives available."[32] Customers may receive a one-time consultation and/or ongoing assistance as needed. This effort will inject into the market "knowledgeable energy management service providers that can conveniently arrange comprehensive improvements in buildings."[33]

The SMCB Advisor will use BayREN Integrated Commercial Retrofits (BRICR) (see *"Leveraged Resources*" for more details), to streamline lead generation for Independent Contractor Program-credentialed and Quality Assurance (Q/A) providers, small- and medium-sized contractors, utility offerings, LGPs and other implementation partners. The SMCB Advisor will provide local government staff with linkages to private- and ratepayer-supported financing options, answer questions from SMCB customers, stay abreast of ongoing related sub-program changes and updates, disseminate new information to market participants, and provide a link to other local government-sponsored sustainability programs (e.g., green business programs, water agency conservation programs, Pay As You Save (PAYS®) financing, small business finance assistance, etc.). The SMCB Advisor sub-program is intended to serve as the central hub and information funnel for BayREN's efforts in the SMCB sector.

As in the multifamily sector, many LGP programs operating in the Bay Area also have small commercial offerings. In these cases, projects will be referred to them as appropriate under the SMCB Advisor sub-program. Within the BayREN territory, Marin Clean Energy (MCE) operates programs serving small and medium commercial customers. BayREN will coordinate with MCE (or other community choice energy providers) in referring projects to its programs as appropriate.

[32] ACEEE." Expanding the Energy Efficiency Pie," 2015. page 8.
[33] CPUC, "California Long-Term Energy Efficiency Strategic Plan", 2008, page 37.

Tactic C2. Expand co-pay financing for existing rebate/incentives program offerings that leverage current project delivery infrastructure (e.g., Local Government Partnership programs), marketing, contractors, Q/A, etc.

Objective: Reduce up-front barriers and increase participation in partner and regional commercial energy efficiency programs

There are very limited options for energy efficiency loans of less than $5,000, the threshold for PG&E's OBF offering. This lack of access to small sums of capital prevents many businesses from taking advantage of ratepayer-funded incentives intended to drive savings in the sector. LGPs targeting SMCBs are already struggling to maintain cost-effectiveness targets due to increasing code stringency and narrowing measure lists. The directive to double program savings (SB 350) within fourteen years is daunting. Providing customer access to small sums of funds to cover the "co-pay" (project cost minus program incentive) would significantly increase uptake of energy efficiency projects for current offerings and structures.

San Francisco is currently piloting this approach using non-ratepayer funds to capitalize a revolving loan fund, offering 0% interest "microloans" to cover these co-payments. Administered by a non-profit community lending partner, this new microloan leverages an experienced team of sales and technical staff and a well-established program delivery infrastructure under San Francisco Energy Watch. BayREN intends to scale this model to the nine county region, which will attract capital sources (Strategic Energy Resources, foundation, and program-related investment funds) and build on the success of the San Francisco pilot to expand access to additional markets. Because of the small microloan amounts, a very modest amount of capital can fund a large number of co-pays.

The BayREN also offers its Water Bill Savings Program (formerly BayREN PAYS® - see Cross-Cutting Chapter) in partnership with participating water utilities to deliver water efficiency improvements to commercial water customers as part of water utility service, and allow certain cost-effective energy measures to ride along on the water bill surcharge mechanism.

Tactic C3. Educate and support Commercial PACE gatekeepers, particularly contractors, to take advantage of PACE financing

Objective: Expand use of PACE financing to reduce up-front costs and barriers to upgrades

The existing Commercial PACE (C-PACE) Financing sub-program is designed to increase uptake in commercial PACE financing available through a variety of program administrators and capital providers throughout the Bay Area. There has already been tremendous investment of public and private resources to establish PACE programs throughout California; however, for commercial property owners, much of the potential has yet to be realized. Access to financing for energy improvements remains a significant barrier to achieving savings and scaling programs to reach goals directed by the State. In commercial properties, companies with unrated credit own over 90% of commercial real estate, which essentially

freezes out a large swath of the sector from easy access to capital to fund projects.[34] C-PACE allows many more property owners to qualify for financing of a wide range of projects that can be cash-flow positive because of the uniquely longer terms of PACE.

BayREN currently supports the advancement of market acceptance and increased use of this innovative financing solution by providing advanced contractor training, education, and project development support that is responsive to the priorities of the entire range of PACE "gatekeepers" (key decision makers), including: building owners, first mortgage lenders, capital providers/PACE administrators, and perhaps most importantly, contractors. Since launching in 2015, the sub-program has trained over 100 commercial energy contractors and has developed a pipeline of $15 million in projects. In addition, PACE administrators have responded to BayREN's open and transparent approach by lowering preferred minimum transaction sizes and offering more competitive interest rates, which will favor use by SMCBs.

Strategy 3. Test and Demonstrate Innovative Deployment Methods

Tactic C4. Drive projects and energy savings via Pay-for-Performance incentives paid out over time for metered savings

Objective: Enable long-term energy savings in the SMCB sector

Direct install and deemed rebate programs are unable to maintain their rate of savings delivery after decades of program delivery, much less double energy savings as mandated by SB 350. But by allowing ratepayer incentives for to-code savings, AB 802 has unlocked the potential to realize the significant savings stranded under prior program cycles. This is particularly impactful for the relatively complex systems in the small- to mid-sized commercial buildings, but will require a comprehensive approach to measuring savings.

By aligning new incentive structures and emerging innovative approaches to financing energy efficiency projects (e.g., OBF_AP, and C-PACE), and focusing on measuring savings at the meter (AMI and related technology-enabled), BayREN intends to support key market actors to deliver high value projects to the SMCB sector. BayREN will promote and leverage local government energy efficiency staff and existing LGPs, the Investor Confidence Project (ICP) protocols and their practitioners (see *"Leveraged Resources*" for more details), and the BRICR modeling and targeting tool. BayREN will enable technological solutions to efficiently track and monitor savings, work closely with public and private financing providers to leverage P4P and other incentives, and provide technical support and tools for operations and maintenance (O&M) savings opportunities. The means of calculating metered savings will also support an innovative and efficient Evaluation, Measurement & Verification (EM&V) process for proposed activities.

[34] http://beedison.com/will-standardized-credit-assessments-for-unrated-off-takers-unleash-the-potential-of-solar-in-the-non-residential-space/.

Furthermore, as AMI and BAS technologies continue to advance while pricing continues to decline, demand response (DR) in the SMCB sector represents an untapped market with strong potential, which will play a role in P4P. Existing DR programs often overlook this sector because of perceived difficulty in enrolling small businesses and low resultant kW savings. However, technology now exists to fully integrate this sector into a comprehensive DR strategy. For example, DR-enabled thermostats are now readily available at affordable price points and can enable SMCB sector participation in DR. In exchange, SMCB owners and operators enjoy improved comfort and reduced utility costs.

Tactic C5. Employ portfolio and district approaches for commercial energy efficiency improvements

Objective: Increase participation and scale of efforts, including creating effective paths to ZNE for SMCB

Engaging SMCB customers effectively presents a challenge due to their numbers, diversity, and owner/tenant characteristics. Efforts to reach SMB customers to encourage upgrades are time consuming and resource intensive. The size of the businesses can make it difficult to finance substantial improvements, and the relative lack of time and interest by these customers for engaging in energy efficiency programs can present difficulties.[35]

There is potential to try new approaches in this sector by creating aggregated programs that leverage a portfolio-wide or districts of SMB customers. The portfolio approach (e.g., working with a single owner of multiple buildings), may result in streamlining, as these relationships will be established and strengthened through the Performance Advisor. This portfolio strategy is supported in the EBEE Action Plan, Strategy 2.2.4 Building/Portfolio Cohorts, indicating the ability to "encourage engagement, awareness, value, and implementation." The BayREN will evaluate early program implementation to determine where the most potential for portfolio approaches may be found. Initially, this approach will be implemented as a test-and-learn approach to ensure it is effective and meets the Plan's objectives.

District approaches could also prove effective by formulating ways to address a number of buildings, both new and existing, with more comprehensive and long-term solutions. Equally, district-wide financing tools such as the Enhanced Financed Infrastructure District, group procurement, and peer engagement can all be used to enhance and push deeper energy savings in a defined geographic area over time. This District concept, which was referenced in the draft Strategic Plan 2016 Highlights,[36] indicates an approach to achieve aggregated ZNE at the District level. Several local governments within BayREN are already conducting municipally-focused ZNE pilots that integrate deep energy efficiency, renewable generation, energy storage, electrical vehicle charging, and related microgrid approaches to support this vision. In some instances, multiple buildings and sites and involved. These efforts are driven by a powerful combination of energy innovation at the local level, a desire to demonstrate "community resiliency" (or the ability to serve critical constituent needs after disruptions caused by external forces

[35] California Energy Commission "Existing Buildings Energy Efficiency Action Plan" 2015, page 19.
[36] Email guidance provided by the CPUC August 15, 2016. "DRIVER 1. Programs Enable ZNE Buildings and Districts: New Commercial Construction and Renovation Programs (e.g. Savings by Design, Prop 39 School, and future programs) facilitate the development of ZNE Buildings and Districts, through incentives, technical assistance and training."

such as natural disasters), and the collaborative spirit of public agencies that BayREN works to foster. The EBEE Action Plan provides several areas for this approach including in Strategy 1.7 Local Government Leadership and the development of Energy Performance Districts.[37] The BayREN will work with member agencies to identify potential districts and choose 1 to 3 to test and demonstrate this approach and its capability to achieve goals.

[37] Ibid, page 56.

Coordinating Activities

Leveraged Resources

BayREN's efforts in the small and medium sized commercial sector will expand in several key areas: building upon PG&E and LGP programs, and filling key gaps; targeting customers through site-specific information on efficiency bundled with other distributed resources; and project standardization that promotes comprehensiveness and reduces transaction costs.

Existing Utility Programs and Local Government Partnerships

As previously mentioned, BayREN's commercial strategies are built around the history and experience of partnering with PG&E's LGP programs, such as Energy Watch programs and Strategic Energy Resource projects. SER projects are non-resource activities that enable a range of local government activities that support goals articulated in the California Energy Efficiency Strategic Plan and efforts to develop new approaches to delivering energy efficiency. These initiatives not only provide invaluable experience and insights, but also directly inform solutions to various market gaps and barriers in the SMCB sector.

DOE SMCB Grant (BRICR)

In March 2016, ABAG (under the auspices of BayREN), was awarded a Federal grant by the U.S. Department of Energy's Building Technologies Office Commercial Buildings Integration Program to support innovative approaches to assessing SMCB's at scale for the purpose of accelerating, targeting, and delivering energy efficiency in the small and medium commercial buildings market. The project, called "BayREN Integrated Commercial Retrofits" project (BRICR) is supported by the following innovations:

- *Comprehensive Approach.* Local governments' need for climate-secure, resilient energy resources aligns with commercial building owners' interest in reduced costs, electric reliability, and tenant demand for services such as renewables and electric vehicle charging.
- *Leveraging Existing Programs.* Local governments manage and implement incentive programs, which operate within cost-effectiveness tests, EM&V criteria, and the energy code. As BRICR drives down the cost of targeting, design, and project development using open source tools, the underlying data will afford the same opportunity to all market actors in the Bay Area.
- *Continued Funding.* Advanced analytics developed by the project will inform and enhance existing and new energy offerings, directing building owners along two paths for comprehensive efficiency improvements: (1) deep energy retrofits, and (2) serial upgrades integrated into capital improvement cycles that aim for ZNE. BRICR will make a strong case for ratepayer investment to continue to support these outcomes.

BRICR posits that one of the key limits to existing incentive programs is the lack of information infrastructure to systematically assess not-yet-realized efficiency potential. Program implementers and contractors have considerable engineering capacity and programs offer incentives for a wide array of measures, however, in the absence of an accessible method to deliver energy scenario simulation,

customer offerings rarely address the entire building. Participating contractors are a significant source of leads and cost estimates, but contractors commonly serve specific end-uses and are unqualified to estimate costs, integrate opportunities beyond their scope, or knowledgeably offer financing options.

One of BRICR's primary outputs will be a tool that builds on existing open source tools (developed by the national labs) to perform large-scale building energy modeling analysis on SMCBs to reduce the cost of targeting, design, and project development. BRICR leverages previous work to create a useful and durable modeling and targeting tool. The user interface will give program implementers and other market actors the ability to update building energy asset data based on observation, adding to our shared knowledge of energy efficiency opportunities in small commercial buildings, including accurate descriptions of energy end uses in buildings.

Using the BRICR tool, large-scale building energy models will be developed regionally, calibrated with data from city benchmarking programs (e.g., San Francisco and Berkeley), and energy project development opportunities derived from the tool will be piloted in these communities, leveraging the existing interaction with project stakeholders. BRICR will serve as a central coordinating hub to inform and implement the BayREN commercial sector strategy and related policy initiatives. This approach aligns with the second framework goal of the EBEE Action Plan (2015) to provide data-driven decision making that enhances program design while providing consumer-focused energy efficiency.[38] BayREN is currently sharing information with PG&E and exploring additional ways that our shared work can be leveraged to expand the market for energy efficiency and drive deeper savings in SMCBs.

Investor Confidence Project (ICP)

Another component of BayREN's proposed approach is to leverage best practices for energy efficiency project development platforms, such as the Investor Confidence Project (ICP). A project of the Environmental Defense Fund (EDF), ICP defines a clear roadmap from retrofit opportunity to reliable, investable projects. ICP is enabling a marketplace for building owners, project developers, utilities, public programs, and investors to trade in standardized energy efficiency projects. ICP is a model that can "align efforts and help establish a consistent statewide market for energy efficiency project finance."[39] By certifying projects against an industry standard, ICP reduces transaction costs and increases confidence in savings in order to help attract private capital and scale up energy efficiency investments. PG&E is currently piloting an "alternative pathway" for on-bill financing as a CPUC-approved HOPPs[40] program that uses ICP as a project qualification and EM&V standard. The Green Building Certification Institute has also recently announced it would be providing third-party verification support for the ICP system. BayREN intends to expand and disseminate these efforts to build up the market for Investor Ready Energy Efficiency™ projects.

[38] CEC, "Existing Buildings Energy Efficiency Action Plan," 2015. Goal 2, Strategy 2.1.
[39] Ibid., Goal 5.
[40] High Opportunity Energy Efficiency Program or Project.

EM&V Efforts

Evaluation, Measurement & Verification (EM&V) is critical to ensure program effectiveness and compliance with overall program goals. BayREN recognizes that a strong commitment to EM&V is vital both to the long-term success of the BayREN programs and to the satisfaction of the SMB customer.

The BayREN Commercial Sector Business Programs are designed to work in concert with, and complement, existing LGP and other PG&E programs. By adding capacity and specialization without duplication of existing program infrastructure, BayREN will maximize the benefit to the SMB Customer without negatively impacting program costs.

BayREN will efficiently refer all applicable SMB projects to the appropriate LGP or MCE commercial programs. By doing so, BayREN will leverage the existing EM&V protocols already in place by these partners. These EM&V practices are well established and vetted by both PG&E and the CPUC and there is no need to design and implement a redundant system.

Table 3.7. EM&V Study and Data Needs

Study Title/Topic Focus	Research Question	Objective	Timeframe
EM&V practices are well established; the BayREN does not proposed additional Commercial EM&V Study Needs at this time.			

Marketing, Education, & Outreach

Program marketing is increasingly important, especially as consumers face an ever expanding array of messages in all aspects of their lives. Energy consumers and energy efficiency customers are no different. Being able to provide targeted and clear messaging from a trusted source is vital to the success of a program. As discussed in the Overview chapter, BayREN's unique organizational structure as a collaboration of nine Bay Area Counties has enhanced the success of its existing programs because we are perceived as trusted messengers. As local governments, we are known and trusted by our local communities and have long records of delivering successful programs and services. The SMCB Performance Advisor will serve as the central hub for bundling and optimizing new BayREN offerings, as well as those offered by PG&E and MCE, and providing direct project-level technical assistance and general information for customers and contractors. Messaging about SMCB offerings will be coordinated with complementary BayREN marketing efforts, such as the Codes & Standards and Water Bill Savings sub-programs.

Access to detailed energy data enabled by AMI provides unique opportunities for sophisticated, tailored marketing of programs. If the BayREN can regularly secure access to these kind of data held by PG&E, insights offered by smart meters and related technology can yield highly detailed customer energy use data. When these data are combined with advanced analytics, it can provide more granular detail on customer segments and consumption patterns that help identify customers that may be most receptive to particular messages and services. Local governments may also leverage marketing and outreach strategies with other local programs, such as LGP and Green Business Programs, providing a set of offerings to

constituents, vendors, and contractors that include not only energy measures but co-benefits as well. Furthermore, BayREN members will utilize partnerships with community-based organizations and other sustainability and energy-related local initiatives to deliver effective marketing tactics.

BayREN will leverage these existing platforms, as well as ME&O initiatives supported by BRICR and the local IOU programs, to extend the reach of BayREN's SMCB programs. By coordinating with existing programs, rather than launching its own ME&O effort, BayREN will maximize the impact without causing confusion in the market.

Table 3.8. Marketing, Education, & Outreach Approaches and Coordination

Marketing Need	Approach	Objective	Timeframe
Reach Small and Medium Property Owners	Send letter on Local Government letterhead to all Small/Medium Property Owners in target areas; follow up with calls and emails.	Build awareness of program.	Short-term
Reach Small and Medium Business Owners	Coordinate with Statewide ME&O to build broad awareness through outreach efforts.	Build awareness of program.	Short-term
Educate SMCBs	Present programs at Chambers, business organizations, etc.	Increase education and uptake in programs.	Ongoing
Outreach to Residential Contractors	Use BayREN channels/Home Energy Advisor to inform potential contractors already engaged about new program.	Link existing contractors to new opportunities.	Short-term

Workforce Education & Training

Energy efficiency programs must move from projects with savings that are largely deemed to projects that include multiple measures and address below-code savings opportunities. This requires significant evolution in the participating contractor base for energy efficiency programs.

BayREN will draw on all existing contractor pools: those of the LGPs, third-party direct install providers, and the BayREN pool. In addition, BayREN will tap into the developing market of energy audit providers, which continues to grow in response to benchmarking legislation at the state and local level. Some of these providers are partnering with implementers and contractors, making these teams a natural fit for P4P programs in SMCB. Emerging frameworks and processes such as the ICP protocols will be actively disseminated and leveraged to provide contractors with third-party verification support and enhance their credibility when making project proposals. Based on our early experience assisting project developers and contractors who seek to leverage commercial PACE to implement larger-scale, multi-measure, deep retrofit projects, training and education is still needed to increase contractor literacy and confidence in proposing financing solutions to customers. Sales training and "fact-based" project proposal tools that incorporate incentives, rebates, and financing into comprehensive cash flow analysis, and that focus on tangible business benefits for participation, will be developed and disseminated.

Significant training will be required to transition small local HVAC, lighting, and refrigeration contractors to operate under a more comprehensive pay-for-performance and/or finance-based models.

With innovative targeting tools (e.g., BRICR) and accessible financing options to increase project scopes and close rates, we expect the contractor base will be motivated to evolve.

BayREN will use the SMCB Performance Advisor as a central coordination and communication portal for ongoing education and project assistance to the contractor base. BayREN will track evolving contractor expertise and needs, and tailor offerings accordingly.

Cross-Cutting Initiatives

The BayREN coordinates Commercial Sector tactics with BayREN Cross-Cutting initiatives for Codes & Standards and the Water-Energy Nexus. Commercial tactics are in line with local government permitting requirements consistent with SB 1414 and promote local government financing options. Finally, BayREN coordinates Commercial tactics at the design and implementation levels with other Program Administrator activities, leveraging SMCB Performance Advisor services to make referrals and provide participants with information on aligned IOU, CCA, local jurisdiction, financing, and other energy and water programs. Cross-Cutting coordination between the Commercial Sector and other BayREN activities includes:

- **Residential Sector**
  - Cross-educate aligned contractor groups for Residential and Small Commercial projects to increase program participation.
  - Use Performance Advisors to educate program participants about similar financing mechanisms used by Residential and Small Commercial projects and their associated benefits.
  - Engage Participating Residential Contractors who may also serve SMCB.

- **Public Sector**
  - Engage Participating Public Sector Contractors who may also serve SMCB.
  - Leverage Building Energy Management System and decision support services to align Commercial projects.

- **Codes & Standards**
  - Require proper permitting and code compliance for program projects, including incorporation of SB 1414 regulations.
  - Integrate proper permitting and code compliance into program-specific training and QA/QC.
  - Use Performance Advisors to educate program participants about the value of proper permitting and code compliance.
  - Increase feedback loops between Participating Commercial Contractors and code development processes.

- **Water-Energy Nexus**

- Use Performance Advisors to educate program participants about water efficiency upgrades, rebates, and on-bill financing mechanisms.
- Cross-promote on-bill service offerings to Participating Commercial Contractors.
- Increase BayREN engagement in Water-Energy Nexus proceedings and use of water-energy nexus calculator.

Key Partners/Coordination

Table 3.9. Partners and Coordination Approach

Other REN Sub-programs	Coordination Mechanism	Expected Frequency
BayREN Financing (C-PACE program, Water Bill Savings Program, etc.)	Project referrals, co-training	As requested by contractor/building owner or determined by SMCB Advisor, or co-marketed through C-PACE contractors, CAEATFA/CHEEF program, private energy efficiency financing providers, and others.
Codes & Standards	Meetings, other regular communication	As needed to ensure consistency of message and increase efficiency of local government outreach.
PG&E and MCE Programs	Meetings, other regular communication	Quarterly
PG&E Local Government Partnerships	Meetings, communication, participating contractor and QA updates	Quarterly
PG&E OBF Action Plan (HOPPs)	Meetings, communication, participating contractor and QA updates	Quarterly
ABAG BRICR project	Regular meetings, other communication	Monthly
Non-BayREN Financing Programs (OBF, CHEEF, private financing solutions)	Project referrals, meetings, other regular communication	Quarterly or as needed.
EDF Investor Confidence Project	Meetings, other regular communication	Quarterly or as needed.
Local Workforce Investment Boards	Meetings, other regular communication	As needed.
Building Trade Associations	Meetings, other regular communication	As needed as part of education and recruitment efforts.
Commercial Real Estate Groups and Associations (BOMA, IREM, etc.)	Association meetings, trainings	As needed as part of marketing and outreach efforts.

Section 4
PUBLIC SECTOR

BAY AREA Regional Energy Network

Section 4. Public Sector

Introduction

The BayREN proposes a new Public Sector initiative to provide unique strategies and tactics to support Bay Area local governments to become leaders in advanced energy practices. BayREN will lead a targeted effort to provide local government agencies with a strong level of control and understanding of their facilities, enabling them to increase participation in other ratepayer programs, fully engage with state energy policies, and provide leadership to their communities. BayREN will also expand upon a current BayREN Codes & Standards pilot and tap the state's Buildings Zero Net Energy (ZNE) initiative led by the Department of General Services (DGS).

BUSINESS PLAN VISION, OUTCOMES AND BUDGET

Vision

By 2020, Bay Area local governments will be leaders in using energy efficiency to reduce energy use and global warming emissions, both in their own facilities and throughout their communities.

Public Sector Outcomes

- *60% of Bay Area local governments use standardized energy management systems and best practices to increase energy efficiency in local government buildings.*
- *Local government early adoption of ZNE buildings accelerates broader local ZNE adoption.*

2018-2025 budget (total) *$13.5 M*

This Public Sector Business Plan proposes services new to BayREN, which serve common needs and activities of the BayREN local governments and member agencies. Further, these activities support the implementation of the Existing Buildings Energy Efficiency (EBEE) Action Plan, in particular Strategy 1.7 Local Government Leadership. The proposed services were developed in consultation with PG&E and Bay Area Local Government Partnerships (LGPs), and are consistent with CPUC's policy in D.12.11-2015 that Regional Energy Networks (RENs) should:

1. Provide activities that utilities cannot or do not intend to undertake.
2. Pilot activities where there is no current utility program offering, and where there is potential for scalability to a broader geographic reach, if successful.
3. Pilot activities in hard-to-reach markets, whether or not there is a current utility program that may overlap.[1]

[1] California Public Utilities Commission, Decision 12-11-015, Decision Approving 2013-2014 Energy Efficiency Programs and Budgets, November 8, 2012, Page 17.

Market Context

The Public Sector, as defined by CPUC, represents a broad range of organizations and facility types, and can be divided into the following sub-categories:

- Federal.
- State.
- Local Government (City, County, Special District).
- Education (University, Community College, K-12 School).

Within the BayREN territory, there are 101 cities, nine counties, and over 600 Special Districts, which service 20% of California's total population.

The BayREN public sector programs will initially target local government facilities with the exception of streetlights, transit, and water/wastewater treatment operations. To the extent feasible given available resources, the BayREN will also offer services to K-12 schools and community colleges, upon request and in coordination with any other Program Administrators or statewide programs serving those sectors.

This local government sub-sector is already the target of a variety of existing and proposed programs, including programs by PG&E and its LGPs.[2] The BayREN scope has been carefully developed in consultation with these market actors to fill niches that directly support existing and emerging programs.

[2] Marin Clean Energy does not serve the public sector.

Sector Summary

The following summarizes the two primary service areas that the BayREN Public Sector programs will address and that are detailed in the following pages.

Advanced Energy Management and Decision Support

The Advanced Energy Management and Decision Support service is a targeted initiative that will provide agencies with a strong level of control and understanding of their facilities, enabling them to increase participation in other ratepayer programs, fully engage with state energy policies, and provide leadership to their communities. The service will strive to achieve savings on a portfolio level, rather than a summation of individual measures and efforts, and to fundamentally change the way public agencies manage their portfolios. The service is intended to complement existing and proposed programs and services, including LGP programs, PG&E's proposed job order contracting program, and energy information programs. This proposed service was informed by SoCalREN's Enterprise Energy Management Information System (EEMIS).

The service will increase the deployment of building monitoring and control systems under a regional portfolio of Building Energy Management System(s) (BEMS) as a means to optimize building operations, engage stakeholders, and use real data to inform investment and policy decisions. As used here, a BEMS refers to a system or set of systems that: (1) can be accessed remotely to monitor and control equipment (via hardwire, pneumatics, or wireless), and (2) integrates with utility billing data and provides data visualization and analytics. The service incorporates three tactical approaches:

1. Aggregated procurement of BEMS.
2. Training for staff and contractors in those systems.
3. Centralized monitoring and evaluation of a regional portfolio of BEMS-controlled facilities and decision support analysis to encourage investments and policies by reducing uncertainty and financial risk.

The decision support services, based on data collected through the BEMS, is intended to drive investments in other technologies, participation in other ratepayer-funded programs, and adoption of policies affecting both public and private facilities.

According to a BayREN survey (summary results follow in the Market Analysis below), BEMS systems, where they exist, are not being used to their full potential due to a lack of standardization and training. A properly functioning BEMS would enable facilities staff to accurately schedule building operating hours, optimize temperature and airflow to maintain occupant comfort, manage peak demand charges by preconditioning space and staggering equipment operating cycles, and remotely diagnose equipment failure. More importantly, BEMS will provide equipment and operational data that can support investment decisions in energy efficiency, equipment maintenance, and capital expenditures, thereby promoting institutional change that will lead to market transformation.

As currently envisioned, the BayREN will facilitate the deployment of functional BEMS systems through, for example, a competitive solicitation consistent with public procurement requirements for BEMS design, including set-up, commissioning, training, licenses, and installation of open-source control actuators and monitors (as needed). The strategy would also seek to create a user community by, for example, establishing a regional user-group(s) and knowledge base. The approach should also offer analytics based on equipment and operational data acquired through the BEMS deployment to provide decision support analysis for investments in energy retrofits, early equipment retirement, and capital improvements, as well as connecting clients to rebate and incentive programs and assisting agencies to identify financing sources based on reliable projected energy cost savings.

Systems Integration for Early Adoption of ZNE

The Systems Integration for Early Adoption of ZNE service seeks to expand upon a BayREN Codes & Standards pilot and tap the state ZNE initiative led by DGS.[3] The program will accelerate the development of public sector ZNE projects and policies by, for example, providing technical assistance to support early adoption of ZNE buildings with the goal of creating ZNE portfolios, and potentially leveraging procurement and financing enabled by the State. A major focus should be on minimizing energy intensity to enable on-site generation to meet the demands of the facilities. However, the program should also support broader state policy goals by providing local jurisdictions with resources to incorporate energy efficiency as well as electrification and renewable distributed energy generation and storage.

[3] The DGS is leading the effort to implement Governor Brown's Executive Order B 18-12 for 50% of new State Buildings to be ZNE beginning in 2020; 100% in 2025 and 50% of Existing Building Area to be ZNE.

Evolving Approaches

While the Public Sector initiative is new, the BayREN has extensive experience in the residential and codes and standards markets, and has developed expertise and relationships with local agencies and LGPs throughout the region, including its membership of the nine counties and 101 supporting jurisdictions. The BayREN has evaluated and learned about the needs of local agencies, in particular about those needs that are best met at a regional level. In developing its new Public Sector offerings and Business Plan, the BayREN seeks to support existing ratepayer-funded programs and services and has drawn upon lessons learned from other service providers.

Public sector programs have been evolving from technical assistance and project management to include portfolio management and financing. Most Local Government Partnerships in the Bay Area and the SoCalREN offer technical assistance and turnkey and/or direct install programs. Many offer some form of analytics as well, such as benchmarking, data analytics and visualization, and advanced energy accounting.[4] Even with these services, financing remains a significant barrier. SoCalREN found that:

"there is limited availability, or understanding, of 'turn-key' financing mechanisms. Specifically, the need for financing that follows a standardized underwriting protocol; offers competitive interest rates attractive to cost-conscious jurisdictions; and provides adequate information for agencies to make investment decisions regarding energy efficiency, all with the goal of reducing overall operating costs."[5]

Just as the progression from projects to portfolios is dependent upon the availability of capital, the availability of capital is dependent upon the quality of underlying asset, that is, the projected savings.[6] In response, the BayREN's Advanced Energy Management and Decision Support services seek to provide public agencies with a sophisticated understanding of their facilities (existing and planned), which will not only help them manage operations more efficiently, but will minimize performance risk and increase access to capital, thereby spurring investment.

Similarly, the Systems Integration for Early Adoption of ZNE service will provide tools and analysis to help public agencies incorporate ZNE into their capital programs. The long-term goal is to establish ZNE portfolios amongst Bay Area local governments and through such leadership and demonstration support the advancement of ZNE policy in the private sector as well, including ZNE community policies.[7] The BayREN intends to partner with DGS, building on their advisory committee's work on ZNE definitions

[4] Benchmarking is a common service amongst many service providers. The East Bay Energy Watch is piloting a dashboard service (Lucid) and SoCalREN offers agencies advanced energy accounting and analytics through the Enterprise Energy Management Information System (EEMIS).
[5] Southern California Regional Energy Network, "2013−2014 Energy Efficiency Portfolio Southern California Regional Energy Network (SoCalREN) Program Implementation Plan", February 14, 2016, Page 161.
[6] Risk management is a key to financing; Southern California Edison specifically noted this with respect to the public sector (Southern California Edison Energy Efficiency Business Plan Public Sector Chapter. Draft. Page 17). The same document also notes that "[i]nadequate data exists about building level performance, making identification of potential energy savings difficult." (page 3).
[7] See policy paper for a discussion of ZNE definitions and scopes that will be considered as part of this strategy. CalState. "Definition of Zero Net Energy (ZNE) for California State Agency Compliance with Executive Order B-18-12", May 19, 2016.

and emerging policy regarding the role of energy efficiency versus renewables. The BayREN also proposes to utilize the training curriculum being developed by PG&E for DGS.

The program expands on a 2016 BayREN pilot, which established a foundation for local jurisdictions to implement ZNE at both the project and policy levels. This pilot had three major components:

- Municipal ZNE Technical Assistance.
- Development of a ZNE Policy Resource Toolkit for local jurisdictions to adopt reach codes.
- Analysis of non-residential energy reach-code metrics utilizing a Zero Energy Performance Index in Climate Zones 2, 3, 4, 12.

Vision, Intervention Strategies, and Objectives

As shown in Table 4.1, the BayREN's Public Sector activities are aligned with its overarching intervention strategies to advance energy efficiency with wrap-around services and support and the demonstration of innovative deployment methods. The BayREN's vision follows the CPUC's CAEESP vision in which Bay Area: "*local governments will be leaders in using energy efficiency to reduce energy use and global warming emissions both in their own facilities and throughout their communities."*[8]

Table 4.1. Public Sector Strategies, Tactics, and Objectives

Intervention Strategy	Tactic	Objective
S1. Provide Wrap-Around Services and Support	P1. Provide BEMS system design, acquisition, setup, and commissioning.	*Public agencies possess an advanced level of control and understanding of their facilities using state-of-the-art building energy management systems.*
	P2. Provide BEMS training and support groups.	*BEMS systems are actively maintained and trend data are available to inform operations and support resource allocations.*
S3. Test and Demonstrate Innovative Energy Efficiency Deployment Methods	P3. Provide portfolio assessment and investment support analysis, based on BEMS data.	*Capital and expense budgets are programmed to optimize energy and operational savings through application of analysis based on real trend and cost data.*
	P4. Provide integrated systems analysis to support early adoption of ZNE.	*Local governments build/renovate to ZNE standards in advance of state target (2030) and accelerate community commitments to ZNE.*

Achieving this vision will require that local governments: (1) adopt energy efficiency as a standard practice, and (2) have staff who are trained and policy makers who are committed to advanced energy efficiency practices. Ultimately, this new capacity supports participation in the broader set of state policies, both at the agency corporate level and throughout the community. The BayREN Public Sector tactics are designed to directly enable Bay Area jurisdictions to achieve this vision.

[8] CPUC, "California Long Term Energy Efficiency Strategic Plan," 2010, Page 90.

Public Sector Budget and Metrics

Budget

The budget (Table 4.2) for the Public Sector initiative will facilitate the forecasted short-, mid-, and long-term metrics targets discussed below. Funds will be used for the development of specifications, the conduct of a competitive solicitation, engineering support for agency-level specifications, and assistance with the execution of agreements and work orders between the vendor(s) and participating agencies. Some portion of the implementation funds will also be used for control and monitoring equipment and licensing fees. These amounts will be determined upon completion of the solicitation process.

Table 4.2. Public Sector Budget

Budget ($)	2016*	2017*	2018	2019	2020	2021	2022	2023	2024	2025
Admin.**	-	-	**	**	**	**	**	**	**	**
Implementation	-	-	430,000	670,000	1,093,000	1,639,000	2,217,000	2,284,000	2,352,000	2,300,000
Marketing	-	-	20,000	31,000	64,000	76,000	79,000	81,000	84,000	49,000
Non-Incentive Total	-	-	**450,000**	**701,000**	**1,157,000**	**1,715,000**	**2,296,000**	**2,365,000**	**2,436,000**	**2,349,000**
Incentive	-	-	-	-	-	-	-	-	-	-
Total	-	-	**450,000**	**701,000**	**1,157,000**	**1,715,000**	**2,296,000**	**2,365,000**	**2,436,000**	**2,349,000**

** As a newly proposed area of activity, there was no 2016 or 2017 BayREN Public Sector budget. 2018 budget is proposed as year 1 of the Business Plan.*
*** With this Business Plan, BayREN proposes to reallocate Administrative costs from Sector Program budgets to the overall BayREN Portfolio budget. As a result, starting in 2018, Administrative allocations have been removed from Sector Program budgets. Additional discussion in Overview.*

Sector Metrics

Although the strategies are expected to generate savings, both directly through the deployment of BEMS, and indirectly by supporting investments on other measures, there may be advantages to deploying the services as non-resource activities and allowing the savings to accrue to other existing and proposed programs. The BayREN will evaluate the pros and cons of both options.

In addition to the standard metrics for Strategy 1 cited in Table 4.3, the BayREN will also track changes in the share of floorspace enrolled in the service and the percentage of savings achieved from the baseline for participating sites. These metrics will be developed using program tracking data and surveys.

Table 4.3. Public Sector Metrics

Intervention Strategies	Market Effect Metrics	Baseline	Metric Source	2018-2020 Target*	2021-2024 Target*	2025+ Target*
S1. Provide wrap around services and support ***Estimated % of annual budget: 60%***	Output: Electrical energy savings	Initial Program Year	Program tracking data	Average: 1,300,000 kWh/year	Average: 7,500,000 kWh/year	Average: 7,600,000 kWh/year
	Output: Demand savings	Initial Program Year	Program tracking data	Average: 270 kW/year	Average: 1,560 kW/year	Average: 1,570 kW/year
	Output: Natural gas savings	Initial Program Year	Program tracking data	Average: 110,000 therms/year	Average: 630,000 therms/year	Average: 630,000 therms/year
	Output: Number of participating jurisdictions (cumulative)	Initial Program Year	Program tracking data	12	30	60
S3. Test & demonstrate innovative energy efficiency deployment methods ***Estimated % of annual budget: 40%***	Output: Increase in investment in energy efficiency	Establish with Survey in 2017	Survey for invest-ment data	Increase investment by 10%	Increase investment by 30%	Increase investment by 50%
	Output: Energy savings/sf	Establish with Survey in 2017	Program tracking data and surveys	Achieve average savings of 15%	Achieve average savings of 15%	Achieve average savings of 15%
	Number/floor area of ZNE facilities constructed	Establish with Survey in 2017	Program tracking data	70,000 sf programmed for ZNE	200,000 sf. programmed for ZNE/; 70,000 sf built to ZNE	400,000 sf programmed for ZNE/; 270,000 sf. built to ZNE
	Outcome: Increased early adoption of ZNE retrofits	Establish with Survey in 2017	Bi-Annual Survey	Annual increase 5% over baseline	Increase 5% over previous year	Increase 5% over previous year

** 2018-2020 (Short-term); 2012-204 (Mid-term); 2025+ (Long-term).*

Market Characterization and Trends

The BayREN initially plans to target municipal and county facilities (hereinafter referred to as local government facilities). The BayREN will also offer services, to the extent feasible given available resources, to K-12 public schools and community colleges, upon request and in coordination with other Program Administrators serving those sectors.

It should be noted that the impacts of BayREN public sector services will reach beyond this market. As identified in both the CPUC's Strategic Plan and the EBEE Action Plan, local governments can provide leadership for their communities, significantly expanding the market impacts of interventions in the public sector. (See the Cross-Cutting section below for details about how the public sector services will affect private markets.)

As Table 4.4 illustrates, the municipal and county sub-sector represents the majority of the public sector loads in the Bay Area. As a share of the total Bay Area non-residential market, the public sector accounts for 5% of electrical load and 7% of gas load.

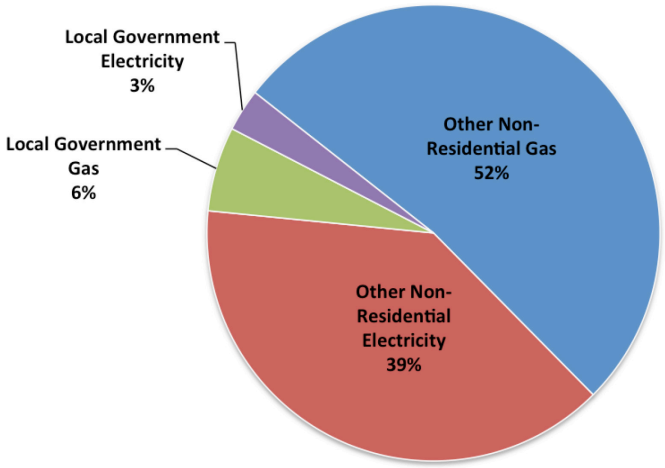
Table 4.4. Public Sector Energy Loads in the Bay Area

Agency Type	MWh	Electricity Share	Therms (1,000)	Natural Gas Share
Municipal/County	365,749	80%	19,606	63%
State	42,101	9%	1,265	4%
Federal	15,572	3%	2,349	8%
Universities/Colleges	13,668	3%	4,004	13%
Special Districts	12,377	3%	159	1%
K-12	6,416	1%	271	1%
Community Colleges	3,366	1%	3,555	11%
Total	**459,250**	**100%**	**31,211**	**100%**

As noted, the BayREN will offer services to local governments and K-12 and community college *facilities*. This subset excludes federal, state, universities/colleges, and districts, as well as water/wastewater treatment, transit, and streetlights.[9] This subset, hereinafter referred to as *local government and education facilities,* represents 4.5% of the region's non-residential site energy consumption.

[9] Streetlights as an end use were not specifically culled out in the data sources but were extrapolated from the public sector using estimates provided by Navigant for the PG&E service territory.

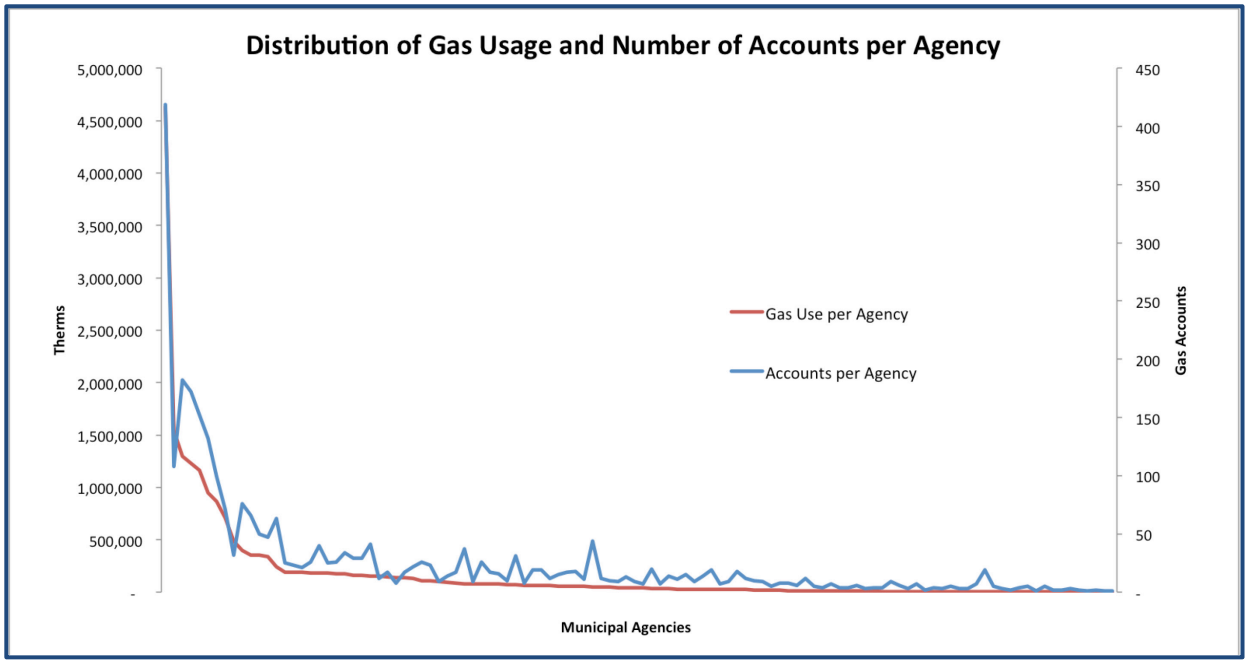
Figure 4.1. Local Government, K-12 and Community College Facility Site Energy



The local government facility submarket in particular is very unique, sharing properties of both small and large customers. In one sense, local government might be considered like the small commercial market. There are over 18,000 municipal/county electric accounts in the Bay Area, and they average less than 20,000 kWh annually. On average, each agency has 154 electric accounts and 26 gas accounts. But in another sense, local governments are like large customers—the average annual consumption per agency is 3.0 GWh and 175,000 therms. These contrasting features illuminate the challenges and opportunities associated with the local government market. The challenge is that local governments must manage a decentralized, heterogeneous portfolio, which increases the expense and complexity of undertaking energy efficiency. However, if the facilities can be organized as a portfolio, they represent a large set of holdings, with significant utility expenses that could be reprogrammed to amortize investments in efficiency.

Figure 4.2 below illustrates the distribution of gas loads (19,606,000 therms total) and accounts (2,886 total) by agency. (Gas is a good proxy for facilities because it does not include streetlights, traffic signals, and the many smaller miscellaneous loads such as irrigation controllers.) Note that with the exception of a few outliers, most agencies have between 5 and 100 gas accounts and gas loads are reasonably correlated to the number of accounts. Thus by aggregating agencies and facilities within each agency, the BayREN will be able to serve a very large number of individual accounts and large aggregate load.

Figure 4.2. Distribution of Gas Usage and Number of Accounts per Agency



According to Navigant Consulting, the potential reduction in the local government sub-sector ranges from 16-20% (excluding streetlights and water operations).[10] Anecdotally, it has been reported that there has been significant participation in lighting retrofits but that more complex and costly measures remain stubbornly hard to access. Theoretically at least, local governments have great incentive to invest in energy efficiency because the portfolios consist largely of long-term, owner-occupied sites. However, the barriers are persistent, as illustrated in the Table 4.5. The BayREN's services do not focus on a particular technology or end use. Rather, the goal is to provide local governments with the tools, training, data, and analysis to support a comprehensive energy program.

The Advanced Energy Management and Decision Support service plans to use BEMS to acquire immediate operational savings and serve as a platform to stage more comprehensive improvements, including retro-commissioning, retrofits, and early retirement. A draft report by Research Into Action finds that local government "*partnership representatives believe that they could better track progress toward goals, demonstrate the impact of a municipal retrofit to LG decision-makers, and decide which facilities to target for future retrofits if they had improved access to energy savings and project stage data."*[11]

Although these markets and the associated savings are much larger than the market for BEMS technology, BEMS has immediate potential. Katipamula and Brambley found that nationally, "*poorly maintained, degraded, and improperly controlled equipment wastes an estimated 15% to 30% of energy used in*

[10] Navigant Consulting, Inc., Tierra Resource Consultants, LLC, Local Government Quantified Savings Component of Strategic Plan Update, Technical Appendix – Final Presentation, October 15, 2014, Pages 3, 4 and 11.
[11] Research Into Action, "Targeted Process Evaluation of the Local Government Partnership Program, Draft Report", October 25, 2106. Page 60.

commercial buildings. Much of this waste could be prevented with widespread adoption of automated condition-based maintenance." [12]

Research Into Action's draft process evaluation found that many local governments do not have an energy management system in place and those that do report that the system is outdated or that staff does not know how to use it.[13]

BEMS is an important access point in that it addresses a core facility management concern—maintenance. Maintenance in the local government sector is a particular challenge in that the portfolios are very diverse and decentralized. The building types are diverse, and the systems themselves vary; many local agencies struggle to maintain multiple BEMS applications, a result of low-bid construction contracts that do not specify brands.

A BayREN survey of 12 Bay Area agencies (12% response rate) responsible for nearly 25 million square feet of facility space found:

- There are 12 different BEMS brands in use, with as many as seven different brands at a single agency.
- On average, 40% of facility space is controlled with BEMS.
- All respondents considered that it is Very Important (7) or Somewhat Important (4) to acquire, expand or upgrade BEMS in their facilities.
- All of the systems but two are managed by staff (one is managed by a contractor, the other is not managed at all).
- Only one jurisdiction considered themselves expert in their system. The others rated themselves as "capable of making occasional minor modifications" (4) and "regular, competent users" (4).

Cook, Smith, and Meier (UC Davis and Microsoft) report in an ACEEE paper that:

"*the primary benefit of the Smart Building solution is its positive impact on the productivity of building managers and engineers. Microsoft will retro-commission roughly 20% of campus buildings each year. Even at this rate of inspection, only large pieces of equipment are checked because it is too costly and labor intensive to hunt for problems with smaller equipment. By using FDD [fault detection and diagnostics] to conduct maintenance in real-time and prioritize faults based on estimated savings, building managers are able to identify more problems, strategically target the critical ones and make informed decisions about how to allocate their time and resources.*"[14]

[12] Srinivas Katipamula & Michael R. Brambley, "Review Article. Methods for Fault Detection, Diagnostics, and Prognostics for Building Systems—A Review, Part I", 2011, Page 1.
[13] Research Into Action, "Targeted Process Evaluation of the Local Government Partnership Program, Draft Report", October 25, 2106, Page 86.
[14] Cook, Jonathan (UC Davis Energy Efficiency Center), Smith, Darrell (Microsoft), Meier, Alan (UC Davis Energy Efficiency Center). 2012. Coordinating Fault Detection, Alarm Management, and Energy Efficiency in a Large Corporate Campus. ACEEE. Page 12.

This work with local governments will also provide valuable information to support program adoption in the small and medium commercial sector, as required by AB 793. By integrating controls, monitoring, and billing data, BEMS offers an opportunity to claim and verify operational savings in the smaller facility market where the pay-for-performance approach has been too costly. Deployment in smaller centrally managed facilities can provide valuable information as the State seeks to acquire operational savings from the small commercial market. Furthermore, the harvesting of verifiable operational savings through BEMS can be reinvested into other areas—such as facilities/energy staff, program participation, and training—creating a virtuous cycle.

The market for the Systems Integration for Early Adoption of ZNE service focuses on renovation and new construction. Local governments periodically renovate facilities as part of seismic retrofits or in response to long-term deferred maintenance. The market is driven largely by the availability of funds, which include federal and state sources such as Community Development Block Grants and FEMA. However, the most significant sources are bond funds, which are subject to voter approval. Policy makers may be reluctant to commit to ZNE in the text of local bond measures due to the uncertainty of associated costs. Without such a commitment, ZNE features, as well as other above-code measures, are subject to being value-engineered out of projects if budget margins narrow. The BayREN service will enable local governments to commit to sustainable design and ZNE during the earliest stages of project development, including bonding authority.

Public Sector Strategies and Tactics

The BayREN Public Sector Business Plan was informed by lessons learned from BayREN members, SoCalREN, PG&E Local Government Programs, and ongoing work and conversation with jurisdictions. This information illustrates the need for reliable and consistent decision making processes and tools, as well as support to develop and implement effective policies in support of state goals. Figure 4.3 below illustrates the Business Plan Intervention Strategies and the associated Public Sector Tactics to implement the strategies. Table 4.5 maps these Strategies and Tactics to a summary of the identified sector problems and market barriers.

Figure 4.3. Public Sector Intervention Strategies and Tactics

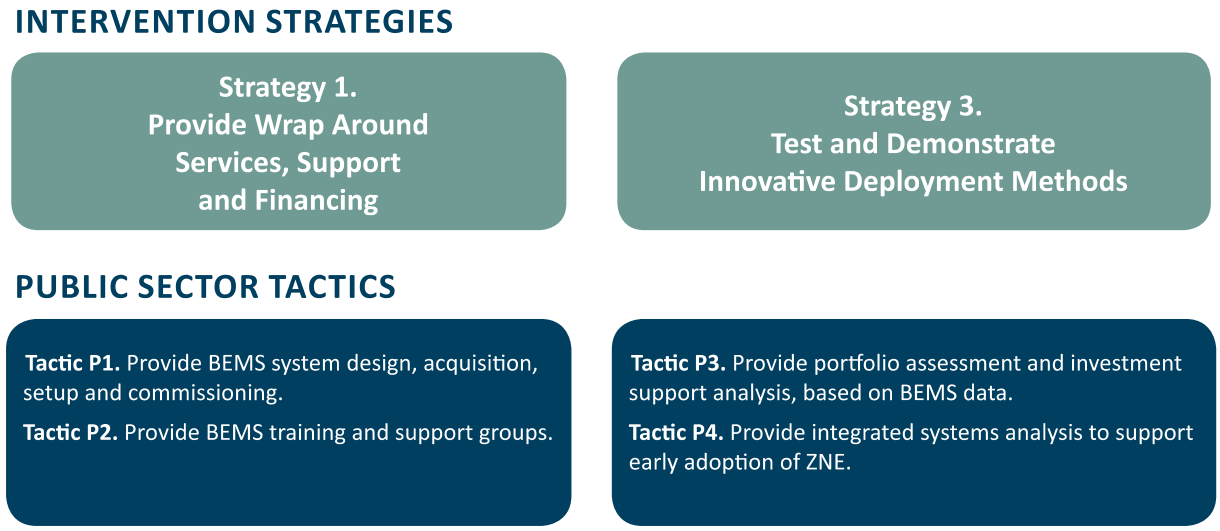


Table 4.5. Public Sector Problem and Market Barriers

Problem	Market Barrier	Strategy/ Tactics
Many local governments do not have adequate dedicated staff or resources to move proactively on energy efficiency in their own or community buildings.	• Complexity of issues and diverse portfolios make it difficult for staff to specialize in energy management. • Public sector agencies serve a broad set of needs and constituents with competing and shifting priorities and may not be able to focus only on energy efficiency. • Agencies are subject to regulations, which restrict communications with vendors and result in substantial transaction costs in analyzing and procuring materials and professional services.	S1/P1 S1/P2
Many local governments lack data, analytical tools, and budget mechanisms to incorporate energy efficiency into their routine operations and decision-making processes.	• Public agencies have a broad span of responsibilities; staff is often made up of generalists who lack the capacity to understand, evaluate, and act on specialized issues. • Limited access to capital: ○ expense and capital budgets are often isolated from each other ○ local governments are not well-suited to manage the risks associated with financing secured by potential savings ○ reliable projections of potential savings to underwrite financing are not readily available.	S3/P3
Many local governments are interested in leading by example and the need to demonstrate ZNE feasibility on their own facilities, yet lack the in-house capabilities to provide early design/cost analysis.	• The fragmented approach to efficiency and renewable programs makes it difficult to scope ZNE projects. • Traditionally program (intended use) considerations precede capital budgets and design but energy features are frequently considered after the initial budget has been established and conceptual design has been articulated. It is then quite difficult to change fundamental design characteristics without incurring significant and costly delays. • Capital budgets established without consideration of future operational expenses severely limit project financing.	S3/P4

Solutions

The BayREN proposes two different approaches to help achieve its Public Sector vision and overcome market barriers. The first is grounded in BEMS and data visualization systems (including integration with billing data), which can provide facilities managers and energy staff with a sophisticated, data-driven understanding of their facilities and opportunities for managing energy, including integration with regular operations and maintenance and capital improvements. The deployment of BEMS systems should be accompanied by training, user groups, and ongoing analysis and support to provide a set of strong service-based relationships that will lead to continuous improvement in energy management. Training will be sought through the Pacific Energy Center and through BEMS service providers.

The Advanced Energy Management and Decision Support service will provide public-sector staff with specific high-quality data and analysis that will enable them first to optimize operations of existing equipment and then to pursue projects through other ratepayer-funded programs.

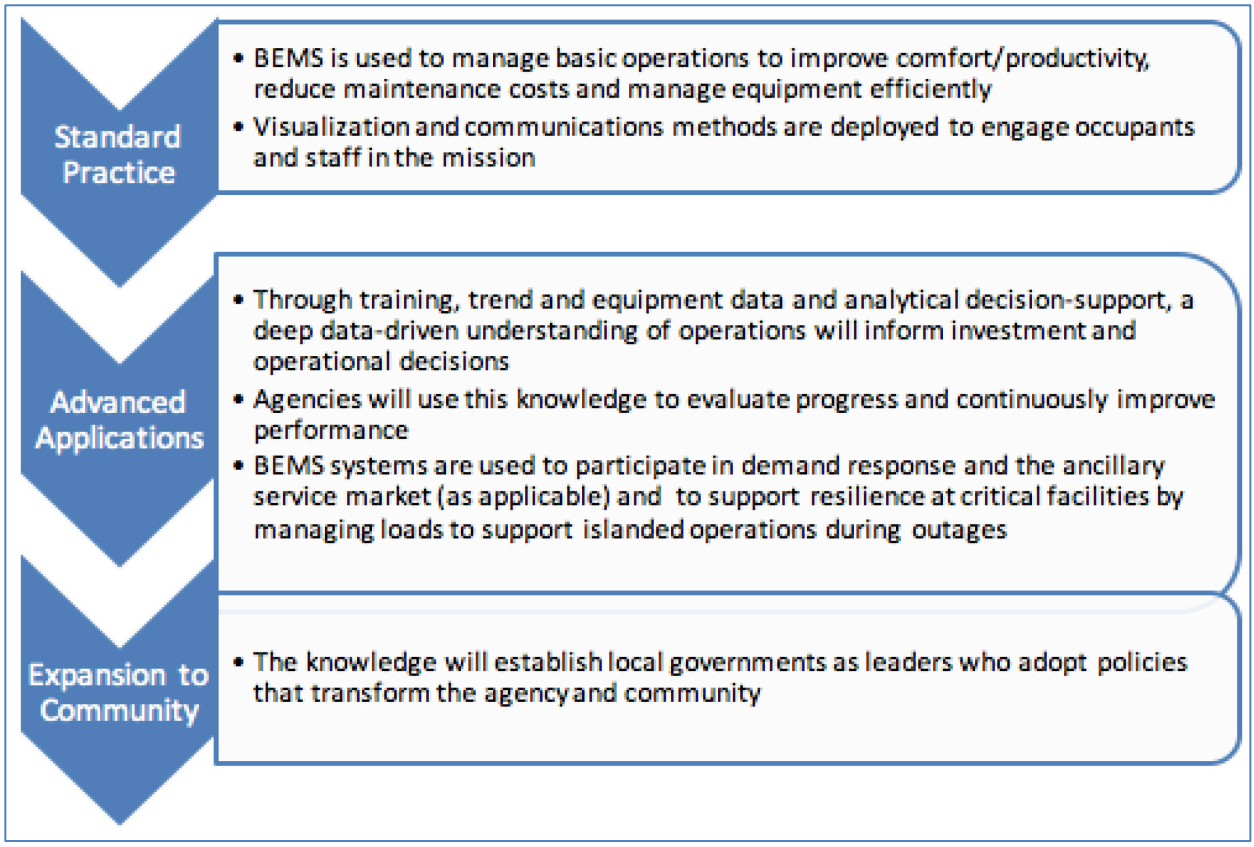
Utilizing a systems approach, both in terms of technology and business practices, will result in transformative institutional changes. Monitoring and control technology, together with training and analysis, will provide local governments with equipment-level priorities, as well as with highly robust pro formas and performance tracking to support low-risk financing.[15] The process will result in a set of business practices that integrates capital planning and operational expenses, enabling agencies to achieve comprehensive savings and demonstrate leadership within their communities.

While not a market transformation strategy per se, the approach shares some aspects of market transformation programs, as described by Navigant Consulting,[16] by measuring "modeled savings based on 'deemed' or average savings, extrapolated to the market" versus a "summation of site-by-site savings," and by striving for "success based on long-term outcomes" versus "annual savings." BayREN's method will be a bottom-up assessment of savings from an aggregated portfolio over various time periods. It is envisioned that the level of participation will evolve as illustrated in Figure 4.4

[15] CPUC EM&V contractor Research Into Action noted in a webinar that one of the major barriers to public sector financing is the lack of information to calculate ongoing savings. 11/8/16.

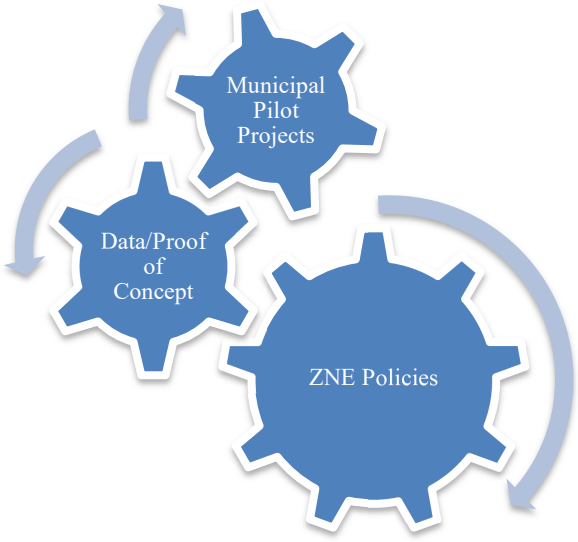
[16] Galvin, Toben; McDonald, Craig; Luboff, Jay (Navigant Consulting Inc.), "A Strategy for Integrating Market Transformation Savings into Resource Acquisition Portfolios", CEEE Market Transformation Conference, Baltimore, MD, 2016, Page 4.

Figure 4.4. Evolution of Engagement through Building Energy Management Systems



BayREN's second approach, as shown in Figure 4.5, will provide integrated ZNE design analysis and is intended to provide proof of concept for local governments to support policy adoption.

Figure 4.5. Adoption cycle for widespread ZNE



The Municipal ZNE technical assistance pilot supported six jurisdictions with engineering analysis on specific municipal buildings. While offered as project level assistance, development of flagship municipal ZNE projects is seen as a policy enabler because local governments need to demonstrate feasibility of ZNE implementation in order to gain community support for reach code ordinance adoption. These jurisdictions were offered a customizable suite of engineering analysis via a consultant, including the following services:

- Develop municipal ZNE pilot project scopes of work.
- Engineering specifications, energy savings, and cost estimates.
- System design comparisons.
- Gas versus electric system evaluation to optimize GHG saved per dollar spent.
- Energy modeling for system optimization and code compliance.
- Procurement – connect projects with options for purchasing and financing efficient equipment.
- Community Scale Municipal ZNE Planning – incorporate energy efficiency as a component of plans/policies to offset the jurisdiction's municipal energy load/bills.

The intent of the expanded Municipal ZNE pilot in 2017 and beyond is to enable local governments to lead by using their own portfolios as an example, which will prime the market for adoption of ZNE policies.

Strategy 1. Provide Wrap-Around Services, Support, and Financing

Tactic P1. Provide BEMS system design, acquisition, setup, and commissioning

Objective: Public agencies possess an advanced level of control and understanding of their facilities using state-of-the-art building energy management systems

This Tactic seeks to increase the deployment of building monitoring and control systems under a regional portfolio of BEMS. The approach will involve a competitive solicitation consistent with public procurement requirements for an aggregated procurement of BEMS design and setup services, commissioning, staff training, software licenses, and installation of open-source controls (as needed). The acquisition will be informed by an inventory of those BEMS commonly used by public agencies and agency requirements, and will attempt to move the State toward a commonly-accepted platform(s), replicating successful software approaches that have been tested widely and demonstrated to be cost-effective.

The service complements PG&E's proposed intervention strategy of using data analytics to "enable a more accurate deployment of resources for the largest impacts."[17] The disaggregated trend data acquired through BEMS coupled with parsed data from interval meters will improve the accuracy and cost-efficiency of identifying retrofit opportunities.

[17] PG&E, "Draft Business Plan, Public Sector Chapter", October 18, 2016, page 23.

As noted above, BEMS, where they exist, are not being used to their full potential due to a lack of standardization and training. A properly functioning BEMS would enable facilities staff to accurately schedule building operating hours, optimize temperature and airflow to maintain occupant comfort, manage peak demand charges by preconditioning space and staggering equipment operating cycles, and remotely diagnose equipment failure.

A robust BEMS should include the following features:

- Remote access to monitor and control equipment using open source BACNET technology.
- Hardwire interface, wireless interface, and pneumatic actuator interface.
- Fault detection and diagnosis.
- Automatic acquisition and integration of utility billing data (either directly or through existing commonly used platforms).
- Robust analytical and data visualization.
- Simple data sharing procedures to enable export to other commonly used platforms
- Data and cyber-security controls.
- Various privilege levels, including the ability to share trend data with a regional portfolio administrator for analysis.
- 24x7 support services.
- Automated Demand Response (ADR) capability.
- Project financing through the BEMS vendor (optional).

Tactic P2. Provide BEMS training and support groups

Objective: BEMS systems are actively maintained and trend data are available to inform operations and support resource allocations

This Tactic seeks to provide BEMS training for staff and contractors and create a user community by, for example, establishing a regional user-group(s) and knowledge base. Training will be sought from a variety of sources, including BEMS service providers and the Pacific Energy Center.

Training should include the following elements:

- General BEMS training, prior to the BEMS solicitation, so that staff can provide informed input to the specifications.
- Full on-site training for all installed systems, including customized user manuals. This element will be incorporated into the BEMS commissioning process.
- On-line training for refreshment, updates topics on demand.
- Periodic trainings for new staff and for all staff on in-depth topics.
- A regional user's group, with an online knowledge base.
- Ongoing customer services helpline for specific issues.

Strategy 3. Test and Demonstrate Innovative Deployment Methods

Tactic P3. Provide portfolio assessment and investment support analysis, based on BEMS data

Objective: Data are used to reduce risk and drive investment decisions

This Tactic seeks to provide analytic and decision support services to optimize energy and operational savings, based on real trend and cost data collected through the BEMS. As envisioned, trend and equipment data for the regional portfolio would be centrally available and subject to analysis to identify large-scale opportunities for energy efficiency improvements, improved occupant comfort/productivity, reduced maintenance costs, and to generate pro formas to support project financing.

A BEMS portfolio should be considered as a platform to stage comprehensive energy projects. By scaling up the portfolio and obtaining access to detailed information, the service can provide expertise that would not otherwise be available or affordable to individual communities. This approach would lead to a comprehensive set of project recommendations and accurate life-cycle savings projections, which would reduce financing risks and help underwrite financing and measurement and verification equipment to support participation in other performance-based incentive programs. This analysis will help local governments "level the playing field" between operating and capital budgets and access long-term comprehensive savings and improved productivity and operations.

Tactic P4. Provided integrated systems analysis to support early adoption of ZNE

Objective: Agencies program capital and adopt policies such that efficiency, renewables, and energy storage are balanced to achieve early adoption of ZNE

This Tactic expands upon the BayREN Codes & Standards pilot that provides technical assistance to support early adoption of ZNE, and integrates with the ZNE campaign underway at DGS. A major focus will be on minimizing energy intensity to enable on-site generation to meet the demands of the facilities. However, the program will also support broader state policy goals by providing local governments with resources to evaluate their options to implement electrification and renewable distributed generation and storage. A ZNE strategy should provide the following:

- Project-specific systems engineering and cost analysis to increase efficiencies and lower energy intensities to levels that can be served by on-site renewables.
- On-site renewable generation assessments "right sized" for lowered energy loads.
- Modeling for optimized gas and electric system design, and optimized investment in efficiency and renewables.
- Integration of energy storage for demand management and ancillary services markets and islanding, as appropriate.

- Support for portfolio ZNE strategies, as appropriate, where jurisdictions have set the objective of achieving ZNE at the community scale, and where community scale is defined by a jurisdiction's municipal building portfolio.
- Local government training.
- Targeted to code enforcement staff who will review ZNE projects receiving buildings permits.
- Targeted to public works, capital, engineering, and facilities staff who will design and operate municipal ZNE facilities (possibly using a version of the PG&E curriculum under development for DGS).
- Monitoring the performance of buildings/portfolios intended to achieve ZNE.
- Provide tools (e.g., data loggers, building/portfolio monitoring software such as Lucid) for measuring and tracking energy usage and generation in order to assess if reduced energy loads are being met by energy generated either on-site or within the municipal portfolio.
- Communication templates and case studies to support ZNE reach code policy adoption.

This program (Table 4.6) will provide an opportunity for the CPUC to test mechanisms to fund project activities that provide both energy efficiency and renewable resources.

Anticipated Programs

Table 4.6. Anticipated Sector Programs

Program Title	Focus	Timeframe	Existing or New	Resource (R) Non-Resource (NR)
Advanced Energy Management and Decision Support	Provide staff with specific high-quality data and analysis that will enable them first to optimize operations of existing equipment and then to pursue projects through other ratepayer-funded programs.	Short-term	New	NR (initially)
Systems Integration for Early Adoption of ZNE	Provide tools and analysis to help public agencies incorporate ZNE into their capital programs.	Short-term	New	NR

Coordinating Activities

Leveraged Resources

The BayREN seeks to leverage the following non-ratepayer resources: local construction bonds, FEMA grants, Community Development Block Grants (CDBG), existing line item expenses for BEMS expenses, in-kind resources from the DGS, and grants from the New Buildings Institute.

The largest potential source of leveraged funds is the programming of capital budgets for energy efficiency. Local agencies regularly issue bonds for renovations, including Americans with Disabilities compliance and seismic upgrades, and new construction. These local bonds are often paired with grant resources, such as FEMA and CDBG grants. By providing reliable cost-savings projections, the BayREN expects to increase the inclusion of advanced energy measures in such projects.

The BayREN plans to coordinate its ZNE activities with DGS, which has been charged with implementing Executive Order B-18-12 in most state buildings.

The BayREN plans to continue to partner with the New Buildings Institute to host workshops on ZNE.

Many agencies already have BEMS contracts. These existing resources can support BayREN activities by being consolidated under the aggregated BEMS procurement as they expire. For many jurisdictions, this may be more cost-effective than current contracts. For those jurisdictions with more than one provider, it will improve operations and training.

EM&V Efforts

Although not market transformation strategies per se (due to the limited size of the market sub-sector), the BayREN services could be evaluated as market transformation initiatives, in terms expressed by Navigant Consulting,[18] i.e., measuring "modeled savings based on 'deemed' or average savings, extrapolated to the market" and striving for "success based on long-term outcomes."

With this in mind, two documents provide a useful framework. In their policy paper, CPUC consultants Prahl and Keating[19] draw a distinction between evaluation of resource acquisition and market transformation strategies, particularly with respect to the timeframe used for the evaluation. They suggest managing risk by careful vetting and focusing on leading indicators of success. CPUC staff Cathy Fogel builds on their framework in her comments to draft business plans,[20] proposing a three-phase process:

[18] Galvin, Toben; McDonald, Craig; Luboff, Jay (Navigant Consulting Inc.). Op. cit.

[19] Ralph Prahl, Ken Keating, Consultants to the CPUC Energy Division. Building a Policy Framework to Support Energy Efficiency Market Transformation in California. October 14, 2013.

[20] Cathleen Fogel, Energy Efficiency Branch, Energy Division, CPUC. Overarching Comments on Program Administrator Business Plans Focus on Market Transformation Strategies, September 28, 2016, Page 4.

- Phase I, scanning and identification of target markets, conducted as part of the draft Business Plan.
- Phase II, vetting and approval by the CAEECC and the CPUC, which should be contained in the final Business Plan and Advice Letter.
- Phase III, implementation and continuous evaluation, should be incorporated into the implementation plan. Elements include continuous evaluation, industry partnerships, market evaluations, coordination with downstream activities, and periodic review by the CAEEC.

Several outcomes can be directly and indirectly measured (see metrics table 4.3 for more information). Once BEMS systems have been deployed and trends have been established, short-term savings can be based on reliable verified savings data using performance-based incentive protocols. Savings on ZNE facilities can be measured initially using building simulations and, after a full year of operations, actual performance data as reported to the New Buildings Institute or the International Living Future Institute. (Note, because this service will be addressing renewables as well, the EM&V process should be coordinated with renewable program EM&V activities.)

Indirect savings associated with market transformation outcomes can be measured through changes in the level of investment and participation in other ratepayer programs, actual measured savings that are not attributable to the BEMS, and the adoption of policies affecting municipal and the larger community portfolio of buildings.

One possible area of study regarding the comprehensiveness of small and medium commercial sectors cited in the EM&V plan[21] may also prove helpful: *"we might want to do this study on an annual basis, and the current study is also framed as leading into follow-up process evaluation work to figure out why certain program are positive or negative outlier. The study looks across all nonresidential programs in 2010-2014. Study findings will include multiple metrics and review different measure type, program type, urban/rural, and building type."*

Similarly, the Energy Division recommended additional study of the SoCalREN Enterprise Energy Management Information System (EEMIS), to assess ease of use and the potential for scaling up the program.[22]

Other EM&V questions may include the following:

- To what extent do the services affect participation in other measure-specific programs, including demand for services under PG&E's Job Order Contracting program? Historic trends and comparisons to control groups should help assess the effectiveness of the intervention strategies.
- Does the approach lead to widespread adoption? This can be measured through changes in the amount of floor space affected by the strategies.

[21] California Public Utilities Commission, "2013-2016 Energy Division & Program Administrator Energy Efficiency Evaluation, Measurement and Verification Plan Version 6", 2016, Page 81.
[22] Ibid., Page 177.

- Do the services achieve long-term success? In the short-term, this can be posited through changes in the level of staff competence, as measured through surveys and testing during training.

Table 4.7 provides a summary of potential EM&V studies and questions that may be implemented in the ten-year business plan timeframe.

Table 4.7. EM&V Study and Data Needs Public Sector

Study Title/Topic Focus	Research Questions	Objective	Timeframe
Municipal Building Stock and Controls	• What is the total floor and EUI by Bay Area local government building type? • How much of that space is covered by BEMS and what types of BEMS are deployed? • What is the level of staff competency with BEMS? • How have these changed during the program cycle?	Understand and track municipal market.	Mid-term
Municipal Energy Use/Intensity	• What is the energy use and EUI for each municipality and municipal building in the Bay Area? • How has this changed during the program cycle? • How much of the change can be directly correlated to BayREN interventions?	Target on highest needs in municipalities and track program performance.	Short-term
Energy Efficiency Activity	• How much are local governments investing in energy efficiency, renovation, and new construction? • What are local government participation rates in energy efficiency programs by end-use? • How have these changed during the program cycle?	Track program performance.	Mid-term
ZNE Adoption	• What is the total floor area and EUI of ZNE space by type in various stages: planned, under contract, occupied, verified? • How has this changed during the program cycle?	Track program performance.	Mid-term

Marketing, Education, & Outreach

The BayREN Public Sector effort will use several channels for marketing, education, and outreach. The primary channels will be direct communication between the BayREN and its network of local agencies and the PG&E LGPs.

BayREN's unique organizational structure as a collaboration of the nine Bay Area counties and 101 cities has enhanced program success because, as local governments, we are known and trusted by the local communities and have a long record of delivering successful programs and services. Outreach will be conducted directly through known contacts with program staff in the 101 local agencies and through the county-level BayREN representatives.

The BayREN will also collaborate with the PG&E LGPs. Each of these partnerships already provides services to the public sector, and PG&E is proposing an overarching job order contracting program through the LGPs. The BayREN's proposed strategies were designed to dovetail with these programs, providing a foundation to increase participation.

In addition, the BayREN will specifically target facilities staff (which is usually not the same as energy/sustainability staff) through the Northern California Chapter of the American Public Works Association, in the form of presentations at regular chapter meetings. Table 4.8 summarizes the anticipated marketing and outreach approaches and their key objectives.

Table 4.8. Marketing, Education, & Outreach Approaches and Coordination

Marketing Need	Approach	Objective	Timeframe
Market Research	Survey local agencies.	Gather general data on baseline conditions and needs.	Short-term
Collateral material	Develop and maintain e-brochures, Q&As, fact sheets, slide decks.	Provide documentation of program.	Short/Mid-term
Market Research	Interviews with facilities staff.	Gather specific data and feedback on program details.	Mid-term
Reach energy, facilities, and capital planning staff in Bay Area agencies	Email to existing BayREN staff contacts in Bay Area local agencies. Engage county-level BayREN representatives to contact local staff. Direct outreach to LGPs and PG&E. Presentations at regular meetings of the Northern California Chapter of the American Public Works Association. Webinars	Build Awareness of program. Drive traffic to website and webinars.	Short/Mid-term
Reach public agency executive staff	Presentations at existing venues, such as county-level city manager and mayor's associations. Presentations at executive board (e.g., council) meetings.	Garner support for decision makers.	Short/Mid-term
Enrollment	Create sample council reports/resolutions.	Simplify enrollment process.	Mid-Long-term

Workforce Education and Training

As service-oriented strategies, workforce education and training are essential elements of the BayREN scope. Training will be sought from a variety of sources, including BEMS service providers and the Pacific Energy Center (e.g., Programmable Logic Controller series; Control: Design, Performance and Commissioning series). Training may include the following elements:

- General BEMS training, prior to the BEMS solicitation, so that staff can provide informed input to the specifications.
- Comprehensive on-site training for all installed systems, including customized user manuals. This element will be incorporated into the BEMS commissioning process.
- Ongoing customer services help line for specific issues.
- Periodic trainings for new staff and on in-depth topics.
- A regional user's group, with an online knowledge base.
- ZNE training customized to building department staff, including overview of key metrics, which indicate to a plan reviewer whether a building is meeting a specific ZNE definition.
- ZNE training customized to public works, local government design/engineering staff, and facility managers who design and operate municipal facilities (possibly using the curriculum being developed by PG&E for DGS).

Cross-Cutting Initiatives

The BayREN public sector programs will have significant indirect cross-cutting impacts. Bay Area local governments will lead by example and pave the way for greater adoption of advanced energy practices, in the commercial sector in particular. In addition, the experience gained in local government projects will lead to improved overall compliance with codes and standards, as staff becomes more familiar with compliance strategies, and it may also underpin local efforts to adopt more stringent codes and standards.

The State's ZNE requirements present new challenges to designers, builders, developers, and code officials. The uncertainty associated with new methods, costs, and building performance poses risks that many in the industry are unwilling to assume until mandated. The services offered by the BayREN will place local governments in the vanguard, providing opportunities for the building industry to gain experience that can then transfer to the private market. Similarly, construction of public ZNE buildings will offer code officials experience with new methods and materials. And the existence of ZNE buildings in the public realm will serve as examples for private developers who need to understand how such buildings perform, financially and physically. Local agency experience with ZNE may also provide local agencies with concrete justifications to support local reach codes for ZNE construction.

Similarly, the deployment of a network of BEMS and decision support services may help provide an infrastructure to support services to the commercial market. This infrastructure would include soft items such as specifications, procurement documents, contracts, advanced analytical tools for aggregated BEMS, and a trained vendor workforce, as well as material items such as improved wireless BEMS configurations

for smaller buildings and the communications and information technology to support a large-scale network of facilities.

Cross-cutting coordination between the Public Sector and other BayREN activities includes:

- **Commercial Sector**
  - Cross-educate aligned contractor groups for commercial projects to increase program participation.
  - Engage participating commercial contractors who may also serve Public Sector projects.
  - Leverage BEMS and decision support services to align with commercial projects.

- **Codes & Standards**
  - Require proper permitting and code compliance for program projects, including incorporation of SB 1414 regulations.
  - Integrate proper permitting, code compliance, and building operation and management best practices into program specific training and QA/QC.
  - Increase feedback loops and data sharing between Public Sector projects, the C&S community, and code development processes.
  - Create case studies and other educational materials to demonstrate local government leadership on public building projects that meet and exceed advanced energy efficiency goals.

- **Water-Energy Nexus**
  - Provide opportunity for municipal projects to be funded through on-bill mechanisms offered by aligned Partner Water Utilities.

Key Partners/Coordination

These strategies have been designed to complement existing and proposed services and have been developed in consultation with Bay Area LGPs, PG&E, and DGS. As the programs are developed and deployed, the BayREN will work, partner, and coordinate with a number of state, regional and local government agencies, as well as Bay Area-specific groups related to energy and climate change.

- **Bay Area Cities and Counties** represent the target market and will engage in contracts directly with the BEMS service provider(s) and will be the recipient of ZNE design services.
- **PG&E and PG&E Local Government Partnerships** will continue to be engaged in the development of the programs and will be solicited to provide technical assistance, financing assistance, and incentives through direct install programs and job order contracting.
- **Community Choice Aggregators** will be consulted during the development of the programs and will be included in marketing and outreach campaigns.

- **BEMS providers** will be recruited, likely through a competitive solicitation with model contracts. It is expected that the solicitation would occur approximately six months after the execution of the BayREN agreement.
- **Energy Engineers/Consultant(s)** will be recruited, probably through a competitive solicitation, to provide analysis for the Bay Area portfolio.
- **Business associations and ProspectSV**[23] may be engaged to solicit participation in the BEMS solicitation process.
- **Third-party program implementers** may be engaged to provide products and services identified for upgrades through Decision Support Analysis.
- **The California Department of General Services** may be engaged to provide guidance on specifications for BEMS and on ZNE definitions and policies, strategies, and training.
- **The California Energy Commission and the ISO** may be engaged to identify opportunities for advanced demand management strategies and participation in market mechanisms.

[23] Prospect Silicon Valley, a nonprofit "urbantech hub."

Section 5
CODES AND STANDARDS

BAY AREA Regional Energy Network

Section 5. Cross-Cutting: Codes & Standards

Introduction

The BayREN Codes & Standards (C&S) Chapter addresses three key areas: Energy Code Compliance Tools and Services; Specialized and Focused Trainings and Workshops; and Stakeholder Engagement and Policy Development. Activities are intended to reinforce and expand existing local government infrastructures and capacities for permitting and inspecting buildings, encourage building activity to exceed the requirements of the California Building Energy Efficiency Standards (Title 24, Part 6, also the Standards), and report on building activity and progress toward energy efficiency goals. The BayREN C&S programs leverage the relationships held by local governments to engage market actors who for one reason or another may not prioritize energy efficiency in building projects. This includes permit applicants for residential and small commercial projects (property owners and contractors) and building department staff including building officials, permit technicians, plan reviewers, and building inspectors. As a cross-cutting initiative, the BayREN's C&S work is coordinated and aligned with BayREN Residential, Commercial, and Public Sector activities.

BUSINESS PLAN VISION, OUTCOMES AND BUDGET

Vision

The Codes & Standards Community effectively delivers the fundamental and contributory co-benefits of proper permitting and compliance at a scale needed to achieve the State's energy goals for new and existing construction.

Public Sector Outcomes

- *85% of Bay Area Jurisdictions receive energy code compliance support and services to effectively increase permit closeout rates by 50%.*
- *Data from over 16,000 projects in 50 Bay Area jurisdictions help drive increased adoption of advanced energy policies.*

2018-2025 budget (total) *$16.3 M*

This Codes & Standards Chapter further develops existing activities that BayREN has implemented since 2013. Enhancements are based upon feedback from key program stakeholders and partners including: Bay Area building professionals, building departments, and chapters of the International Code Council (ICC) Bay Area planning and policy agencies, the Statewide IOU Codes & Standards Team, the California Energy Commission's Standards Development and Outreach Teams, and the California Building Officials Organization (CALBO).

Market Context

The BayREN Codes & Standards initiatives address building activity where local authorities having jurisdiction (AHJs) are responsible for enforcing local and state building codes, energy ordinances, and efficiency standards. Market actors involved in this Codes & Standards Community include:

- Building Department Staff: Chief Building Officials, Permit Technicians, Plans Examiners, Building Inspectors, etc.
- Other Local Government Staff: Planners and Community Development Staff, Sustainability Staff, City Managers, and Elected Officials.

- Building Professionals: Architects, Designers, Contractors, Energy Consultants, and Third Party Code Plans Examiners, Inspectors, Raters, and Verifiers.
- Building Owners and Managers.
- Partner Agencies and Utilities: California Public Utilities Commission, California Energy Commission, Building Standards Commission, the State Investor Owned Utilities, Municipal Utilities, etc.
- Industry and Professional Groups: International Code Council (ICC) Chapters, American Institute of Architects (AIA), Local Realtor® Associations, California Building Industry Association (CBIA) chapters, the U.S. Green Building Council and its local chapters, Build It Green, and Building Owners and Managers Association (BOMA) chapters, etc.

The C&S Community in the Bay Area's 110 different AHJs must engage 7.5 million residents, who live and work in buildings primarily built before the Standards were implemented in 1978.[1] Building department staff at these AHJs serve almost 28,000 contractors and are the most direct and local resource to ensure these professionals build energy efficient buildings. Yet the resources and capacities across these AHJs vary significantly. BayREN's preliminary research of 63 local governments indicates that 54% of jurisdictions had three or fewer full-time staff in their building division (with 10% having zero full-time staff). Building division budgets ranged from $5-$499 per capita. A review of publically available information indicates that 40% of building departments have electronic permitting systems available, and 34% have permit systems with on-line services for applicants. This same review indicates that 80% of AHJs have the option to use contracted, third-party plan check and building inspection services. Bay Area building departments oversee building activity related to 2,800,000 existing housing units and 61,926 offices, retail, hotel, and industrial buildings.[2]

Within these existing buildings, as well as for the Bay Area's new construction, the BayREN member agencies are uniquely positioned to leverage their relationships to local governments to engage, educate, and support local building departments and other local government staff officials to affect greater compliance and increased energy savings. This includes cross-cutting C&S efforts to ensure BayREN and other Program Administrator programs are consistent with SB 1414. The BayREN's ongoing coordination with the Statewide IOU and CEC C&S teams has reinforced the benefits of BayREN playing this activator and facilitator role as reflected in Strategies and Tactics proposed in this Chapter.

[1] Nearly 70% of the Bay Area's residential and small-medium commercial buildings were built before 1978.
[2] Housing unit data compiled from Annual 2014 Permit Data for the nine Bay Area Counties as reported by the U.S. Census: http://censtats.census.gov/bldg/bldgprmt.shtml. Commercial building data compiled by BayREN's access to Commercial Building Data Gather and Cleaning Tool, 2014.

Sector Summary

The BayREN C&S initiative is focused on working with local jurisdictions to increase their ability to enforce energy codes and permit compliance, reap the resulting savings from properly installed projects, and develop and test advanced local energy ordinances. The BayREN will continue to support the current 77 jurisdictions that are already part of its program and will seek to deepen and expand engagement to those departments and to the rest of the jurisdictions in the Bay Area.

The BayREN C&S activities are informed by evolving state and regional policies including California's Long Term Energy Efficiency Strategic Plan (CAEESP), the Existing Building Energy Efficiency (EBEE) Action Plan, and evaluation reports of the BayREN programs to date. This includes supporting strategies for greater compliance, new regulations for permitting required in SB 1414, and helping to support and encourage efforts moving to ZNE buildings.

Evolving Approaches

BayREN Codes & Standards will continue to evolve over the next ten years, consistent with guidance from the Commission, EM&V Evaluations, and the needs of our local government stakeholders. We will continue to pursue partnership opportunities with the Statewide IOU C&S Team, the CEC, local building professionals, and local building departments. BayREN activities will be prioritized to meet the needs of these stakeholders and to test innovative services and tools that could be scaled to larger regional or statewide efforts.

Near- and mid-term tactics are intended to enhance code compliance opportunities that are specific to local governments. The following is a summary of current and proposed activities and how they will expand in the coming years.

Energy Code Compliance Tools and Services

The BayREN gathers, develops, and promotes best practices and facilitates data sharing between jurisdictions to promote compliance with energy codes and green building standards. BayREN and self-selected Bay Area jurisdictions work to identify enforcement barriers and challenges, recognize successful energy code enforcement processes and strategies, share resources to improve compliance with the Standards, and document and report on compliance.

BayREN is currently testing electronic tools to help improve permitting compliance, including online- and kiosk-hosted information tools for residential water heater replacement permits and tablet-based non-residential lighting design, plan check, and inspection software. For e-tools with demonstrated potential, BayREN will explore software add-ons that will allow these tools to more easily "plug-in" to common permitting systems such as Accela and eTrackIt. As the scale and scope of tool deployment increases, it should increase the transparency of local government permit data to inform state metrics and data repositories.

Specialized and Focused Trainings and Workshops

The BayREN connects building department staff and private sector professionals with energy code trainings and workshops that focus on enforcement processes and best practices. This includes referral to existing training resources offered through Energy Code Ace[3] and the Statewide IOU C&S team, trainings developed and delivered by the BayREN to fill training gaps, and locally hosted building department/building professional workshops.

BayREN's Title 24 Part 6 trainings complement and supplement existing IOU/Energy Code Ace trainings, by offering short (60-90 minute) and long (4 hour) modules that focus on specific topics such as Residential Forms and Permit Submittals for Additions. Based on Commission evaluations, BayREN will be adding online webinar trainings for existing curriculums to reach a larger, statewide audience. Local government trainings and workshops hosted by BayREN and partner agencies provide a common venue

[3] Energy Code Ace is an on-line resource tool developed by the Statewide IOU C&S team: http://energycodeace.com/.

for building professionals, building department staff, policy makers, and program implementers to coordinate activities between design firms, build firms, industry organizations, local and state agencies, and municipal and investor-owned utilities As the energy code becomes more complex and integrated with other parts of the building code (such as the T24 green building code, Part 11, and the plumbing and electrical codes), BayREN C&S will seek to find common training applications and collaborations that offer and promote comprehensive updates on enforcement best practices.

Stakeholder Engagement and Policy Development Activities

The BayREN promotes and tests local policies, ordinances, and initiatives to advance energy efficiency standards and encourage greater use of renewable and sustainable materials in building construction. BayREN and partners engage with local government policy makers, sustainability staff, and building professionals through regional forums, local council meetings, and other venues to share resources related to policy and program design issues on energy efficiency and energy code compliance improvement. Table 5.1 summarizes BayREN's C&S activities for the past four years.

The Bay Area has long been a leader in voluntary adoption of above-code measures by local governments.[4] Effective "reach" policies and codes of the future will be vetted by leading public agencies today, and BayREN is in a unique position to catalyze uptake of leading regional policies and initiatives and contribute lessons learned and market feedback to the state's codes and standards updates. As an example of BayREN C&S efforts to test and scale advanced policy initiatives, BayREN is proposing that a ZNE Municipal Analysis initiative currently within BayREN's C&S program be expanded into a standalone "Systems Integration for Early Adoption of ZNE" program as part of the BayREN's Municipal/Public Sector activities.

Table 5.1. Codes & Standards Historic Program Achievements

	2013	2014	2015	2016
# of Training Modules	N/A	72	54	38
# of Training Attendees	N/A	469	552	518
# of Regional Forums	1	6	6	4
# of Regional Forum Attendees	78	333	225	325
# of Tools/Resources Developed	N/A	12	15	13

[4] The Bay Area policy assessment of 2010 illustrates that many local governments have deep experience exceeding code minimums through policy: http://www.usgbc-ncc.org/storage/documents/advocacy/bacc%20regional%20assessment.pdf.

Vision, Intervention Strategies, and Objectives

As shown in Table 5.2, BayREN's Codes & Standard activities are aligned with BayREN's overarching intervention strategies to advance energy efficiency with wrap-around services, and support the demonstration of innovative deployment methods. These activities are intended to achieve a vision in which the C&S community effectively delivers the intended benefits of proper permitting and compliance at a scale needed to achieve the state's energy goals for new and existing construction.

Table 5.2. Intervention Strategies, Tactics, and Objectives

Intervention Strategy	Tactic	Objective
S1. Provide Wrap-Around Services and Support	CS1. Increase the use of existing compliance strategies and electronic compliance tools into local building department practices and permit systems.	*The C&S community delivers increased compliance and increased compliance margins through streamlined permit application, plan review, inspection requirements and verifications, and permit close out.*
	CS2. Develop and promote energy code and best practice trainings and workshops consistent with state and local energy goals.	*The C&S community regularly engages on and shares relevant energy efficiency resources, best practices, compliance barriers.*
S3. Test and Demonstrate Innovative Energy Efficiency Deployment Methods	CS3. Test and promote advanced energy codes and policies including ZNE.	*Local governments contribute research and findings on advanced building concepts (i.e., ZNE; benchmarking) and infrastructure supports for policy implementation.*
	CS4. Make energy-related permit data more accessible to industry.	*The C&S community has access to permit data to increase transparency and inform decision making.*

Codes & Standards Budget and Metrics

Budget

The budge shown in Table 5.3 will facilitate the forecasted short-, mid-, and long-term metrics targets with the expectation that increased participation and project volume is achieved as initial efforts scale and gain traction. For example, webinar based trainings will be able to reach larger audiences with marginal increased effort. The annual variation of the BayREN C&S budget is due to activities and anticipated level of effort associated with the regular update cycle for Title 24, including but not limited to updates for training curriculums; increased demand for trainings, participation in code update workshops and rule making.

Table 5.3. Codes & Standards Budget

Budget ($)	2016*	2017*	2018	2019	2020	2021	2022	2023	2024	2025
Admin.**	173,898	171,500	**	**	**	**	**	**	**	**
Implementation	971,923	838,000	1,770,000	1,899,000	1,963,000	1,934,000	2,075,000	2,145,000	2,114,000	2,268,000
Marketing	346,266	265,000	18,000	19,000	20,000	20,000	21,000	21,000	22,000	23,000
Non-Incentive Total	**1,492,087**	**1,274,500**	**1,788,000**	**1,918,000**	**1,983,000**	**1,954,000**	**2,096,000**	**2,166,000**	**2,136,000**	**2,291,000**
Incentive	-	-	-	-	-	-	-	-	-	-
TOTAL	**1,492,087**	**1,274,500**	**1,788,000**	**1,918,000**	**1,983,000**	**1,954,000**	**2,096,000**	**2,166,000**	**2,136,000**	**2,291,000**

** 2016's actual budget and 2017's proposed budget are included for reference. 2018 budget is proposed as year 1 of the Business Plan.*

*** With this Business Plan, BayREN proposes to reallocate Administrative costs from Sector Program budgets to the overall BayREN Portfolio budget. As a result, starting in 2018, Administrative allocations have been removed from Sector Program budgets. Additional discussion in Overview.*

Sector Metrics

The metrics in Table 5.4 align with the Intervention strategies outlined above and indicate anticipated short, mid- and long-term targets for each program area.

Table 5.4. Codes & Standards Metrics

Intervention Strategies	Market Effect Metrics	Baseline	Metric Source	2018-2020 Target*	2021-2024 Target*	2025+ Target*
S1. Provide Wrap Around Services and Support **Estimated % of annual budget: 75%**	Output: Number of jurisdictions receiving services	2016 Baseline - 75 of Bay Area jurisdictions	Program Tracking Data	Maintain engagement with 88 jurisdictions	Maintain engagement with 93 jurisdictions	Maintain engagement with 93 jurisdictions
	Output: Number of participants receiving services	2016 Baseline - 777 participants	Program Tracking Data	Average 900 participants/yr	Average 1200 participants/yr	Average 1600 participants/yr
	Output: Number of building projects receiving services**	2016 Baseline - 32 projects	Program Tracking Data	Average 150 new projects/yr	Average 1200 new projects/yr	Average 9500 new projects/yr
	Outcome: Increased code compliance and permit closeout.	Establish Baseline with Survey in 2018	Bi-annual survey	Annual increase 5% over baseline	Increase 5% over previous year	Increase 5% over previous year
S3. Test and Demonstrate Innovative Energy Efficiency Deployment Methods **Estimated % of annual budget: 25%**	Output: Number of building projects enrolled in demonstrations**	2016 Baseline - 32 projects	Program Tracking Data	Average 150 new projects/yr	Average 1200 new projects/yr	Average new 9500 new projects/yr
	Output: Number of jurisdictions / participants enrolled in demonstrations	2016 Baseline - 5 jurisdictions	Program Tracking Data	Average annual participation of 10	Average annual participation of 20	Average annual participation of 40
	Outcome: Increased adoption of advanced energy policies	Establish Baseline with Survey in 2018	Bi-annual survey	Annual increase 5% over baseline	Increase 5% over previous year	Increase 5% over previous year

** 2018-2020 (Short-term); 2012-204 (Mid-term); 2025+ (Long-term).*

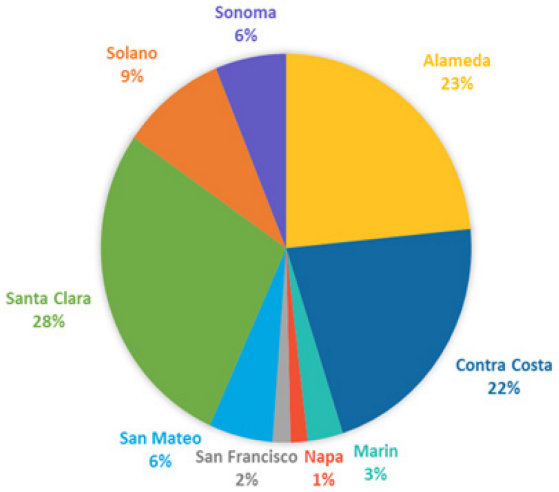
*** Currently, the building project metric is not disaggregated between Strategy 1 and 3. This will be addressed in the C&S Implementation Plan to avoid double counting.*

Market Characterization and Trends

The Bay Area's 110 local governments (building and planning departments) oversee a significant volume of construction activity in the residential and nonresidential markets. While the nine Bay Area counties account for approximately 20% of California's residential population, the region accounted for approximately 25% of California's new residential construction in 2014. In addition, there is significant building activity related to additions, alterations, renovations, rehabs, and tenant improvements in the region's existing buildings, including approximately 2,800,000 existing housing units. Of the Bay Area's residential and small-medium commercial buildings, nearly 70% were built before 1978 and the introduction of the Standards.[5] This represents a significant opportunity to increase building efficiencies and achieve energy savings through better energy code compliance and enforcement and more advanced energy policies and ordinances.

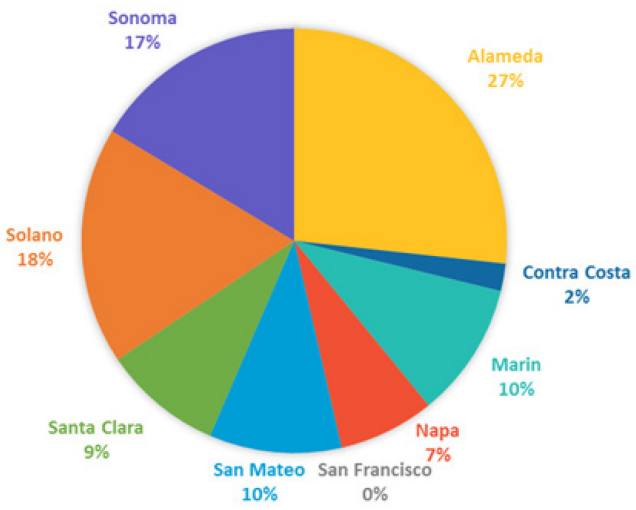
Permit data for new residential construction and HVAC replacement help illustrate industry activity. In 2014 there were 7,056 new residential buildings permitted in the Bay Area,[6] representing 21,389 living units and over $5 billion in construction costs. Figure 5.1 shows this new construction by county. And although HVAC projects are known to be significantly more numerous compared to the number of HVAC permits pulled, the more than 4,900 HVAC permits (~13% of all HVAC permits in California) issued in the nine Bay Area counties in 2014 gives a sense for the geographic distribution of this common retrofit project.[7] Figure 5.2 shows HVAC permits for 2014 by county.

Figure 5.1. 2014 New Residential Construction in the Bay Area, percentage by County[8]



[5] US Census Bureau, 2011-2015 American Community Survey.
[6] Information compiled from Annual 2014 Permit Data for the nine Bay Area Counties as reported by the U.S. Census: http://censtats.census.gov/bldg/bldgprmt.shtml
[7] CIRB 2014 Annual Building Permit Summary, May 11, 2015, Construction Industry Research Board, http://www.mychf.org/products-and-services.html.
[8] Information compiled from Annual 2014 Permit Data for the nine Bay Area Counties as reported by the U.S. Census: http://censtats.census.gov/bldg/bldgprmt.shtml

Figure 5.2. 2014 HVAC Permits in the Bay Area, percentage by County[9]



As shown in Table 5.5, the Bay Area's building activity is carried out by a large community of building professionals, including over 1,500 licensed HVAC contractors, over 2,500 plumbers, and over 4,300 electrical contractors.[10]

Table 5.5. Bay Area Contractors Segmentation

County	Total # of Contractors	Count by Unique License Type									
		B	C-2	C-4	C-10	C-11	C-20	C-36	C-38	C-39	C-45
		General Building	Insulation & Acoustical	Boiler, Hot Water Heating	Electrical (General)	Elevator	HVAC	Plumbing	Refrigeration	Roofing	Electrical Sign
Alameda	4788	3577	45	41	783	9	289	413	59	169	26
Contra Costa	4258	2908	35	38	624	1	280	336	50	112	13
Marin	1955	15007	15	13	239	1	53	125	9	33	3
Napa	723	503	3	5	117	1	31	51	4	20	3
San Francisco	2989	2107	11	44	528	3	104	423	17	71	3
San Mateo	3366	2350	16	36	528	5	176	368	29	84	6
Santa Clara	5495	3674	40	35	893	4	404	499	55	182	23
Sonoma	3140	2234	31	37	439	2	147	253	39	74	10
Solano	1253	775	13	11	203	5	84	98	13	60	13
BAY AREA	**27967**	**19635**	**209**	**260**	**4354**	**31**	**1568**	**2566**	**275**	**805**	**99**

If this building activity is in compliance with California's Building and Appliance Standards for energy efficiency, significant energy savings will be delivered to California's residents and will further the state's energy goals. BayREN Codes & Standards activities are intended to complement PG&E efforts to achieve these savings, which in 2018 alone should result in an estimated savings potential of over 168 GWh, 35

[9] CIRB 2014 Annual Building Permit Summary, May 11, 2015, Construction Industry Research Board, http://www.mychf.org/products-and-services.html.
[10] Data pulled from California State Licensing Board, 2014.

MW, and 1.9 MM therms within the Bay Area.[11] Table 5.6 shows these estimated savings by program year.

Table 5.6. 2017-2024 Estimated Bay Area PG&E Incremental C&S Savings with Interactive Effects[12]

Year	GWh	MW	MM Therms
2017	168.83	35.06	1.90
2018	136.09	34.39	2.05
2019	133.65	34.44	2.07
2020	126.98	33.77	2.07
2021	108.75	31.45	1.98
2022	98.23	29.89	1.90
2023	84.71	28.14	1.88
2024	79.93	27.18	1.78

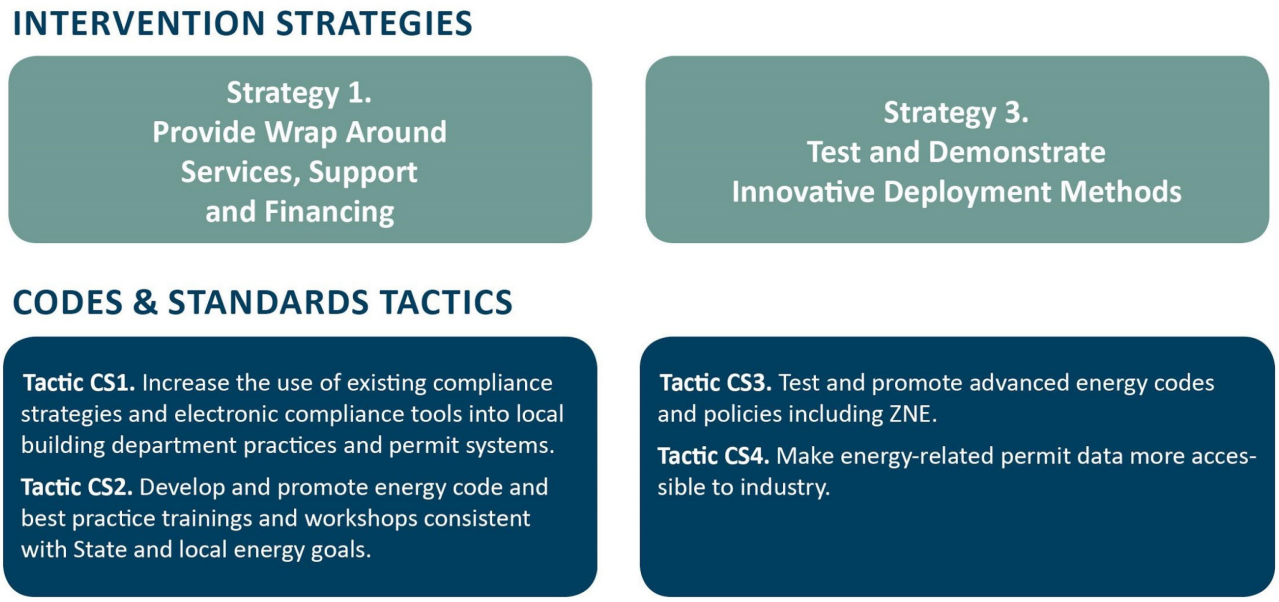
Conservative assumption that 1/3 of PG&E C&S savings are achieved within the Bay Area. Based upon analysis of 2014 American Community Survey statistics indicating the Bay Area represents ~49% of population and ~49% of housing units within PG&E territory.

[11] Navigant Potential & Goals Study (ResultsViewer62615PUBLICDRAFT.xlsx); American Fact Finder 2014 American Community Survey (https://factfinder.census.gov/).
[12] Navigant Goals and Potential Study (ResultsViewer62615PUBLICDRAFT.xlsx); American Fact Finder 2014 American Community Survey (https://factfinder.census.gov/).

Codes & Standards Strategies and Tactics

BayREN C&S activities are intended to address specific market barriers with actionable strategies that engage and leverage the resources of key program stakeholders. Figure 5.3 provides a snapshot of the C&S Intervention Strategies and Tactics. These are mapped in Table 5.7 to problem statements and market barriers that have been identified through the 2013-14 CPUC C&S Compliance Improvement Process Evaluation, BayREN's work with 15 building departments as part of the 2014-15 Permit Resource Opportunity Program (PROP),[13] research of 63 Bay Area permitting agencies, participation in the 2019 T24 code development process, and ICC Chapter Engagement.

Figure 5.3. Codes & Standards Intervention Strategies and Tactics



[13] https://www.bayren.org/codes/prop-final-report

Table 5.7. Codes & Standards Problems and Market Barriers

Problem	Market Barriers	Solutions	Strategy/ Tactic
Regular updates to the energy code means compliance and enforcement requirements are constantly evolving.	• Property owners attempt to "value engineer" energy efficiency measures out of projects if possible to minimize project costs and delays. • Responsibilities for achieving and verifying compliance are impacting more building professionals and shift across members of the C&S Community. • Building departments must prioritize structural, health, and safety code related issues while also striving to enforce energy code.	The C&S Community uses: • HERS, Acceptance Testing, benchmarking, and other strategies to deliver increased and streamlined compliance. • online interfaces for: permit application; plan review; inspection requirements and verifications; permit close out.	S1/CS1
Compliance requires engaging a large and diverse group of Building Professionals that must navigate inconsistent permitting processes and requirements across Bay Area's 110 Building Departments.	• The C&S Community has limited venues engage on code and policy implementation. • Energy code requirements vary by permit scope, climate zone, and building or site attributes, while energy code interpretation and enforcement varies by jurisdiction.	The C&S Community has regular opportunity to engage on and share common and best practices.	S1/CS2
It is difficult to effectively test, promote and implement policy and retrofit best practices necessary to achieve energy efficiency, ZNE, and Climate goals.	• Siloed funding limits coordination between members of the C&S Community, while a lack of transparent data for permitting and energy code compliance makes it difficult to make informed decisions that improve compliance.	The C&S Community contributes research and findings on advanced building concepts (i.e., ZNE; benchmarking) and infrastructure supports for policy implementation.	S3/CS3, CS4

Strategy 1. Provide Wrap Around Services, Support and Financing

Tactic CS1. Increase the use of existing compliance strategies and electronic compliance tools into local building department practices and permit systems

Objective: The C&S Community delivers increased compliance and increased compliance margins through streamlined permit application, plan review, inspection requirements and verifications, and permit close out

BayREN is working with local jurisdictions, the Statewide IOU Codes team, the CEC, and the C&S community to identify, develop when necessary, promote, and deploy strategies, tools, and system technologies for energy code compliance and permitting. Near- and mid-term activities[14] include:

- Local government online- and kiosk-hosted information tools for common projects that require permits, intended to educate permit applicants about project-specific local energy code requirements, incentives for exceeding code, and best practices. Tablet-based/electronic design, plan check, and inspection software that can help building professionals and building department staff evaluate energy code requirements and compliance.
- Data systems aggregating project specifications and compliance information across multiple jurisdictions.
- Promoting Energy Code ACE and the CEC's Online Resource Center resources, and engaging building departments to increase the use of third-party verifiers and associated registries (i.e., HERS) to verify compliance.

The BayREN is specifically interested in helping the C&S community leverage existing resources, tools, and compliance mechanisms, at both the state and local level, to their greatest potential. For example, as HERS raters and acceptance test technicians (ATTC) are increasingly relied upon for third-party verification of building projects, BayREN will work with local governments and the HERS/ATTC providers to increase the transparency and accountability of these third parties. Locally, BayREN will explore software add-ons that will allow e-tools with demonstrated potential to more easily "plug-in" to common permitting systems to increase scale and scope of tool deployment.

Tactic CS2. Develop and promote energy code and best-practice trainings and workshops consistent with state and local energy goals

Objective: The C&S Community regularly engages on and shares relevant energy efficiency resources, best practices, compliance barriers

The BayREN, in coordination with partners, hosts and participates in a wide range of joint collaborations. This includes efforts to identify, develop, deliver, and promote trainings for energy code compliance and permitting. Other BayREN efforts include workshops and similar collaborations specifically focused on

[14] CEC, "EBEE Action Plan", Strategies 1.5.1; 1.5.5; 2.1.3, 3.2; 4.2.

helping building professionals and building department staff effectively navigate the parts of the energy code and state and local sustainability policies that are most relevant to them. Key topics include T24 Part 6 and Part 11 updates, common code interpretations, real estate engagement and building labeling, benchmarking and ZNE activities, and water conservation. This work leverages new and existing resources from the IOUs, CALBO, ICC, and other partners as appropriate. Near- and mid-term activities[15] include:

- Delivery of BayREN's existing T24 Part 6 trainings to complement and supplement existing IOU/Energy Code Ace trainings, with live "classroom" (60-90 minute and 4 hour sessions) and online modules that focus on specific topics such as Residential Forms and Permit Submittals for Additions.
- Quarterly BayREN-hosted Regional Forums (web-hosted statewide and in person) to address energy and sustainability topics prioritized by stakeholders and increase the common level of political/process engagement and technical understanding (i.e., as these relate to TDV, ZNE, and DER interplays) of the C&S community.
- "Energy Coach" mentoring sessions to reinforce training topics and best-practices for use of existing compliance strategies and tools (from Tactic CS1).
- Participation in local LGPs, Bay Area Green Business Program, and water agency planning groups and expansion of current engagement with ICC Chapters, CALBO, and BOMA Chapters.
- Outreach through local government channels to engage the C&S community on energy code requirements and policies, including evolving benchmarking and energy-use assessment or disclosure requirements, enabling technologies, and associated benefits and value-adds.
- Participation in state and local code update processes to increase feedback loops between the local C&S Community and state and regional policy makers.
- Posting presentation materials and supporting resources on the BayREN website and distributed to all program contacts (the BayREN's Codes & Standards contact list currently includes 2,500 individuals).

Strategy 3. Test and Demonstrate Innovative Deployment Methods

Tactic CS3. Test and promote advanced energy codes and policies including ZNE

Objective: Local governments contribute research and findings on advanced building concepts (i.e., ZNE; benchmarking) and infrastructure supports for policy implementation

Rapidly evolving approaches to outcome-based codes and post-occupancy code requirements (such as commissioning and ZNE) promise to stretch the limits of traditional building code and inspection processes. BayREN will identify and facilitate advance building code test/pilot projects that are directly applicable to local government resources, expertise, and funding to explore and respond to challenges and

[15] Ibid., Strategies 1.2.3; 1.4.1; 1.4.2;1.5.3; 2.1; 4.1.

opportunities in the implementation of energy codes and energy policies. Reach code adoption will be integrated with other BayREN Sectors, including Residential, Commercial, and Public.

The BayREN's activities will be coordinated and aligned with CEC, CPUC, and Statewide IOU efforts to increase the C&S community's ability to successfully meet new requirements. Furthermore, BayREN will support and assist county agencies' work through local partnerships to expand the region's capacity to develop and promote advanced energy codes and policies and provide data reporting and feedback loops to CEC, CPUC, and the Statewide IOU C&S teams. Near- and mid-term activities[16] include:

- BayREN support for the implementation of the Berkeley Energy Saving Ordinance (BESO) and the development of a regional network for Home Energy Score (HEScore) assessors. Support local governments to develop residential policies such as energy assessments at time-of-remodel or rental housing inspection.
- BayREN coordination with the Statewide IOU Reach Code team to develop, support, and track local energy policy and reach code implementation, including reach code tracking tools and local solar ordinances that integrate energy efficiency.
- BayREN coordination with San Francisco Department of the Environment and City of Berkeley on benchmarking requirements and the development of energy performance indexes. BayREN coordination with local governments to provide technical analysis and procurement supports for municipal buildings to more easily achieve ZNE goals while also maximizing the opportunity for efficiency. BayREN is proposing as part of the Public Sector Chapter of this Business Plan that this initiative be expanded into a standalone "Systems Integration for Early Adoption of ZNE" program (see Public Sector, page 4.4).

Tactic CS4. Make energy-related permit data more accessible to industry

Objective: The C&S community has access to permit data to increase transparency and inform decision making

The BayREN sees significant value and opportunity in aggregating the vast amount of building data held by AHJs into a regional database to inform energy policy development and implementation at the state, regional, and local level. These data can also support efforts to increase the perceived and real value of energy code compliance and help maximize the benefits of building data and energy performance for permit applicants and building owners and operators. Near- and mid-term activities[17] include:

- BayREN engagement with CEC and HERS registries to understand how building department and permit information could be integrated into a regional database.
- BayREN recruitment of partner jurisdictions to enter into data sharing agreements. Data analysis and feedback loops to inform local and regional policy development and market understanding. This will include BayREN's ZNE support for municipal buildings, Bay Area jurisdictions'

[16] Ibid., Strategies 1.7; 1.8.2; 1.8.3; 4.1.
[17] Ibid., Strategies 1.2.3; 1.4; 1.5.1; 1.8.2; 1.8.3; 3.1.2; 3.2.1; 4.1.

evaluation and adoption of various approaches to asset ratings, and working with requests from local building professionals to understand costing estimates and impacts for evolving services (e.g., average costs for a CalGreen inspection).

Data for building activity are tracked at the local level and can illustrate compliance gaps and other issues if made accessible to the C&S community. State and regional agencies and local building professionals and building departments will benefit from investing in mechanisms to effectively aggregate, rather than duplicate, these data sources. Table 5.8 sets out the anticipated C&S program.

Anticipated Program

Table 5.8. C&S Anticipated Program

Program Title	Focus	Timeframe	Existing or New	Resource (R) Non-Resource (NR)
Codes & Standards	Support C&S Community to comply with and exceed energy code requirements.	Short-term	Existing	NR

Coordinating Activities

Leveraged Resources

The BayREN can leverage various local government resources and capacities to enhance C&S activities. Foremost among these is the potential to better engage building departments to use ongoing code enforcement to educate building professionals and permit applicants on the value of energy efficiency and code compliance. The BayREN's review of 63 Bay Area jurisdictions and their building department showed that these 63 Building Divisions or their departments received over $56M in funding for fiscal year 2015-16.

In addition to ratepayer funded activities, BayREN C&S leverages BayREN and BayREN-agency led work supported by other funding streams including local government funds, California Energy Commission, U.S. Department of Energy, and Department of Water Resources Grants. BayREN is also leveraging regional relationships with the Bay Area Regional Collaborative and the Bay Area Air Quality Management District to fund codes-related activities, and will also be actively engaged with the other regional agency, the Metropolitan Transportation Commission.

The BayREN C&S activities, due to their cross-cutting nature will be leveraged by and coordinated with the BayREN's Residential, Commercial, and Public Sector programs. Coordinated activities with the IOU Statewide C&S team and local ICC Chapters also leverages resources and outreach channels and increases the impact of each organization's efforts.

EM&V Efforts

BayREN is actively involved in EM&V working groups and planning exercises with the CPUC and Statewide IOU C&S team.

Responses to the 2013-14 Compliance Improvement Process Evaluation

- **Recommendations for Permit Resource Opportunity Program (PROP):** BayREN's 2013-15 Compliance Improvement work was focused principally on the Permit Resource Opportunity Program (PROP). The findings from this work have significantly informed current C&S activities for Energy Code Compliance Tools and Services. This includes more focused and resource-efficient efforts to distribute information tools and resources, and a shift to testing and demonstrating strategies for electronic and web-based compliance tools.

- **Recommendations for BayREN Trainings and Regional Forums:** Since 2015, the BayREN and IOU C&S teams have maintained more regular coordination activities to ensure trainings and forums address areas of non-compliance and code changes while engaging as large of an audience as possible. All of BayREN's 2016 forums have been offered both in person and by webinar, and

training modules are currently being transitioned to webinar format. In 2016, BayREN also became an ICC preferred training provider allowing for Continuing Education Units.

- Increased engagement with ICC Chapters, CALBO, AIA, and other professional groups through trainings, forums, workshops, and other collaborations has also increased BayREN's ability to use these organizations and their networks to distribute information and resources for energy code compliance, energy code update processes, and general energy policy and energy efficiency announcements.

- BayREN Trainings, Forums, and other joint collaborations are a critical channel for input and feedback from the C&S Community. This not only helps establish a record to inform state and regional policy development, but also ensures C&S activities remain responsive to existing and evolving needs. Forums also allow the diverse stakeholder attendees, including elected officials, building department heads and staff, regulatory agency staff and others, to share lessons learned and best practices. Strong professional relationships have been built through these forums that allows for organic mentoring among Bay Area jurisdictions.

- **Recommendations for BayREN Tools:** BayREN compliance improvement tools reviewed for the 2013-14 Evaluation were paper-based (or PDF) checklists and guides, developed to address needs expressed by building department staff and building professionals in the 2013 BayREN C&S Survey and 2014 PROP work. BayREN has sought to increase the use of these tools through several strategies, including mailing campaigns and webinars to make the paper tools more immediately accessible to users and, in collaboration with the CEC, to include links to the tools in the CEC's Online Resource Center. BayREN has also worked with the CEC to contribute content from certain checklist and guides to the 2016 T24 Compliance Manual. Content for the checklists and guides has also served as the informational foundation for BayREN's current and proposed online- and kiosk-hosted information tools for common projects requiring permits (e.g., residential water heater replacement).

Anticipated EM&V Study and Data Needs

The BayREN plans to conduct a bi-annual C&S Community Survey to obtain regular feedback to the program. This would build off of BayREN's similar survey from 2013, and would explore compliance barriers, training needs, permit volumes and trends, and permitting practices.[18] These regular surveys will also help BayREN contribute to the EM&V Roadmaps and Plans with input and feedback from the C&S community. Specific topic areas that should be addressed in these plans include:

- The increasing interplay of energy codes and energy policy as related to energy efficiency, solar electric systems, solar hot water, battery storage, and electric vehicle infrastructure. To effectively support T24 updates and development and energy policy implementation, activities within the Energy Efficiency Portfolio must be able to recognize this interplay and address it appropriately.

[18]https://www.bayren.org/sites/default/files/BayREN%2520CS%25202013%2520Survey%2520Report%2520for%2520BayREN%2520website.pdf

- The opportunity to leverage local government permit data to inform assumptions and methodologies for measure costs, cost-effectiveness, code impacts, and reach code adoption.

BayREN is also interested in working with the CPUC and the Statewide IOU team to determine the best ways to evaluate and learn from test projects and other demonstrations conducted by BayREN. For instance, there are opportunities for BayREN and the IOUs to coordinate more closely on Code Readiness projects, piloting of new code language, and reach code cost-effectiveness studies and impact tracking. BayREN is eager to work with Energy Division to establish appropriate expectations, protocols, levels of rigor, and response times for this type of EM&V approach. BayREN is also interested in working closely with the CEC to determine how local jurisdiction information can be used to support the implementation of SB 1414 and requirements for HVAC equipment tracking. Table 5.9 sets forth EM&V study needs identified by BayREN.

Table 5.9. EM&V Study Needs

Study Title/ Topic Focus	Research Question(s)	Objective	Timeframe
Impact of E-Permitting	• Does e-permitting increase permitting rates? • Lower job costs for contractors? • Increase building department efficiencies?	Understand the value of e-permit systems to expand their use.	Short-term
Impact of Local Ordinances	• How can the impact of local ordinances effectively be tracked? • What are the energy savings delivered by local ordinances?	Inform the further development of advanced energy policies.	Mid-term
Compliance Improvement Control Trials	• Can [to be determined tool/service] improve compliance/compliance margins? • Can [to be determined tool/service] increase the energy savings delivered by building projects?	Evaluate the cost-benefit of specific compliance tools/services.	Mid-term

Marketing, Education, & Outreach

BayREN's unique organizational structure as a collaboration of the nine Bay Area counties has enhanced the success of its programs through our ability to act as trusted messengers. As local governments, we are known by the local communities and have a long record of delivering successful programs and services. Within Codes & Standards, this trusted messenger role enables BayREN's engagement with the C&S community for a number of implementation activities. This engagement is conducted directly through the county-level BayREN representatives with known staff contacts in the 101 local cities. Each county's representative works with:

- Chief building officials and building department staff at local jurisdictions.
- Planning and sustainability staff with local jurisdictions.
- Local ICC Chapter leaderships and membership.
- Building professionals and building owners and managers participating in other BayREN programs.

Therefore, the primary marketing need for BayREN C&S is continued use of its website (with over 5,000 unique page views since October 2013) and its email contact list (~2,500 contacts) to regularly communicate with the C&S community. BayREN uses these outreach channels to share updates from the BayREN, local jurisdictions and partners, the Statewide IOU team, the CEC, and other stakeholders.

Table 5.10. Marketing, Education, & Outreach Approaches and Coordination

Marketing Need	Approach	Objective	Timeframe
Host information, resources, and event details.	Use BayREN hosted website; provide links to CEC On-Line Resource Center, Energy Code Ace, and other aligned websites.	Build awareness of programs and services.	Short-term
Communicate information, resources, and event details.	Send email announcement and updates to contact list(s); promote aligned messaging from BayREN C&S partners and aligned parties.	Build awareness of programs, services, and aligned initiatives.	Short-term

Workforce Education and Training

One of BayREN Codes & Standards' primary activities is to provide training to building professionals and building department staff to increase compliance with the energy code and ensure energy efficiency measures have been installed by a skilled and trained workforce. This is consistent with the overall focus of Codes & Standards' activities and the overarching vision of enabling the C&S community to effectively deliver the intended benefits of proper permitting and compliance at a scale needed to achieve the state's energy goals for new and existing construction. BayREN C&S also works with the other BayREN sectors to promote proper permitting practices consistent with the building code and legislation (e.g., SB 1414).

Cross-Cutting Initiatives

The BayREN C&S activities will be closely aligned with the BayREN Residential, Commercial, and Public sectors to ensure coordinated delivery of services and stakeholder engagement. Further discussion of cross-cutting supports is provided in the Residential, Commercial, and Public Sector Chapters.

Key Partners/Coordination

Since the launch of the program in 2013, the BayREN has made significant progress in clarifying its role and the value it offers to key partners and stakeholders. Table 5.11 identifies local members within the C&S community and their compliance responsibilities. Highlights for planned coordination include but are not limited to:

- Closer coordination with the Statewide IOU and PG&E C&S teams to more effectively deploy non-duplicative resources and activities.
- Regular engagement with the CEC Standards Development and Education and Outreach teams.
- Regular attendance at Bay Area ICC Chapter meetings and open communication channels with CALBO.

Table 5.11. Local Roles within C&S Community[19]

Role	Overview	Compliance Responsibilities
CBOs (LG)	Oversee activities of building department staff, determine priorities, staffing, and budget needs for department.	• Guides counter techs, plans examiners, and inspectors in setting priorities for project review, designating importance of Title 24, Part 6 and 11 among other codes and standards. • Sets priority for training among staff. • Informs decisions around infrastructure projects including online permitting platforms.
Planners (LG)	Review projects for compliance with general plans and CEQA, issues entitlements.	• Peripheral role in reviewing energy-related aspects of projects such as siting for renewables, grid impacts, transportation impacts, and CEQA compliance associated with energy efficiency (Appendix F).
Counter Techs (LG)	Review permit submittal package for appropriate forms and components.	• Review permit submittal package for appropriate forms and components (all codes, not just energy efficiency).
Plans Examiners (LG)	Review complete permit submittal package for code compliance, health and safety, etc.	• Reviews plans for all code compliance, not just energy efficiency. • Issues permit.
Building Inspectors (LG)	Physically inspects installation of building features for code compliance, health and safety	• Makes multiple site visits to verify code compliant and proper installation of features (all codes, not just energy efficiency). • Closes permit. • Issues certificate of occupancy.
Architects	Designs projects, manages design team including owner and design engineers.	• Specifies products, develops system layouts and floorplans. • Draws project plan sections and details. • Completes compliance forms and uploads to HERS registries. • Compiles permit application submittal package. • Some construction-phase duties.
Design Engineers	Electrical, mechanical, and plumbing designers design project components to meet code compliance and owner desires.	• Specifies products and performance requirements for applicable components. • Develops applicable system layouts. • Draws sections/details for applicable components. • Completes applicable compliance forms. • Completes permit application submittal package.
Energy Consultants	Advises design team on energy code requirements, performs energy modeling and completes compliance documentation to meet code requirements.	• Performs energy modeling and load calculations. • Advises design team on compliant project approach. • Completes forms and uploads to HERS registry.
Builders/ General Contractors	Coordinates construction and manages project schedule and budget to complete project to specified design.	• Coordinates with design team and installers to install project features. • Determines which forms to post onsite for inspections, completes forms on HERS registry. • Coordinates inspections with HERS raters, ATTS, building inspector. • Provides owner with complete package of completed forms.
HERS Raters	Performs field verification and diagnostic testing to confirm compliance with T24, Part 6, and that systems are installed and functioning properly.	• Performs field verification and diagnostic testing to confirm compliance on projects that trigger HERS requirements. • Signs and uploads compliance docs to HERS registry.

[19] This table has been developed in coordination with the Southern California Regional Energy Network.

Role	Overview	Compliance Responsibilities
Acceptance Technicians	Performs field verification to certify lighting controls are properly installed and operational.	• Performs field verification to certify compliance on commercial lighting projects. • Completes and submits Acceptance Test forms.
Cx Agents	Commission building systems prior to permit closure/certificate of occupancy issuance.	• Completes and submits commissioning report to owner for display at final inspection.
Residential, Commercial, Multi-Family Building Owners, Operators & Portfolio Managers	Hires design and construction team to build project. Helps define project scope, schedule, and budget. Responsible for energy benchmarking and management.	• Benchmarking operational performance. • Defines project design elements/approach. • Ultimately responsible for obtaining permits. • Owner's Project Requirements (OPR). • Commissioning requirements. • Receives Certificate of Occupancy.
Home Inspectors	Perform residential inspections at time of sale, provide inspection report to prospective home buyer to inform of code infractions, safety concerns, and structural deficiencies.	• Informs prospective buyers of code infractions (ex: non-permitted additions) at time of sale.

BayREN / Statewide IOU C&S Complementary Activities

Coordination activities and mechanisms developed between BayREN, PG&E, and the Statewide IOU C&S Team are detailed in the Table 5.12, while Table 5.13 lists cross-sector coordination efforts.

Table 5.12. C&S Coordination

BayREN / IOU C&S Program Areas / Activities	Complementary Approaches to Intervention Strategies	Coordination Mechanisms
Code Development	Statewide IOU C&S Team: Advocacy for Building Codes (Intervention 1) BayREN: Energy Code Workshops (CS2)	• IOU and CEC public code update workshops. • Coordinated outreach to ICC Chapters.
Local Government Ordinances and Policy Supports	Statewide IOU C&S Team: Technical Assistance for Reach Codes; Code Readiness (Interventions 2, 4) BayREN: Energy Code Workshops, Test Advanced Codes, Permit Data (CS2, 3, 4)	• BayREN Regional Forums and collaborations • IOU Workshops. • Statewide IOU Reach Code coordination calls. • Shared tracking sheets for Reach Code requests/resources. • Website cross-links.
Code Compliance	Statewide IOU C&S Team: Compliance Improvement (Intervention 3) BayREN: Energy Code Tools, Workshops, Permit Data (CS Tactics 1, 2, 4)	• BayREN/PG&E C&S coordination calls. • Training referrals and co-hosting. • Website cross-links.

Table 5.13. BayREN Cross-Sector Coordination

Other REN Programs	Coordination Mechanism	Expected Frequency
BayREN Single Family, Multifamily, Commercial, Public	BayREN Coordinating Committee	Bi-weekly
SoCalREN and 3CREN C&S	Coordination Calls	Monthly
IOU Programs	**Coordination Mechanism**	**Expected Frequency**
PG&E C&S Team	Coordination calls	Monthly
Statewide IOU Reach Code Program	Coordination calls	Bi-Weekly
Statewide IOU C&S Sector	Coordination calls	Bi-Annually
Coordination Partners Outside the CPUC	**Coordination Mechanism**	**Expected Frequency**
CEC	Coordination calls	Monthly
Local ICC Chapters	Chapter meeting attendance	Monthly/Bi-Monthly
CALBO	Coordination calls	As needed
Bay Area Air Quality Management District	Coordination meetings	Quarterly
BOMA (Easy Bay and San Francisco Chapters)	Chapter meeting attendance	Quarterly
BIA - East Bay	Chapter meeting attendance	Quarterly
American Institute of Architects (Bay Area Chapters)	Chapter meeting attendance	Quarterly
Bay Area LGPs	Coordination calls; shared staffing/roles	Ongoing

Section 6
WATER-ENERGY NEXUS

BAY AREA Regional Energy Network

Section 6. Cross-Cutting: Water-Energy Nexus

Introduction

BUSINESS PLAN VISION, OUTCOMES AND BUDGET

Vision

Water utility customers can opt to pay for cost-effective and/or required efficiency improvements as part of their utility service.

Public Sector Outcomes

- *40 Bay Area water utilities offer on-bill efficiency services to their customers.*

2018-2025 budget (total) *$7.2 M*

The BayREN's Water-Energy Nexus work supports partner municipal water utilities to encourage customer water efficiency while capturing additional energy efficiency where possible. The current BayREN initiative provides Partner Utilities with model tariffs, on-bill program designs, and technical assistance to enable the installation of water and, depending upon the Partner Utility, energy improvements.[1] Participating customers pay for services through a monthly tariffed "efficiency charge," which appears as a line item on their utility bill and is based on their metered use. The BayREN is proposing to expand these efforts to increase Bay Area water utilities' commitment and capacity to provide eligible customers with optional and voluntary services for water and energy efficiency property improvements. As a cross-cutting initiative, the BayREN's Water-Energy Nexus work is coordinated with BayREN Residential, Commercial, and Public Sector activities.

Work to date has allowed the Town of Windsor, the City of Hayward, and East Bay Municipal Utility District (EBMUD) to provide single family and multifamily water customers with services to install high efficiency indoor plumbing fixtures, convert lawns to drought tolerant landscapes, and repair and upgrade irrigation systems. These cost-effective on-bill improvements are intended to produce total utility bill savings that exceed the efficiency charge. BayREN, Partner Utilities, and stakeholders are also refining the model tariff and program design to develop low to no up-front cost options for properties to pursue improvements required by code changes, time-of-sale requirements, or emergency drought regulations.

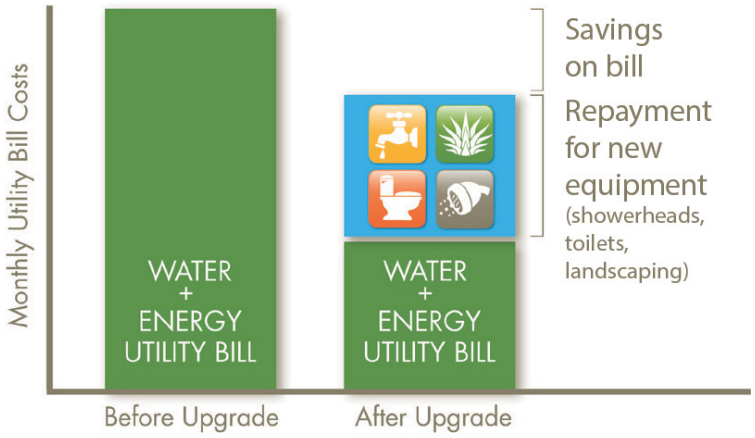
This Water-Energy Nexus Business Plan Chapter provides further detail and context for the Cross-Cutting initiative in the BayREN Residential, Commercial, and Public Sector Chapters. The initiative builds on existing activities that BayREN and the Sonoma County Regional Climate Protection Authority (the BayREN Member Agency that first implemented Windsor Efficiency PAYS® in 2012) are conducting with current Partner Utilities, feedback from water customers and contractors participating in these Partners' programs, and feedback from other industry stakeholders including realtors, apartment associations, and the PG&E finance team.

[1] From 2013-2016, this work was conducted under the BayREN PAYS® On Water Bill Program. BayREN original Program Implementation Plan that authorized this work in 2013-16 used the trademarked name of the Pay As You Save® (PAYS®) model. To enable further program evolution consistent with the PAYS® model but also aligned with the California market, BayREN is proposing to rename this already approved program to the Water Bill Savings Program.

Market Context

In the initial CPUC authorization of the RENs, it was anticipated that the REN model would be able to address and design new approaches for water-energy nexus programs based on local government relationships with water providers.[2] The BayREN has piloted and found a successful approach to doing just that. The model tariffs and on-bill program designs developed by BayREN can be deployed by any municipal water utility that has the authority to establish a tariff and the ability to add and track line-item charges on its customers' water bills. For these utilities, on-bill efficiency improvements can be provided to eligible customers as an optional voluntary part of their utility service. Utility bill savings are greatest for customers with volumetric (rather than flat) water and sewer rates. Figure 6.1 illustrates the on-bill concept, showing how efficiency improvements, by lowering utility bills, pay from themselves over time.

Figure 6.1. The On-bill Model



While any customer class with a municipal water utility account could use on-bill programs to make efficiency improvements, BayREN's programs to date have principally served single family and multifamily residential customers. The PAYS model in other states has been successfully deployed to serve commercial and municipal customers.[3]

An analysis of 72 Bay Area water utilities indicates that 66 may be able to offer cost-effective on-bill improvements to single family and/or multifamily customer classes, with potential markets of 1,360,000

[2] CPUC, Decision 12-05-015, May 18, 2012, page 150.

[3] The PAYS® model in other states has been used successfully to serve commercial and municipal customers. Kansas' How$mart® program (MidWest Energy), started in 2008, reported 15% of participants were commercial customers. New Hampshire's SmartStart program started in 2002 (EverSource formerly Public Service of New Hampshire) serves municipal customers. Arkansas' HELP PAYS® program (Ouachita Electric Cooperative) invested 1.5 million dollars in its first four months of operation; one third of these funds were targeted to two municipal customers. All of these programs are still in operation.

single family homes[4] and 480,000 multifamily housing units.[5] Eligible improvements would include basic indoor plumbing fixtures (high efficiency toilets, showerheads, and aerators) and could be expanded in certain areas to include lawn conversion to drought tolerant landscaping. Costs for these improvements typically fall below common thresholds for other financing mechanisms, such as PACE for example, which typically has a minimum project value of $5,000. BayREN on-bill program designs are intended to address the barriers that these other financing mechanisms have, relating to various participant and improvement eligibility requirements (i.e., being the property owner or not allowing sheet mulching, a common water efficient landscaping practice).

[4] 2010-2014 American Community Survey 5 year Estimates. Number of housing units, residents per unit, vacancy rates, building sizes and age. Single family housing= 1 unit detached built before 2014

[5] The Bay Area is served by 91 water utilities, BayREN's analysis focused on the largest 72 utilities based upon population. Population estimates are based on 2009-2013 American Community Survey 5-Year Estimates. Number of housing units, residents per unit, vacancy rates, building sizes and age. Multifamily housing =5 or more units built before 2000

Sector Summary

Partner Utilities operating BayREN-facilitated on-bill program designs offer their customers the opportunity to voluntarily install cost-effective improvements on their property and repay for these improvements over time on their water bill. Efforts are made to provide a simple path to provide these services with:

- No up-front cost, no new debt obligation, no credit checks, and no liens.
- A utility-approved monthly efficiency charge that is lower than the utility (water, sewer, and energy) bill savings generated by the improvements.
- Repayment required only while the participant is a utility customer at the project location and the improvement is within its useful life.
- A guarantee that failed improvements are repaired or the payment obligation is terminated.

These four assurances provide an opportunity for any customer type to benefit from efficiency as part of their utility service. They also position this on-bill model as a mid-to-downstream strategy, in which customers receive the ongoing benefits of efficiency as a service (including repair of improvements when cost-effective) for the duration of the repayment term. This provides BayREN and California ratepayers with a model that:

- Promotes an efficiency service specifically designed to provide customers with measures, upgrades, and consumer protections that result in net utility bill savings.
- Serves typically hard-to-reach sectors (e.g., affordable multifamily housing) and allows existing rebate funds to be repurposed for more strategic purposes by increasing the potential for cost-effective project costs to be paid by customers over time on their utility bill.
- Provides an on-ramp to efficiency and long-term program and contractor relationships
- Can be used to pursue property improvements required by code changes, time-of-sale requirements, or emergency drought regulations.

Although there is opportunity for various property improvements to be facilitated by program services and the associated efficiency charge, a “Basic” cost-effective measure package has been used by Partner Utilities to date as an initial entry point to program services. As Partner Utilities are currently all municipal water utilities, this Basic Package includes:

- A 1.06 gallon per flush or better toilet with a Maximum Performance (MAP) rating of 600 grams or more.
- A high efficiency (typically 1.5 gallon per minute) showerhead.
- A 1.0 gallon per minute bathroom faucet aerator.
- A 1.5 gallon per minute kitchen faucet aerator.

The Basic Measure package meets or exceeds requirements of the Water Conservation Act of 2009 (SB X7-7)[6] and can be used to help properties comply with the pending 2017 (single family) and 2019 (multifamily) time-of-sale requirements created by SB 407.[7]

[6] http://leginfo.legislature.ca.gov/faces/billCompareClient.xhtml?bill_id=200920107SB7
[7] http://leginfo.legislature.ca.gov/faces/billCompareClient.xhtml?bill_id=200920100SB407

Evolving Approaches

The BayREN's Water-Energy Nexus initiatives will continue to evolve over the next ten years, consistent with guidance from the Commission, EM&V Evaluations, other state water agencies as appropriate, and the needs of Bay Area water utilities and water customers. We will continue to pursue partnership opportunities with the Statewide IOU Finance Team, local building and landscape professionals, and local building and planning departments. BayREN will also continue to focus efforts on activities that meet the needs of these stakeholders, do not duplicate efforts of other Program Administrators, and test innovative services and tools that could be scaled to larger regional or statewide efforts.

Over the long term, these activities are intended to significantly expand the opportunity for Bay Area water customers to pay for cost-effective and/or required efficiency improvements as part of their utility service rather than as an out-of-pocket expense. Short- and medium-term efforts are intended to:

- Share lessons learned from Partner Utility on-bill programs (i.e., the Town of Windsor, the City of Hayward, and EBMUD) to inform ongoing market and technical adjustments within each Utility's offering.
- Develop a regional program model that would centralize funding and administration under a Joint Powers Authority (JPA) that would allow:
    - Easier opt-in for utilities and their water customers.
    - Refinement and expansion of program services to better meet the needs of various customer types, including affordable housing and small-to-medium commercial properties.
    - Greater access to capital aligned with these different "asset classes" to pay for up-front project costs.
    - Better alignment with BayREN and PG&E energy efficiency programs (rebate, technical advising, and financing), and MCE when necessary, providing participating customers with more pathways to pursue water and energy property retrofits.
- Grow a financing marketplace with tariffed efficiency services and improvements, enabling qualified contractors and building professionals to deliver turnkey water and energy efficiency projects.

These proposed activities will be informed by ongoing stakeholder engagement, including work with multifamily property owners and groups, the real estate industry, the finance industry, and efficiency-as-a-service companies (ESCOs) and organizations. Table 6.1 summarizes the growth of BayREN's on-bill financing programs.

Table 6.1. Water-Energy Nexus Achievements

	2013	2014	2015	2016
# Municipal Utility Partners	3	3	3	3
# On-Bill Program Designs In-field	1	1	2	3

These past achievements have focused on providing individual Partner Utilities with the following supports:

- Town of Windsor – Windsor Efficiency PAYS®: Residential field services since October 2012 for single and multifamily. Services include indoor plumbing fixtures and outdoor turf conversion to drought tolerant landscapes. Commercial landscaping services launched in December 2014. Services include installation of weather-based irrigation controllers and irrigation system repairs.
- City of Hayward – Green Hayward PAYS®: Multifamily residential indoor and multifamily/commercial landscaping field services since August 2015. Services include indoor plumbing fixtures, common area energy measures that deliver savings to the property owner (lighting, hot water distribution, etc.), and weather-based irrigation controller installation.
- East Bay Municipal Utility District – EBMUD WaterSmart On-Bill Program: Multifamily residential indoor and single family/multifamily/commercial landscaping components approved for test projects, with field services available since July 2016.

As of January 2017, these programs have delivered retrofits to 230 single family homes and 400 multifamily units.

Vision, Intervention Strategies, and Objectives

Table 6.2 shows how the Water-Energy Nexus activities are aligned with BayREN's overarching intervention strategies to demonstrate innovative deployment methods and advance energy efficiency with wrap-around services and supports. Activities address key policy directives and fill gaps not currently met in the portfolios of other Program Administrators. If successful, activities will demonstrate a functional model to rapidly scale cost-effective and necessary property improvements for water and energy efficiency.

Table 6.2. Water-Energy Nexus Strategies and Tactics

Intervention Strategy	Tactic	Objective
S1. Provide Wrap- Around Services and Support	WE1. Expand the number of participating municipal utility partners to scale on-bill market and service delivery.	*Partner Water Utilities' increased participation will improve access to capital and capacity to expand the number of water efficiency projects.*
	WE2. Facilitate adoption of model tariffs and on-bill program design for market consistency**.**	*Regionalized efficiency services streamline program delivery and increase property owners' and market actors' ability to participate in utility-facilitated efficiency services at scale.*
	WE3. Provide technical assistance to refine program components to meet efficiency needs specific to target customer classes.	*Customers and utilities have ongoing support to ensure on-bill services deliver expected resource savings and provide exceptional customer experiences with efficiency.*

Water-Energy Nexus Sector Budget and Metrics

Budget

The budget (Table 6.3) will facilitate the forecasted short-, mid-, and long-term metrics targets with the expectation that increased participation and project volume are achieved as efforts scale and gain traction. The budget represents an increase in current funding to support the expansion of the proposed activities, which include increased effort to recruit Partner Utilities to the Regional JPA program model and ensure program designs and model tariffs meet the needs of all appropriate customer classes.

Table 6.3. Water-Energy Nexus Budget

Budget ($)	2016*	2017*	2018	2019	2020	2021	2022	2023	2024	2025
Admin**	48,983	34,610	**	**	**	**	**	**	**	**
Implementation	270,536	257,085	976,000	867,000	799,000	780,000	777,000	807,000	893,000	959,000
Marketing	82,199	69,451	75,000	77,000	32,000	44,000	34,000	35,000	48,000	37,000
Non-Incentive Total	**401,718**	**361,146**	**1,051,000**	**944,000**	**831,000**	**824,000**	**811,000**	**842,000**	**941,000**	**996,000**
Incentive	-	-	-	-	-	-	-	-	-	-
TOTAL	**401,718**	**361,146**	**1,051,000**	**944,000**	**831,000**	**824,000**	**811,000**	**842,000**	**941,000**	**996,000**

** 2016's actual budget and 2017's proposed budget are included for reference. 2018 budget is proposed as year 1 of the Business Plan.*
*** With this Business Plan, BayREN proposes to reallocate Administrative costs from Sector Program budgets to the overall BayREN Portfolio budget. As a result, starting in 2018, Administrative allocations have been removed from Sector Program budgets. Additional discussion in Overview.*

Sector Metrics

The metrics in Table 6.4 align with the Intervention strategies outlined in the previous pages and indicate anticipated short-, mid- and long-term targets for each program area.

Table 6.4. Water-Energy Nexus Metrics

Intervention Strategy	Market Effect Metrics	Baseline	Metric Source	2018-2020 Target*	2021-2024 Target*	2025+ Target*
S1. Provide Wrap- Around Services and Support **Estimated % of annual budget: 100%**	Output: Number of water utility accounts participating	2016 Baseline: 630 participants	Program Tracking Data	Annual average of 1,800 new participants[8]	Annual average of 3,600 new participants	Annual average of 5,000 new participants
	Output: Energy savings, including embedded water savings and site savings	2016 Baseline: "basic" package savings average per participant[9]: kWh (embedded); Therms & Gallons Water (site)	Program Tracking Data	Average annual savings: 57,000 kWh: site+embedded; 40,000 therms; 16,800,000 gallons water	Average annual savings: 109,000 kWh: site+embedded; 77,000 therms; 32,200,000 gallons water	Average annual savings: 152,000 kWh: site+embedded; 107,000 therms; 44,700,000 gallons water
	Outcome: Number of Partner Water Utilities offering on-bill efficiency services	2016 Baseline - 3 partners	Program Tracking Data	10 Partner Utilities (~11% of Bay Area Water Utilities)	20 Partner Utilities (~22% of Bay Area Water Utilities)	40 Partner Utilities (~43% of Bay Area Water Utilities)

** 2018-2020 (Short-term); 2012-204 (Mid-term); 2025+ (Long-term).*

[8] Participation averages are based on a 1% annual market penetration of single and multifamily account in a representative sample of potential Partner Utilities to be targeted for enrollment in the respective short term (i.e., 10 utilities) midterm (i.e., 20 total utilities) and long term (i.e., 40 utilities). This rate of market penetration is assumed based upon 5% market penetration in the first 2 years of Windsor Efficiency PAYS®.

[9] Average savings based upon common existing indoor plumbing fixtures for Bay Area single and multifamily properties as cited by East Bay Municipal Utility District and Santa Clara County fixture penetration studies, installed "Basic" indoor fixture package as cited in the Sector Summary above, common occupancy and usage rates, and embedded kWh savings in saved water from the Water-Energy Nexus calculator v. 1.04 (http://www.cpuc.ca.gov/nexus_calculator/).

Market Characterization and Trends

"Some of the cheapest greenhouse gas emission reductions available seem to be not energy-efficiency programs, but water-efficiency programs."[10]

California's water use is estimated to consume 19% of the electricity in the state.[11] This fact, paired with the ongoing drought and the relative cost-effectiveness of water measures, offers a substantial incentive to address water use in the Bay Area as part of the BayREN portfolio. The Bay Area is served by 91 water utilities, and 66 of these are strong candidates for the BayREN's on-bill program design.[12] These utilities represent 1,840,000 housing units in the Bay Area.

Approximately 80% of Bay Area homes were built before 1994, and it is likely that a vast majority of these homes have plumbing fixtures (toilets, showerheads, and aerators) that would benefit from upgrades that would reduce water use and energy consumption.[13] In addition, a new California law enacted by SB 407 requires all toilets rated to flush at more than 1.6 gallons to be retrofitted to a low-flow toilet starting in 2017.[14] This mandate can serve as a powerful marketing tool for a customer-friendly program aimed at making water efficiency affordable and simple. Further, analysis of the BayREN's current program found that cost-effective savings can be achieved by installing the Basic Measure Package in newer properties. For example, although Windsor is a newer community where many homes have toilets rated at 1.6 gallon per flush, actual measured flush volume averaged 2.2 gallons per flush, indicating that many properties could cost-effectively upgrade these fixtures. Combined, the 66 utilities identified could provide cost-effective indoor plumbing fixture retrofits for nearly 1,360,000 single family homes[15] and 480,000 multifamily housing units.[16]

The measures included in the Basic Package are (1) high efficiency toilets and showerheads, and (2) bathroom faucet aerators and kitchen faucet aerators that exceed current code requirements. While the Basic Package is well-suited for residential customers (single and multifamily), other cost-effective measures are appropriate for commercial properties, including irrigation and other improvements for large commercial landscapes and upgrades to commercial kitchens. Additional potential measures include common area lighting, in-unit LED lighting, and landscaping. The maps in Appendix A further detail the

[10] Peter Gleick, Pacific Institute, "Water Efficiency Key to Saving Energy", Worldwide Watch Institute, January 10, 2017.
[11] NRDC, "Water Efficiency Saves Energy: Reducing Global Warming Pollution Through Water Use Strategies", March 2009.
[12] Based upon analysis of these utilities' water, sewer, and energy rates indicating an opportunity for cost-effective installation of the current Basic Package of measures identified.
[13] 1994 was the year increased toilet efficiency became mandated under the Energy Policy Act of 1992. See Residential Sector Market Analysis for more details on Bay Area building vintages.
[14] https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=200920100SB407.
[15] Based on 2010-2014 American Community Survey 5 year Estimates, Bay Area water utility fixture studies, and prevailing wage calculations. ACS data included review of number of housing units, residents per unit, vacancy rates, building sizes and age. Single family housing = 1 unit detached built before 2014.
[16] Based on 2009-2013 American Community Survey 5 year Estimates, Bay Area water utility fixture studies, and prevailing wage calculations. ACS data included review of number of housing units, residents per unit, vacancy rates, building sizes and age. Multifamily housing = 5 or more units built before 2000.

Bay Area water providers whose customers can cost-effectively pay for the installation of efficiency improvements through an on-bill efficiency charge.

Scale and Opportunity

A study published by ACEEE[17] evaluating the opportunities and areas for energy savings connected to water found that the greatest potential for residential saving was associated with hot water management and conservation. The BayREN Water-Energy program addresses this through shower and faucet aerator improvements as well as improvements to hot water circulation systems. However, the opportunity to capture energy savings from water efficiency also applies to cold water savings from toilet, landscape, and other improvements that reduce demands for the delivery and treatment of water, as well as the treatment of sewage and run-off. Table 6.5 contains a summary of potential savings identified by the ACEEE study for various kinds of water efficiency programs. The BayREN Water-Energy programs will work with Partner Water Utilities and the CPUC to more fully explore the site and embedded energy savings from water improvements and work to reduce the silos in program delivery cited by ACEEE as persistent barriers to understanding the potential and scale of water efficiency improvements.[18]

Table 6.5. Potential Energy Savings from Water Efficiency Programs[19]

Type of Program	Reduction Taken	Energy Savings (million kWh)
Water service electricity use saving.	1% of American homes replaced their older, inefficient toilets with WaterSense.	38
Indoor residential electricity use saving.	Hot water reduction of 20%.	41,000
Water supply and treatment systems.	5% reduction in water supply and treatment leaks, equal to 0.5% of total water supply.	313

The opportunity for the BayREN Water-Energy Nexus programs to serve commercial and municipal on-bill projects is still being explored with both Partner Utilities and the other BayREN sectors. However, the potential water and energy savings that could be delivered by expanding on-bill services to these sectors is significant. Looking at just one specific technology area—dish washing in commercial kitchens, which is a significant area of interest of BayREN partner EBMUD—upgrades to rack conveyor and flight conveyor dishwashers averaged 60% water/65% energy and 75% water/55% energy savings, respectively, in a recent study by PG&E's Food Service Technology Center.[20] These savings would allow bill neutral on-bill upgrades to be made with very short repayment terms, a critical need for commercial kitchens which typically have little operating budget for "extra" purchases like efficient upgrades.

[17] Young, Rachel, "Watts in a Drop of Water," ACEEE White Paper, November, 2014.
[18] Energy savings targets proposed earlier in this chapter include embedded energy savings calculated using the CPUC's Water-Energy Nexus Calculator v. 1.04 (http://www.cpuc.ca.gov/nexus_calculator/).
[19] Griffiths-Sattenspiel and Wilson 2009
[20] http://aceee.org/sites/default/files/files/pdf/conferences/hwf/2016/Delagah_Session7B_HWF16_2.23.16.pdf

Water-Energy Nexus Strategies and Tactics

BayREN Water-Energy Nexus initiatives are based on the use of a utility tariff to offer efficiency improvements and bill savings to any utility customer with cost-effective potential. With this effort, BayREN is providing a tool to access underserved market sectors and increase participation in other programs, including those administered by both BayREN and other Program Administrators. In the short term, these efforts will be deployed for residential customers and in the midterm or long term, expanded to commercial and municipal customers as agreements are made possible with Partner Utilities. Table 6.6 maps the key problems and market barriers to the Sector's solutions and tactics. These Sector Tactics are incorporated under Intervention Strategy 1. Provide Wrap-Around Services, Support, and Financing.

Table 6.6. Water Nexus Problem and Market Barriers

Problem	Market Barrier	Solutions	Strategy/ Tactics
Water and energy efficiency services are siloed across a diverse landscape of over 91 water utilities and 4 energy utilities, all with different capacities for efficiency programs.	Building professionals lack access to streamlined high-volume customer efficiency programs for water.	Expand the number of participating municipal utility partners to scale on-bill market and service delivery. Facilitate adoption of model tariffs and on-bill program design for market consistency.	S1/WE1 S1/WE2
Many utility customers are prevented from enjoying the benefits of efficiency and/or face challenges in meeting requirements to make water efficiency improvements.	Many customers are excluded from programs because they lack property ownership, capital, information about savings potential, or time to participate.	Provide technical assistance to refine program components to meet efficiency needs specific to target customer classes.	S1/WE3

Ultimately, BayREN's Water-Energy Nexus efforts will enable efficiency to become a core part of utilities' customer service offerings. Transitioning to a model where participating customers pay for retrofits out of their bill savings allows a limited amount of ratepayer funds to be leveraged strategically to continue pursuing deeper energy efficiency opportunities. The split-incentive barrier is overcome when efficiency is extended to any customer as part of utility service.

The program will provide a different mechanism to deliver efficiency improvements that directly supports the goals of SB 350 to serve low-income, moderate-income and disadvantaged communities. It will also demonstrate a model that can serve municipal utilities in achieving other community goals—such as rental property condition and safety, greenhouse gas reductions, and water conservation targets.

Strategy 1. Provide Wrap-Around Services, Support, and Financing

WE1. Expand the number of participating municipal utility partners to scale on-bill market and service delivery

Objective: Partner Water Utilities' increased participation will improve access to capital and capacity to expand number of water efficiency projects

Based on input and lessons learned, BayREN will develop scalable opportunities for the delivery of efficiency services through an on-bill model. Near- and mid-term activities include:

- Engaging potential Partner Utilities with billing system functionality to add line-item charges to a utility bill to develop a regional program model.
- Enrolling Partner Utilities based upon commitment to implement the program, utility tariff authority and billing structures, and willingness to participate in regional program administration and service delivery mechanisms.
- Development of a regional program model that meets the needs of committed Partner Utilities and centralizes funding, administration, and service delivery under a JPA.

The regional approach has been identified by current Partner Utilities and BayREN staff as a way to enable JPA member utilities to be pooled into a single entity that could then raise capital (through the issuance of bonds for example) to facilitate the delivery of program services—installation of water and energy upgrades—to member utilities and their customers.

WE2. Facilitate adoption of model tariffs and on-bill program design for market consistency

Objective: Regionalized efficiency services streamline program delivery and increase property owners' and market actors' ability to participate in utility-facilitated efficiency services at scale

By engaging multiple municipal water agencies in a regional program model, BayREN's Water-Energy Nexus programs will contribute a water-specific mechanism for tariffed efficiency services and improvements to the growing marketplace of retrofit financing products. Near- and mid-terms activities include:

- Continuing stakeholder and industry engagement and the leveraging of the BayREN Codes & Standards community and other agency relationships to refine model tariffs and on-bill program designs to address critical issues of disclosure and transferability of efficiency charges and the long-term ability of on-bill services and improvements to provide persistent savings.[21]

[21] Stakeholders engaged to date include contractors, distributors and suppliers, mission driven banks, municipal rate water experts, public financing experts, real estate and lending professionals, multifamily housing groups, and California state government representatives and elected officials.

- Engaging multifamily property portfolio owners, managers, housing associations, and community organizations on strategies and opportunities to enroll eligible properties throughout the region in BayREN and complimentary efficiency programs and project financing.
- Engaging contractors and building professionals to provide accessible paths to participate in on-bill programs, while maintaining contractor performance and accountability for delivering high-quality services that produce persistent resource savings.
- Increasing participating customers' and contractors' ability to pursue additional retrofit opportunities through aligned BayREN, PG&E, and CCA efficiency programs and BayREN Energy Advisors (Residential and Commercial) to deliver maximum benefit to participating water utility customers.

WE3. Provide technical assistance to refine program components to meet efficiency needs specific to target customer classes

Objective: Customers and utilities have ongoing support to ensure on-bill services deliver expected resource savings and provide exceptional customer experiences with efficiency

BayREN's partnerships with water utilities represent a commitment to provide ongoing support and resources to help refine in-field program services and ensure participating water utility customers receive intended benefits through the term of their on-bill repayment. Near- and mid-terms activities include:

- Growing the list of eligible improvements to provide increased opportunities for deeper retrofits while maintaining quality performance and cost-effectiveness.
- Providing an "on-ramp" to efficiency services that allows low- and moderate-income customers to make their homes and businesses more water efficient.
- Developing on-bill opportunities, with sufficient consumer protections, for customers to pursue property improvements required by code changes, time-of-sale requirements, or emergency drought regulations.
- Working with property owners, water customers, realtors, water regulators, and other stakeholders to maximize the potential for on-bill water efficiency improvements instead of rebates and product giveaways.

Table 6.7 profiles the anticipated program.

Anticipated Program

Table 6.7. Anticipated Program

Program Title	Focus	Timeframe	Existing or New	Resource (R) Non-Resource (NR)
Water Bill Savings Program	Expand On-bill programs and supports for municipal water utilities.	Short-term	Existing	NR

Coordinating Activities

Leveraged Resources

The BayREN, as a collaboration of local government implementers, is uniquely positioned to address the needs of water customers seeking to make efficiency improvements. The majority of Bay Area communities are provided with water and sewer services by their local Department of Public Works, while others are served by a special district or other municipal water agency. These water providers are closely connected to other local activities, often providing assistance with community development, planning, and permitting. These agencies work closely with water utility customers through a range of activities including community events, property visits and inspections, and regular communications for billing and utility-specific updates.

Staff with BayREN member agencies have significant opportunities to engage with and collaborate with their counterparts at these municipal water utilities. This includes direct participation by BayREN member agencies in water utility working groups such as the Bay Area Integrated Regional Water Management Plan, jointly hosted events for general conservation activities and emergency drought response, and outreach and engagement through activities like the Bay Area Green Business Program. The Water Bill Savings Program offers an additional mechanism for municipal water utilities to participate in a comprehensive strategy to provide water and energy efficiency services and make progress toward regional and state efficiency goals.

EM&V Efforts

The BayREN will continue engaging with Partner Water Utilities, the CPUC, and IOU finance programs to contribute to and participate in EM&V working groups, roadmapping exercises, and studies appropriate for its Water-Energy Nexus Programs. These activities will benefit from enhanced access to energy utility bill data through AB 802 implementation. This energy bill data, coupled with access to water utility data from Partner Water Utilities, will provide valuable information to verify utility bill savings from on-bill program participants. Partner Utility data will also help refine BayREN and CPUC work within Water-Energy Nexus programs related to embedded energy savings delivered by Bay Area water conservation. Table 6.8 provides a snapshot of EM&V study and data needs.

Table 6.8. EM&V Study and Data Needs

Study Title/ Topic Focus	Research Question	Objective	Timeframe
Efficiency as a utility service.	Does the program ensure installed measures perform and bill savings persist for the duration of repayment? What % of on-bill repayments, line item charges, or assessments transfer to successor customers?	Understand the market demands to effectively extend efficiency services to customers as part of utility service.	Mid-term

Marketing, Education, & Outreach

Water-Energy Nexus initiatives will be promoted through aligned existing BayREN and other Bay Area local government marketing, outreach, and education (ME&O) for customers, stakeholders, and partners in the Residential, Commercial, and Public sectors. On-bill program development and implementation activities will engage existing and potential lender clients and customers (conventional, credit union, and philanthropic) to raise community awareness and define the program as a strategically placed driver to increase customer demand, facilitate streamlined (electronic) processes for program application and enrollment, and provide multiple options for project funding (which may cross-cut and leverage each other). Table 6.9 summarizes the anticipated marketing and outreach approaches and their key objectives.

Table 6.9. Marketing, Education, & Outreach Approaches and Coordination

Marketing Need	Approach	Objective	Timeframe
Reach Residential and Small and Medium Commercial Property Owners	Leverage Residential and Commercial Program Outreach; leverage Partner Water Utility Outreach Channels. Expand current BayREN on-bill program websites supporting Partner Utilities with program information, financing marketplace, and action planning tools.	Build Awareness of program. Ensure participants are aware of program terms and options to finance improvements.	Short-term Short-term (Residential) to Mid-term (Commercial)
Engage Contractors and other Stakeholders	Expand current BayREN on-bill program websites to effectively serve contractors and key data/finance partners.	Streamline program participation.	Short-term

Workforce Education and Training

BayREN Water-Energy Nexus initiatives will work with the other BayREN sectors to promote proper permitting practices consistent the building code and legislation like SB 1414. On-bill programs will require proper licensing, bonding, and insurance, along with additional certifications when appropriate (i.e., through the California Landscape Contractors Association). On-bill programs will also meet living wage and or prevailing wage requirements as appropriate for the customer class and in accordance with Department of Industrial Relations regulations. Finally, on-bill programs will mandate that contractors successfully complete a training course and maintain program certification to be eligible to deliver and be paid for on-bill program services.

Cross-Cutting Initiatives

The BayREN Water-Energy Nexus initiatives will be closely aligned with the BayREN Residential, Commercial, and Public sectors to ensure coordinated delivery of services and stakeholder engagement. To date, that opportunity has been necessarily limited to coordinating activities within the Town of

Windsor, the City of Hayward, and in the service territory of East Bay Municipal Utility District. However, these partnerships have allowed for refinement of protocols for program referrals and coordination to complementary BayREN programs such as BAMBE and Green Hayward PAYS® projects. BayREN will continue coordination between Water-Energy Nexus and Codes & Standards activities to address overlapping areas of opportunity, including retrofit requirements tied to mandates for water efficient landscapes and property retrofits as required by SB 407 (see above).

This coordination will primarily occur within the BayREN Water-Energy Nexus monthly meeting and within the BayREN Coordinating Circle. Further discussion of cross-cutting supports other than those mentioned in this chapter is provided with the Residential, Commercial, and Public Sector Chapters.

Policy Alignment

BayREN Water-Energy Nexus initiatives are aligned with key State policy directives:

- **The California Long-Term Energy Efficiency Strategic Plan** directs state agencies to "develop innovative and affordable financing options for energy efficient buildings and retrofits." Across multiple sectors, innovative financing is identified as an essential aspect of overcoming challenges such as split incentives and rental property occupant turnover. The PAYS approach taken by BayREN creates financing for improvements that remain with the property through owner-occupant turnover and that fully reflect the savings in monthly operating costs from efficient homes.

- **SB 350** establishes bold new goals for energy efficiency of buildings that will only be reached through a diverse and innovative portfolio of tools such as assessments, ratings, education, workforce investment, and financing. The bill also requires that state programs address barriers to participation by low-income customers, and on-bill financing has been identified as a tool for achieving this. The SB 350 Barriers Study Draft Report found that:[22]
    - "*On-bill financing may appeal to low-income customers because the cost of the energy upgrade is simply incorporated into a monthly utility bill. On-bill financing programs have the potential to address a range of barriers, including lack of confidence in energy savings, split incentives, long payback periods, and high up-front costs (Zetterberg and Ng, 2013). Addressing the split incentive, Behles (2013) notes that "if on-bill financing stays with the property, it can provide a way for renters to pay the capital necessary to make upgrades" without investment from the property owner. Evaluating the potential for on-bill financing pilots is an item on the AB 758 Action Plan."*
    - The draft study also found that: "*On-bill financing still requires an outlay of capital, and financiers are likely to require that potential debtors meet a certain FICO threshold. Furthermore, on-bill financing may require permission from the landlord, and could be problematic because successor tenants would be obligated to continue payments for a*

[22] California Energy Commission, SB 350 Barriers Study Draft Report, Docket 16-OIR-02, 2016.

financed improvement they did not agree to. A variant of on-bill financing called PAYS (Pay As You Save) might be more suitable, particularly for low-income customers. Under this model, the utility finances the energy installation and passes along savings to the customer (Ottinger and Bowie, 2015). The advantage of this model is that it obviates the need for the customer to pass a credit check or, in the case of low-income homeowners, take a lien on the property."

- **Executive Order B-29-15** identifies the lasting and projected future impacts of drought as a driver for heightened collaboration to combat threats to water supply. BayREN's Water-Energy Nexus initiatives provide an opportunity for municipal water utilities to collaborate on a regional scale to finance lasting property improvements to reduce customer demand and provide benefits to ratepayers at the water-energy nexus.

- **The Global Warming Solutions Act (AB 32 and SB 32) Climate Change Scoping Plan** presents a comprehensive strategy for reducing GHG emissions in California that places great emphasis on resource efficiency in energy, water, and waste. The 2014 update identified innovative local government financing strategies as an essential tool:[23]
    - "*The development of long-term revenue streams and creative local financing mechanisms and incentives can accelerate emission reductions. For instance, local financial incentives can spur retrofits of the existing building stock, net-zero energy or carbon projects, and other voluntary GHG emission reductions. The expansion of PACE financing programs, the creation of incentive opportunities under various policies and planning efforts, and the formation of new mechanisms are all options that should be explored to continue progress toward reducing emissions across our communities*."

- **The Water Conservation Act of 2009 (SB X7-7)** established a statewide water conservation target of 20% by 2020, and the methodologies by which urban water suppliers achieve compliance include the process for determining eligible water demand reduction measures. The measures included in the BayREN Water-Energy Nexus initiatives comply with and advance the goals of SB X7-7.

- **SB 407** requires that all non-water-conserving plumbing fixtures be replaced with a fixture that complies with the current building standard applicable to new properties of the same type by 2017 in single family properties and by 2019 in multifamily properties. Compliance with the requirement must be disclosed at the time of sale and is also a requirement before obtaining a permit for certain building alterations or renovations. The BayREN Water-Energy Nexus initiatives provide municipal governments with a tool to help property owners comply with SB 407.

[23] California Air Resources Board, AB 32 Scoping Plan Update, 2014.

Key Partners/Coordination

As shown in Table 6.10, the BayREN will partner and coordinate with a number of stakeholders to drive the expansion of the Energy-Water Nexus initiative to achieve water and energy savings.

Table 6.10. BayREN Coordination with External Partners and Stakeholders

IOU Programs	Coordination Mechanism	Expected Frequency
PG&E Finance Team	Coordination calls.	Quarterly
Coordination Partners	**Coordination Mechanism**	**Expected Frequency**
Local Water Districts	Outreach meetings; Coordination calls.	As needed; Quarterly
Community Based Organizations	Outreach meetings; Coordination calls.	As needed; Quarterly
Real Estate Professional/Associations	Meeting attendance.	Quarterly
Professions and trades, e.g., real estate brokers, mortgage officers, appraisers, government building and permitting departments	Meeting attendance.	Quarterly
Professional Building Trade Associations; Specialized trades contractors	Outreach meetings; Coordination calls.	Ongoing
Department of Water Resources	Coordination calls.	Quarterly

Section 7
APPENDICES

BAY AREA Regional Energy Network

Section 7. Appendices

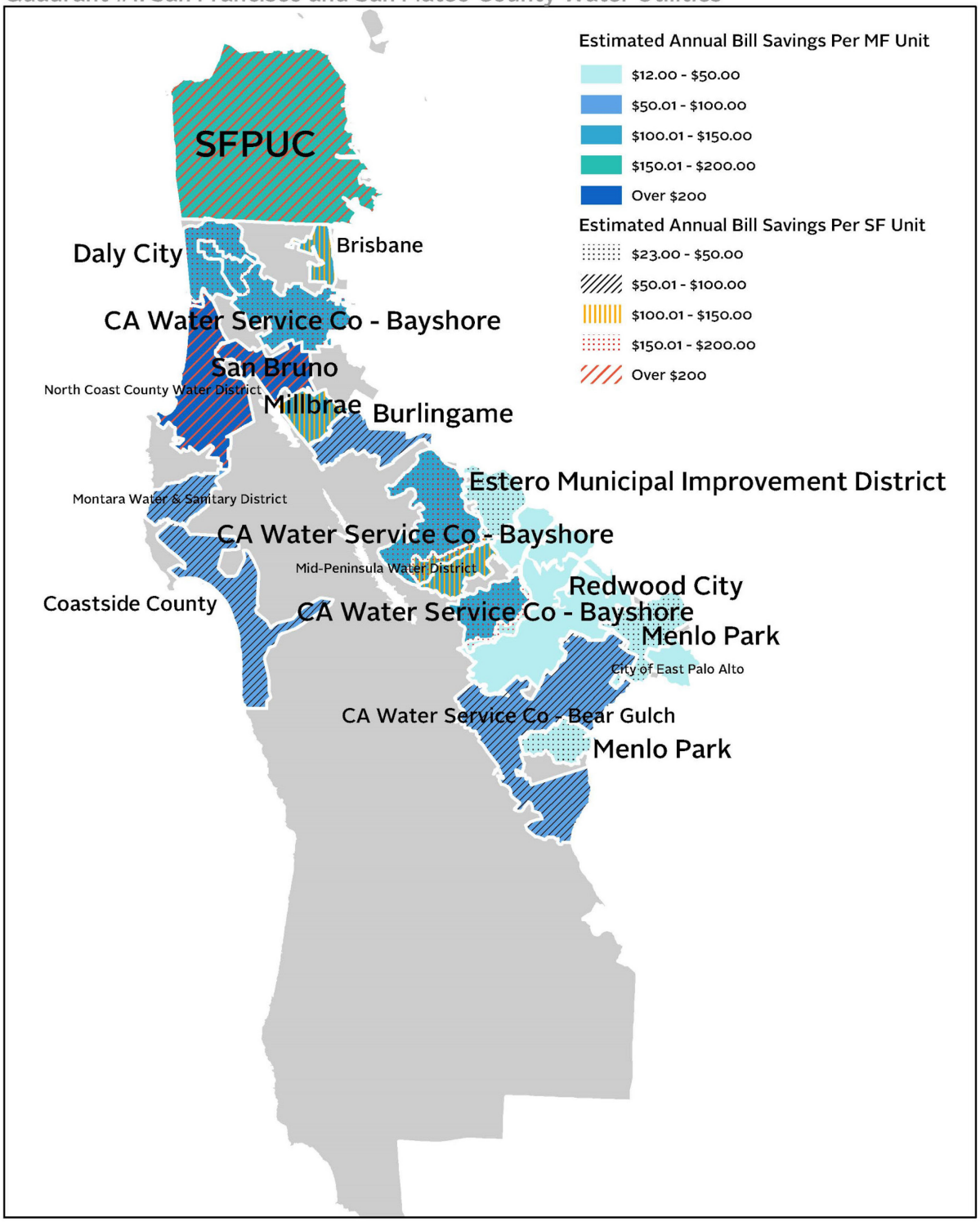
Appendix A. Water-Energy Nexus Maps

The Bay Area is served by 91 water utilities with 66 being strong candidates for the BayREN's on-bill program design. Combined, the 66 utilities identified could provide cost-effective indoor plumbing fixture retrofits for nearly 1,360,000 single family homes[1] and 480,000 multifamily housing units[2].

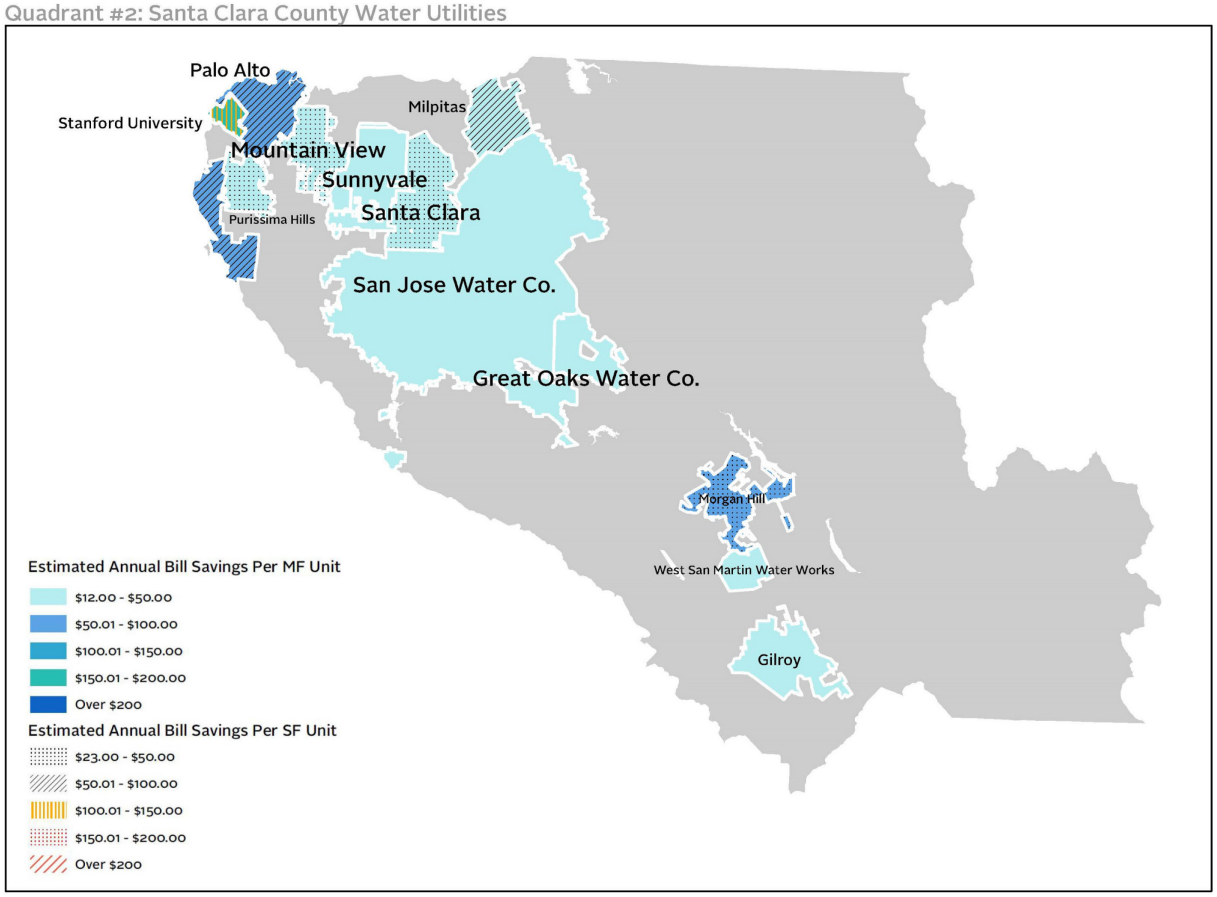
[1] Based on 2010-2014 American Community Survey 5 year Estimates, Bay Area water utility fixture studies, and prevailing wage calculations. ACS data included review of number of housing units, residents per unit, vacancy rates, building sizes and age. Single family housing = 1 unit detached built before 2014

[2] Based on 2009-2013 American Community Survey 5 year Estimates, Bay Area water utility fixture studies, and prevailing wage calculations. ACS data included review of number of housing units, residents per unit, vacancy rates, building sizes and age. Multifamily housing = 5 or more units built before 2000.

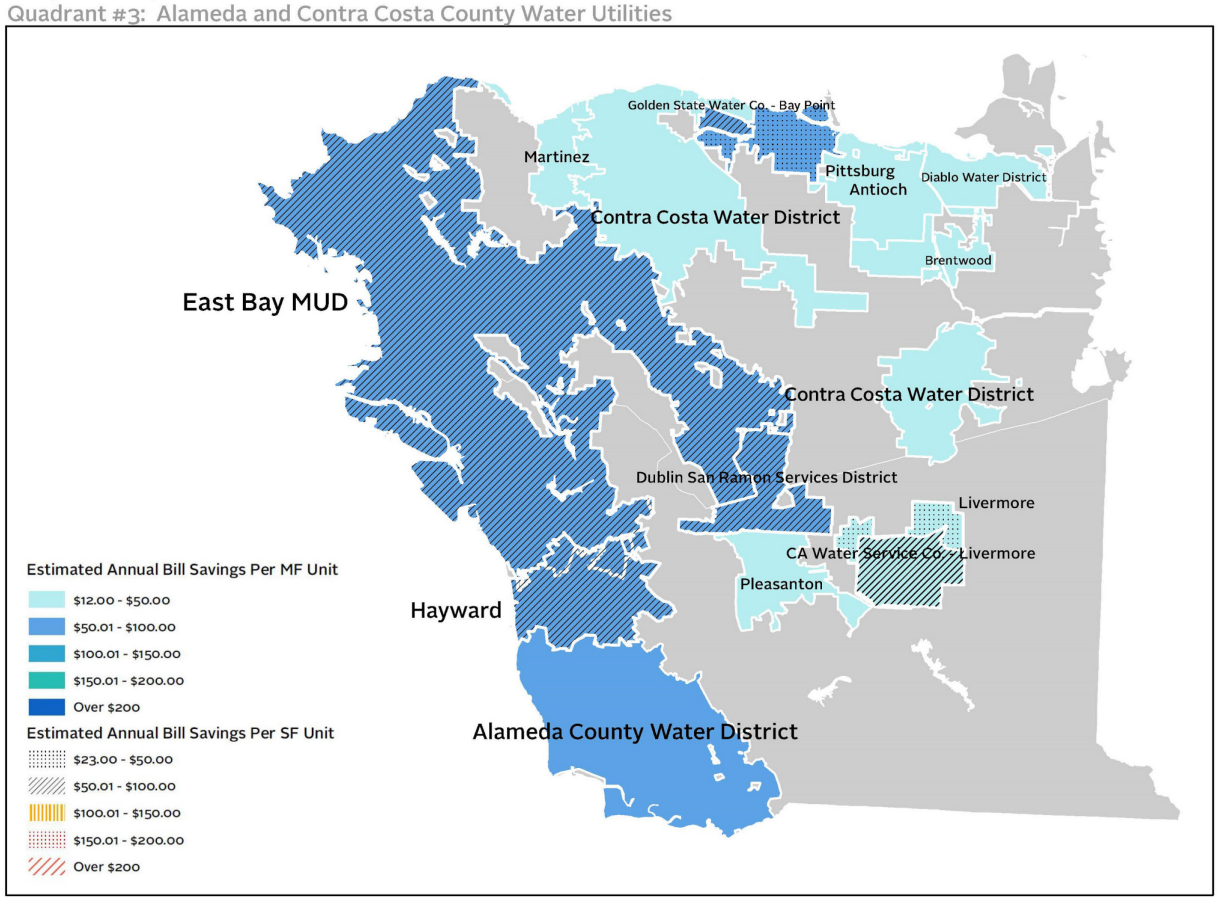
Quadrant #1: San Francisco and San Mateo County Water Utilities



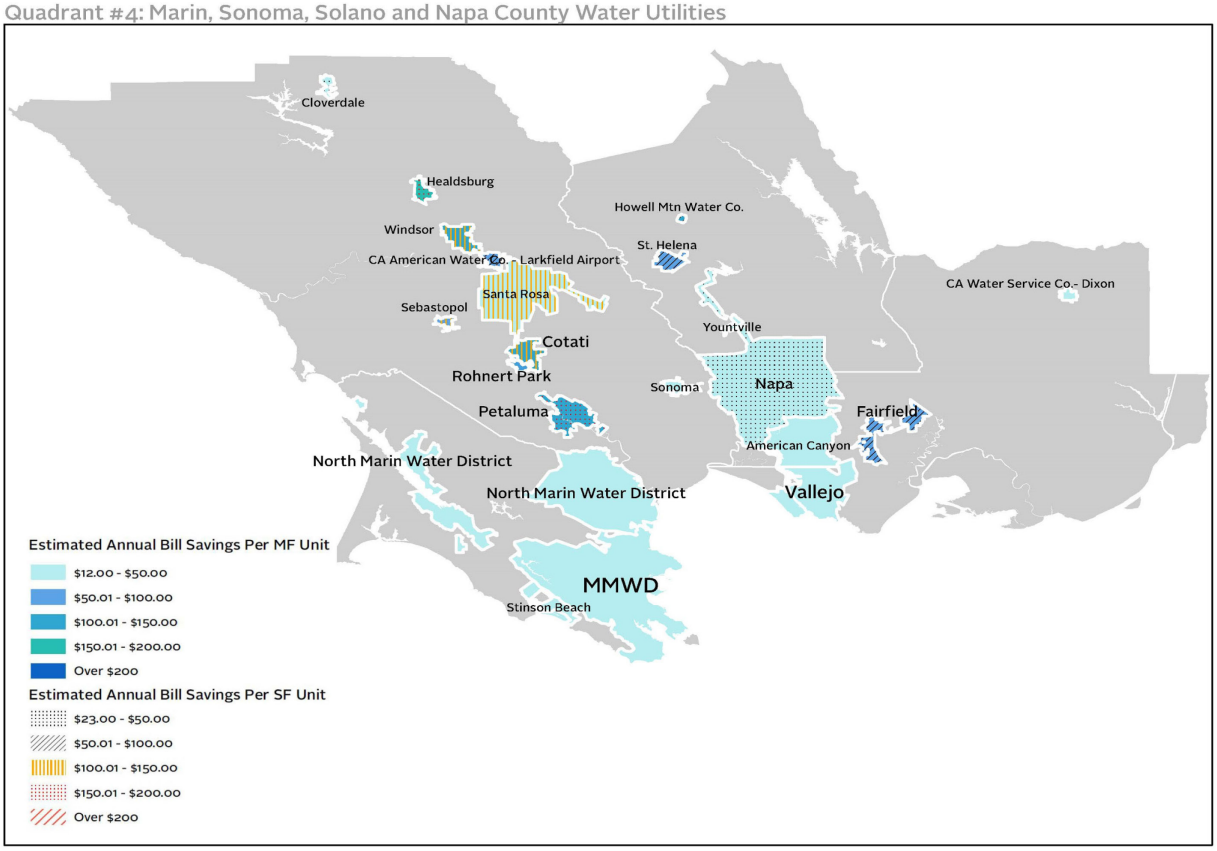
Quadrant #2: Santa Clara County Water Utilities



Quadrant #3: Alameda and Contra Costa County Water Utilities



Quadrant #4: Marin, Sonoma, Solano and Napa County Water Utilities



Appendix B. Acronyms and Abbreviations

The following acronyms and abbreviations were identified for this Appendix during Business Plan development.

AB 32	Assembly Bill 32/California Global Warming Solutions Act of 2006
ABAG	Association of Bay Area Governments
ACCA	Air Conditioning Contractors of America
ACEEE	American Council for an Energy-Efficient Economy
ACR	Assigned Commissioner Ruling
AHJ	Authority Having Jurisdiction
AHRI	Air Conditioning, Heating and Refrigeration Institute
AIA	American Institute of Architects
ANSI	American National Standards Institute
AMI	Advanced Metering Infrastructure
ARRA	American Recovery and Reinvestment Act
ASHRAE	American Society of Heating, Refrigerating, and Air-Conditioning Engineers
BACnet	Building Automation and Control networks
BAMCAP	Bay Area Multifamily Capital Advance Program
BEDES	Building Energy Data Exchange Specification
BEMS	Building Energy Management System
BOMA	Building Owners and Managers Association
BPI	Building Performance Institute
BSC	Building Standards Commission
C&S	Codes and Standards
CAEATFA	California Alternative Energy and Advanced Transportation Financing Authority
CAISO	(or ISO) California Independent System Operator
CALBO	California Building Officials

CaLEAP	California Local Energy Assurance Planning
CalGreen	California Green Buildings Standards Code
CAR	California Association of Realtors
CARB	(or ARB) California Air Resources Board
CBEC	Commercial Building Energy Consumption
CBO	Community-based Organization
CBSC	California Building Standards Commission
CCA	Community Choice Aggregation
CCC	California Commissioning Collaborative
CDE	California Department of Education
CEC	California Energy Commission
CEE	Consortium for Energy Efficiency
CEEA	California Energy Efficiency Alliance
CEESP	California Energy Efficiency Strategic Plan
CEUS	Commercial End-Use Survey
CFL	Compact Fluorescent Lamp or Light
CO2	Carbon Dioxide
CIEE	California Institute for Energy and Environment
CPUC	California Public Utilities Commission
CSAC	California State Association of Counties
CSD	Community Services and Development
CSI	California Solar Initiative
CSLB	Contractors State License Board
Cx	Commissioning
DAS	Division of Apprenticeship Standards
DC	Direct Current

DEER	Database for Energy Efficient Resources
DEODC	Division of Environmental Occupational Disease Control
DG	Distributed generation
DGS	Department of General Services
DIR	Division of Industrial Relations
DOE	U.S. Department of Energy
DOF	Department of Finance
DR	Demand Response
DRA	Division of Ratepayer Advocates
DSA	Division of the State Architect
DSM	Demand-Side Management
DWR	California Department of Water Resources
EAP	California Energy Action Plan
EBEC	Existing Building Efficiency Collaborative
EBEE	Existing Buildings Energy Efficiency
EBO&M	Existing Building Operations & Maintenance
ED	California Public Utilities Energy Division
EE	Energy Efficiency
EEM	Energy efficiency mortgages
EIA	Energy Information Administration
EM&V	Evaluation, Measurement and Verification
EMS	Energy Management System
EPA	U.S. Environmental Protection Agency
EPD	Energy performance district
EPIC	Electric Program Investment Charge
EPRI	Electric Power Research Institute

ESA	Energy service agreements
ESCO	Energy Service Company
ET	Emerging Technology or Emerging Technologies
ETAAC	Economic and Technology Advancement Advisory Committee
ETCC	Emerging Technologies Coordinating Council
ETP	California Employment Training Panel
EUC	Energy Upgrade California
EUI	Energy Use Intensity
FSEC	Florida Solar Energy Center
GAIN	Greater Avenues for Independence
GHG	Greenhouse Gas
GO	Governor's Office
GWh	Gigawatt Hour
HARDI	Heating, Air Conditioning and Refrigeration Distributors International
HCD	Housing and Community Development
HERS	Home Energy Rating System
HVAC	Heating, Ventilation and Air Conditioning
ICC	International Code Council
ICLEI	International Council for Local Environmental Initiatives
IDSM	Integrated Demand Side Management
ID	Irrigation Districts or Integrated Design
IEPR	Integrated Energy Policy Report
IHACI	Institute of Heating and Air Conditioning Industries
ILG	Institute for Local Government
IMT	Institute for Market Transformation
IOU	Investor-Owned Utility

ITP	U.S. Department of Energy‘s Industrial Technologies Program
KSA	Knowledge skills ability
kW	kilowatt
kWh	Kilowatt Hour
LED	Light-emitting Diode (also used to describe lamps using LED technology)
LG	Local Government
LGC	Local Government Commission
LGP	Local Government Partnerships
LGSEC	Local Government Sustainable Energy Coalition
LIEE	Low Income Energy Efficiency
LOC	League of California Cities
MCE	Marin Clean Energy
ME&O	Marketing, Education and Outreach
MEL	Miscellaneous electric load
MF	Multifamily
MLS	Multiple Listing Service
Mth	Million Therms
MW	Megawatt
MWh	Megawatt Hour
NAR	National Association of Realtors
NEMA	National Electrical Manufacturers Association
NIST	U.S. Department of Commerce‘s National Institute of Standards and Technology
NRCS	Natural Resources Conservation Service
NRDC	Natural Resources Defense Council
NREL	National Renewable Energy Laboratory
NWEEA	Northwest Energy Efficiency Alliance

O&M	Operations and Maintenance
OBR	On bill repayment
OPR	Office of Planning and Research
PA	Program Administrator
PACE	Property-Assessed Clean Energy
PCA	Property condition assessments
PDA	Personal Digital Assistant
PG&E	Pacific Gas and Electric Company
PIER	Public Interest Energy Research
POU	Publicly Owned Utility
PRC	Public Resources Code
PV	Photovoltaic
QI/QM	Quality Improvement/Quality Management
R&D	Research and Development
RCx	Retrocommissioning
RD&D	Research, Development and Demonstration
RECO	Residential Energy Conservation Ordinances
REN	Regional energy network
RESNET	Residential Energy Services Network
RFP	Request for Proposals
RH	Relative Humidity
SCE	Southern California Edison
SDG&E	San Diego Gas & Electric
SEEC	Statewide Energy Efficiency Collaborative
SEED	Standard Energy Efficiency Database
SEP	Strategic Energy Plan

SFLI	Single Family Low Income
SGIP	Self-Generation Incentive Program
SMB	Small and Medium Business
SMCB	Small and Medium Commercial Building
SMJU	Small and Multijurisdictional Utility
SMUD	Sacramento Municipal Utility District
SWEEP	Southwest Energy Efficiency Project
TDV	Time-dependent valuation
TURN	The Utility Reform Network
TRC	Total Resource Cost
WAP	Weatherization Assistance Program
WCEC	Western Cooling Efficiency Center
WE&T	Workforce Education and Training
WHPA	Western HVAC Performance Alliance
WIB	Workforce Investment Boards
ZNE	Zero Net Energy

Appendix C. Glossary-Program Administrator Dictionary

The following terms were identified for this Glossary by the California Energy Efficiency Coordinating Committee's stakeholder process during Business Plan development.

Advanced Technologies -- Measures or processes which exceed the efficiency or thermodynamic performance of standard energy using equipment or processes.

Affiliate -- Any person, corporation, utility, partnership, or other entity 5% or more of whose outstanding securities are owned, controlled, or held with power to vote, directly or indirectly either by an administrator or any of its subsidiaries, or by that administrator's controlling corporation and/or any of its subsidiaries as well as any company in which the administrator, its controlling corporation, or any of the administrator's affiliates exert substantial control over the operation of the company and/or indirectly have substantial financial interests in the company exercised through means other than ownership. For purposes of these Rules, "substantial control" includes, but is not limited to, the possession, directly and indirectly and whether acting alone or in conjunction with others, of the authority to direct or cause the direction of the management of policies of a company. A direct or indirect voting interest of five percent (5%) or more by the administrator, its subsidiaries, or its affiliates in an entity's company creates a presumption of control.

Avoided Costs -- Avoided costs refers to the incremental costs avoided by the investor-owned utility when it purchases power from qualifying facilities, implements demand-side management, such as energy efficiency or demand-response programs, or otherwise defers or avoids generation from existing/new utility supply-side investments or energy purchases in the market. Avoided costs also encompass the deferral or avoidance of transmission and distribution-related costs. (D.08-01-006, Footnote 2)

Baseline Data -- The state of performance and/or equipment that what would have happened in the absence of the program induced energy efficiency.

Benchmarks -- Per the May 2, 2016 guidance, "Benchmarking is a logical component of a Business Plan; it allows measurement against industry standards and practices." These are used as a comparison to actual program performance. (See also Program Targets)

CEESP Strategies:

The term "Strategies" was officially used in the California Energy Efficiency Strategic Plan (CEESP). Within each chapter in the CEESP, there are three to six key strategies described by the CPUC. These are accepted as guidance towards the Program Administrators (PAs) (and other market actors). Examples of CEESP Strategies for the Residential Sector include:

- Customer Demand
- Financing (and other incentives)
- Comprehensive Solutions
- Building Innovation
- Statewide Solutions
- Codes and Standards

Coincident Peak Demand -- The metered or estimated demand of a device, circuit, or building that occurs at exactly the same time as the system peak for a given year and weather condition.

Community Choice Aggregators -- Organizations created by local governments pursuant to Assembly Bill 117 for the purpose of procuring power and administering energy efficiency programs on behalf of local citizens.

Competitive Solicitation -- The process whereby parties are requested to submit bids offering innovative approaches to energy savings or improved program performance.

Conservation -- Reduction of a customer's energy use achieved by relying on changes to the customer's behavior which may result in a lower level of end use service.

Conservation Measures -- Activities and/or behaviors aimed at reducing energy consumption.

Conservation Programs -- Programs which are intended to influence customer behavior as a means to reduce energy use.

Cost Effectiveness -- An indicator of the relative performance or economic attractiveness of any energy efficiency investment or practice when compared to the costs of energy produced and delivered in the absence of such an investment.

Cream Skimming -- Cream skimming results in the pursuit of a limited set of the most cost-effective measures, leaving behind other cost-effective opportunities. Cream skimming becomes a problem when lost opportunities are created in the process.

Cross Subsidization -- Benefits enjoyed by one group, such as a customer class, which are funded by another group.

Custom Measures/projects -- Energy efficiency efforts where the customer financial incentive and the ex-ante energy savings are determined using a site-specific analysis of the customer's facility (D.11-07-030 page 31).

Customer -- Any person or entity that pays an electric and/or gas bill to an IOU or CCA and that is the ultimate consumer of goods and services including energy efficiency products, services, or practices.

Cumulative Savings -- As clarified in D.07-10-032, cumulative savings represent the savings in that year from all previous measure installations (and reflecting any persistence decay that has occurred since the measures were installed) plus the first-year savings of the measures installed in that program year.

Deemed Measure -- A prescriptive energy efficiency measure.

Delayed Installation -- Products which are claimed as installed in a specific quarter but are likely to be installed at a later date (D.11-07-030, page 21).

Downstream – a Market Channel relating to programs or elements thereof that primarily address contractor, installer, or end-user customer's purchase, installation, or use of high efficiency products and practices, in contrast to the Midstream or Upstream. [source: Decision 16-08-019 August 18, 2016]

Downstream Incentives -- Incentives provided to contractor, installer, or end-user customer for purchase, installation, and/or use of high efficiency products and practices, which are provided to customers as rebates. [source: Decision 16-08-019 August 18, 2016]

Dual Test -- The requirement that an energy efficiency activity pass both the TRC and the PAC cost-effectiveness test.

E3 Calculator -- The E3 calculator is a model developed by Energy Environmental Economics (or "E3" for use by the IOUs to map Commission-adopted avoided costs to energy efficiency programs for cost-effectiveness calculations.

Effective Useful Life (EUL) -- An estimate of the median number of years that the measures installed under the program are still in place and operable.

Electricity Savings -- Reduced electricity use (or savings) produced by either energy efficiency investment which maintain the same level of end use service or conservation actions which usually reduce energy use by reducing the quantity or quality of the baseline energy services demanded.

Emerging Technologies-- New energy efficiency technologies, systems, or practices that have significant energy savings potential but have not yet achieved sufficient market share (for a variety of reasons) to be considered self-sustaining or commercially viable. Emerging technologies include late stage prototypes or under-utilized but commercially available hardware, software, design tools or energy services that if implemented appropriately should result in energy savings.

End Use – 1) The purpose for which energy is used (e.g. heating, cooling, lighting). 2) A class of energy use that an energy efficiency program is concentrating efforts upon. Typically categorized by equipment purpose, equipment energy use intensity, and/or building type.

Energy Efficiency -- Activities or programs that stimulate customers to reduce customer energy use by making investments in more efficient equipment or controls that reduce energy use while maintaining a comparable level of service as perceived by the customer.

Energy Efficiency Measure -- An energy using appliance, equipment, control system, or practice whose installation or implementation results in reduced energy use (purchased from the distribution utility) while maintaining a comparable or higher level of energy service as perceived by the customer. In all cases energy efficiency measures decrease the amount of energy used to provide a specific service or to accomplish a specific amount of work (e.g., kWh per cubic foot of a refrigerator held at a specific temperature, therms per gallon of hot water at a specific temperature, etc.). For the purpose of these Rules, solar-powered, non- generating technologies are eligible energy efficiency measures (D.09-12-022, OP 1).

Energy Efficiency Programs -- Programs that reduce customer energy use by promoting energy efficiency investments or the adoption of conservation practices or changes in operation which maintain or increase the level of energy services provided to the customer.

Energy Efficiency Savings -- The level of reduced energy use (or savings) resulting from the installation of an energy efficiency measure or the adoption of an energy efficiency practice, subject to the condition that the level of service after the investment is made is comparable to the baseline level of service. The

level of service may be expressed in such ways as the volume of a refrigerator, temperature levels, production output of a manufacturing facility, or lighting level per square foot.

Evaluation, Measurement, and Verification (EM&V) -- Activities that evaluate, monitor, measure and verify performance or other aspects of energy efficiency programs or their market environment.

Evaluation Project Budget -- The project level evaluation budget as it is defined by the program administrators or Energy Division for internal program budgeting and management purposes. Inclusive of direct and allocated overhead and costs (+/-) recovered from other sources.

Ex Ante Values -- Estimated savings values calculated based on assumptions prior to the evaluation of the portfolio cycle. These savings reflect the IOU reported savings, which are trued up with final evaluation.

Ex Ante Review -- The review process that occurs before savings for a measure or project savings claim is "frozen" to verify that the ex-ante values used to calculate the reported savings are reasonable and based on best available information.

Financial Incentive -- Financial support (e.g., rebates, low interest loans, free technical advice) provided to customers as an attempt to motivate the customers to install energy efficient measures or undertake energy efficiency projects. (See Rebate)

Free Drivers -- A free driver is a non-participant who adopted a particular efficiency measure or practice as a result of a utility program. (Source: April 2006 EM&V Protocols)

Free riders (Free Ridership) -- Program participants who would have installed the program measure or equipment in the absence of the program.

Fuel Substitution -- Programs which are intended to substitute energy using equipment of one energy source with a competing energy source (e.g. switch from electric resistance heating to gas furnaces).

Funding Cycle -- Period of time for which funding of energy efficiency programs have been approved by the Commission.

Gas Savings -- Reduced natural gas usage (or savings) produced by either energy efficiency investment which maintain the same level of end use service or conservation actions which can reduce energy use by reducing the quantity or quality of the baseline services provided.

Gross Savings -- Gross savings count the energy savings from installed energy efficiency measures irrespective of whether or not those savings are from free riders, i.e., those customers who would have installed the measure(s) even without the financial incentives offered under the program. Gross savings are adjusted by a net-to-gross ratio to produce net savings, that is, to remove the savings associated with free riders.

Gross Realization Rate -- Gross Realization Rate (GRR) is the ratio of achieved energy savings to predicted energy savings; as a multiplier on Unit Energy Savings, the GRR takes into account the likelihood that not all Commission-approved projects undertaken by IOUs will come to fruition.

Hard to Reach (HTR) -- Those customers who do not have easy access to program information or generally do not participate in energy efficiency programs due to a language, income, housing type, geographic, or home ownership (split incentives) barrier. These barriers are defined as:

- Language – Primary language spoken is other than English, and/or
- Income – Those customers who fall into the moderate income level (income levels less than 400% of the federal poverty guidelines and/or
- Housing Type – Multi-family and Mobile Home Tenants, and/or
- Geographic – Businesses in areas other than the San Francisco Bay Area, San Diego area, Greater Los Angeles Area (Los Angeles, Orange, San Bernardino, Riverside and Ventura counties) or Sacramento, and/or
- Home Ownership – Renters

[source: SoCalREN Residential Chapter—same as Policy Manual]

Incremental Measure Cost -- The additional cost of installing a more efficient measure calculated from the price differential between energy-efficient equipment and services and standard or baseline state. These costs include any direct or indirect incremental cost that is attributable to the energy efficiency activity. This may include design assistance, surveys, materials and labor, commissioning costs, etc.

Indicators -- These are items that are monitored to help understand performance and achievement of metrics. Program Administrators are not judged on Indicators, but are expected to report any requested Indicators to help understand the full story behind the metrics.

Information & Education -- Information and education programs can provide a wide range of activities designed to inform or educate a customer or customer group. Generally, these range from in-depth, one-on-one, on-site or centrally located classroom style instruction in topics related to energy efficiency, to programs that target information to specific types of customers, to general information provided to a wide range of customers, to short inexpensive public service announcements on FCC approved communication frequencies. Programs intended to provide customers with information regarding generic (not customer-specific) conservation and energy efficiency opportunities. For these programs, the information may be unsolicited by the customer.

Innovation Incubator -- A low-cost, stand-alone program designed to grow innovative energy saving programs and processes for the larger portfolio over the long term. The incubator funds new program ideas that meet reasonable scientific scrutiny for potentially cost-effective energy savings and peak reduction.

Installation Rate -- Installation Rate is the ratio of the number of verified installations of a measure divided by the number of claimed installations rebated by the utility during a claim period. Typically, Installation Rates used on an ex ante basis will be based upon previous ex post evaluations.

Institutional Barriers -- A type of market barrier: In this case, the internal organizational hurdles that inhibit the evaluation and or choice to take energy efficiency actions.

Intervention Strategies or Program Interventions: Also referred to as "sector-specific strategies." Within the Business Plans, the term Interventions refers to the categories of tactics (See also Tactics) used within a sector or program (both will use multiple interventions).

Interventions are more flexible than CEESP Strategies and can adapt to specific market conditions.

Least Cost/Best Fit -- The procurement of cost-effective supply and demand-side resources that, regardless of ownership, meet capacity and energy deliverability requirements. Energy efficiency resources are constructed from the bottoms up approach that aggregates the demand and energy savings from various energy-saving measures and activities into applicable end-use categories such as space cooling, space heating, lighting, and refrigeration, in order to provide near- and long-term peaking, intermediate, and baseload requirements.

Levelized Cost -- An estimate of the annualized cost of installing an energy efficiency measures divided by the annual energy savings. Typically calculated by multiplying the incremental cost of the measure by capital recovery factor (function of discount rate and expected useful life of the measure) and then dividing by annual energy savings.

Load Management -- Programs which reduce or shift electric peak demand away from periods of high cost electricity to non-peak or lower cost time periods, with a neutral effect on or negligible increase in electric use.

Long-term 8-10+ years

Lost Opportunities -- Energy efficiency measures that offer long-lived, cost-effective savings that are fleeting in nature. A lost opportunity occurs when a customer does not install an energy efficiency measure that is cost-effective at the time, but whose installation is unlikely to be cost-effective if the customer attempts to install the same measure later.

Metric Baseline -- The minimum or starting point used to compare the metric progress to achieving stated target. [source: SoCalGas Appendix E]

Market Channel -- The point of entrance in the marketplace by a program. (downstream, midstream, upstream)

Market Effect -- A market effect is a change in the structure or functioning of a market or the behavior of participants in a market that result from one or more program efforts. Typically, these efforts are designed to increase in the adoption of energy-efficient products, services or practices and are causally related to market interventions. Market effects include reductions in energy consumption and/or demand in a utility's service area caused by the presence of the DSM program, beyond program related gross or net savings of participants. These effects could result from: (a) additional energy efficiency actions that program participants take outside the program as a result of having participated; (b) changes in the array of energy-using equipment that manufacturers, dealers and contractors offer all customers as a result of program availability; and (c) changes in the energy use of non-participants as a result of utility programs, whether direct (e.g., utility program advertising) or indirect (e.g., stocking practices such as (b) above or changes in consumer buying habits)." Participant spillover is described by (a), and non- participant spillover, by (b) and (c). Some parties refer to non-participant spillover as "free-drivers." (From EM&V Protocols, April 2006) [Source: Policy Manual]

Market Transformation -- Decision (D.)09-09-047, defines market transformation as "long-lasting, sustainable changes in the structure or functioning of a market achieved by reducing barriers to the

adoption of energy efficiency measures to the point where continuation of the same publicly-funded intervention is no longer appropriate in that specific market. Market transformation includes promoting one set of efficient technologies until they are adopted into codes and standards (or otherwise adopted by the market), while also moving forward to bring the next generation of even more efficient technologies to the market."

Measures – 1) Specific customer actions which reduce or otherwise modify energy end use patterns. 2) A product whose installation and operation at a customer's premises results in a reduction in the customer's on-site energy use, compared to what would have happened otherwise.

Midstream -- Market Channel relating to programs or elements thereof that primarily address distributor or retailers, in order to encourage their sales of high efficiency products and practices, in contrast to the Downstream or Upstream. [initial proposed term based on [source: Decision 16-08-019 August 18, 2016]

Midstream Programs -- Programs that primarily addresses distributors or retailers in order to encourage their sales of high efficiency products and practices, in contrast to the Downstream or Upstream. [initial proposed term based on [source: Decision 16-08-019 August 18, 2016]

Mid-term 4-7 years

Net savings -- The savings realized when free ridership is accounted for. The savings is calculated by multiplying the gross savings by the net to gross ratio.

Net to Gross Ratio -- A ratio or percentage of net program savings divided by gross or total impacts. Net to gross ratios are used to estimate and describe the free-ridership that may be occurring within energy efficiency programs.

Non-price Factors -- Those factors included in cost effectiveness tests, other than commodity prices and transportation and distribution costs, e.g., environmental factors.

Non-Resource Program -- Energy efficiency programs that do not directly procure energy resources that can be counted, such as marketing, outreach and education, workforce education and training, and emerging technologies.

Participant Test -- The Participant Test is the measure of the quantifiable benefits and costs to the customer due to participation in a program. Since many customers do not base their decision to participate in a program entirely on quantifiable variables, this test cannot be a complete measure of the benefits and costs of a program to a customer. (See SPM link under Attachment A.)

Partnership -- Coordinated efforts of a utility and a local government or other entity to use the strengths of both parties to achieve energy savings goals.

Peak Demand, Reported (per OP 1 of D.06-06-063 as modified by D.12-05-015) -- The peak megawatt load reduction contained in the most recently adopted DEER used to estimate and verify peak demand savings values. The DEER method utilizes an estimated average grid level impact for a measure between 2 PM and 5 PM during a "heat wave" defined by a three consecutive weekdays for weather conditions that are expected to produce a regional grid peak event. DEER utilizes a 3-day "heat wave" that occurs on consecutive days in June through September such that the three consecutive days do not

include weekends or holidays, and where the heat wave is ranked by giving equal weight to the peak temperature during the 72-hour period, the average temperature during the 72-hour period and the average temperature from noon – 6 PM over the three days.

Peak Demand-General (kW) -- The maximum level of metered demand during a specified period, such as a billing month, or during a specified peak demand period. Extremely high energy use, usually with reference to a particular time period.

Peak Savings- Coincident (kW) -- The estimated peak (e.g. highest) demand savings (MW or kW) from a program for a specific time, date, and location coincident with the forecasted system peak for a given area and a given set of weather conditions. This estimate must also include consideration of the likelihood that the equipment is actually on at the time of coincident peak. Usage of this definition: Resource planning- for making adjustments to forecasts of peak usage for understanding reserve margins and reliability purposes.

Peak Savings- Daily Average (kW) -- The average peak demand savings (kWh impacts/ # of hours in the peak rate period) for a given utility during their peak season. Example for SCE-Peak period is for summer weekdays from 12-6 PM. So - daily average savings would be the number of kWh saved/ # of kWhs saved for all weekday peak periods (= kWh/5 days/week * 12 weeks/ summer* 6 hours/day = kW average. Usage: Cost effectiveness analysis, primarily for valuing energy savings that occur during the peak period using "peak" average avoided costs.

Peak Savings –Non coincident (kW) -- Estimated highest level of peak savings (kW or MW) for a given program during the peak time period for a given utility on the hottest day of a "normal" weather year. Thus if a group of measures saved 1MW at 2PM, 1.7 MW at 3PM, 1.6 MW at 4PM, 1.0 MW at 5 PM and 1.2 MW at 6 PM, the peak non coincident savings would be 1.7 MW. This savings estimate does not take into account how many of the affected devices or equipment will be operating during the peak time period. Usage: Cost effectiveness analysis and procurement.

Peer Review Group (PRG) -- A subset of the Program Advisory Group consisting of non-financially interested members who will review utility submittals to the Commission, assess overall portfolio plans, plans for bidding out pieces of the portfolio, and the bid evaluation criteria for selecting third-party programs.

Performance Uncertainties -- A market barrier: refers to new technologies or systems whose efficiency or system performance levels are uncertain due to lack of experience.

Portfolio -- All IOU and non-IOU energy efficiency programs funded by ratepayers that are implemented during a program year or cycle. May also refer to a group of programs sponsored, managed, and contracted for by a particular IOU.

Portfolio Reporting -- Regularly scheduled reporting by the portfolio administrators directly to the Commission. Metrics reported are: portfolio budgets and expenditures, measures installed, services rendered, and other program activity deemed relevant to Energy Division's responsibility to support the Commission's responsibilities of quality assurance, policy oversight, and EM&V.

Pre-commercialization -- A phase in the life of a product before it is readily available on the market.

Program -- A collection of defined activities and measures that:

- are carried out by the administrator and/or their subcontractors and implementers,
- target a specific market segment, customer class, a defined end use, or a defined set of market actors (e.g. designers, architects, homeowners),
- are designed to achieve specific efficiency related changes in behavior, investment practices or maintenance practice in the energy market,
- and are guided by a specific budget and implementation plan.

Program Activities -- Any action taken by the program administrator or program implementer in the course of implementing the program.

Program Administrator -- An entity tasked with the functions of portfolio management of energy efficiency programs and program choice.

Program Administrator Cost (PAC) Test -- Under portfolio evaluation of cost effectiveness, the PAC test contains the program benefits of the TRC test, but costs are defined differently to include the costs incurred by the program administrator but not the costs incurred by the participating customer. (See the Standard Practice Manual.)

Program Advisory Group (PAG) -- Advisory groups for each utility service area composed of energy efficiency experts representing customer groups, academic organizations, environmental organizations, agency staff and trade allies in the energy market**.**

Program Cycle -- The period of time over which a program is funded and implemented.

Program Implementation Plan -- A detailed description of a program that includes program theory, planned program processes, expected program activities, program budget, projected energy savings and demand reduction and other program plan details as required by the Commission, assigned ALJ, or Energy Division. This document is being replaced for future plans with a combination of "Implementation Plans" and "Business Plans".

Program Implementers -- An entity or person that puts a program or part of a program into practice based on contacts or agreements with the portfolio manager.

Program Intervention – a deliberate effort by utilities to intervene in the market to reduce market barriers and thereby change the level of investment in (or practice of) energy efficiency. An intervention's success in reducing market barriers, therefore, hinges on whether it leads to or causes a net beneficial outcome from a societal perspective. [source: SoCalGas Draft Business Plan, Appendix E]

Program Intervention Metrics: The specific indicator used to measure progress towards achieving desired Program Intervention impacts. Program Intervention Metrics will be measured at the program level and are not included in the business plan. The metric is not the goal or target, but instead defines what characteristics or unit of activities of the Program are measured against Success Criteria (i.e., goals or targets).

Program Strategy -- The set of activities deployed by the program in order to achieve the program's objectives.

Program Targets: The quantitative goal towards which a program level metric tracks progress. Program metrics and targets can be used with both program-level outputs and program-level outcomes, whichever is more useful to the PA. These will most likely include either high, medium and low targets or short and long-term targets.

Program Year(s) -- The calendar year(s) during which the program operates.

Ratepayer -- Those customers who pay for gas or electric service under regulated rates and conditions of service.

Rebate -- A financial incentive paid to the customer in order to obtain a specific act, typically the installation of energy efficiency equipment.

Remaining Useful Life (RUL) -- An estimate of the median number of years that an measure being replaced under the program would remain in place and operable had the program intervention not caused the replacement.

Report Month -- The month for which a particular monthly report is providing data and information. For example, the report month for a report covering the month of July 2006, but prepared and delivered later than July 2006, would be July 2006**.**

Resource Programs -- Energy Efficiency programs that generate energy savings that are quantified and tracked by program administrators**.**

Resource Value -- An estimate of the net value of reliable energy (e.g., kWh, therms) and capacity (e.g., kW, Mcfd) reductions resulting from an energy efficiency program. This includes the net present value of all of the costs associated with a program and all of the estimated benefits (both energy and capacity). The calculation of resource value and associated benefits should be consistent with the avoided costs adopted in the most recent Commission proceeding or otherwise provided for by the Commission**.**

Savings Decay -- The reduction of cumulative savings due to previous measure installations passing their Remaining Useful Life or Effective Useful Life. Per D.09-09-047 and until EM&V results inform better metrics, IOUs may apply a conservative deemed assumption that 50% of savings persist following the expiration of a given measure's life.

Sector -- There are six defined sectors within the CPUC directive, each with their own business plan. These include Residential, Commercial, Public, Industrial, Agricultural and Cross-Cutting. The Cross-cutting sector includes three specific areas; Workforce, Education & Training, Emerging Technologies Program, and utility-specific ME&O.

Sector Metrics -- The Specific Indicator used to measure progress towards achieving desired market effect(s). Directionality, goals, and time frame, which the metric is used to measure, are defined by the Success Criteria associated with that metric (See Success Criteria). For the purpose of developing EE business plans, sector metrics only reflect the PA program intervention strategies, and rely on readily available data to allow for active monitoring by PA of progress towards achieving desired market effect.

Sector-Specific Strategies -- See Intervention Strategies, above.

Sector Targets -- The quantitative goal towards which a sector metric tracks progress. Sector metrics and targets can be used with both sector-level outputs and sector-level outcomes, whichever is more useful to the PA.

Service Area -- The geographical area served by a utility.

Short-term 1-3 years

Source-BTU Consumption -- Conversion of retail energy forms (kWh, therms) into the BTU required to generate and deliver the energy to the site. This conversion is used to compare the relative impacts of switching between fuel sources at the source or BTU level for the three-prong test required for fuel-substitution programs.

Standard Practice Manual (SPM) -- The California Standard Practice Manual: Economic Analysis of Demand-side Programs and Projects is jointly issued by the California Public Utilities Commission and the California Energy Commission. The SPM provides the definitions for the standard cost effectiveness tests and their components used for energy efficiency programs. SPM tests are further clarified in Commission Decisions as cited in the Cost-Effectiveness Rules in this Policy Manual.

Statewide -- A program or subprogram that is designed to be delivered uniformly throughout the four large Investor-Owned Utility service territories. Each statewide program or subprogram should be consistent across territories and overseen by a single lead program administrator. One or more statewide implementers, under contract to the lead administrator, should propose the design and deliver the program or subprogram in coordination with the lead program administrator. Local or regional variations in incentive levels, measure eligibility, or program interface are not generally permissible (except for measures that are weather dependent or when the program administrator has provided evidence that the default statewide customer interface is not successful in a particular location). Upstream (at the manufacturer level) and midstream (at the distributor or retailer level, but not contractor or installer) interventions are required to be delivered statewide. Some, but not all, downstream (at the customer level, or via contractors or installers) approaches are also appropriate for statewide administration. Statewide programs are also designed to achieve market transformation. [source: Decision 16-08-019 August 18, 2016]

Strategic Initiatives -- Within the Business Plan, this term will be used more generally, consistent with standard use of the term. This will not be used to point to one specific level. The CPUC or the program administrators may have strategic initiatives at several different levels.

Tactics -- An action embodied within a program to carry out an intervention strategy. For example, social marketing may be a specific tactic for an engagement intervention.

Third Party Program -- To be designated as "third-party," a program must be proposed, designed, implemented, and delivered by non-utility personnel under contract to a utility program administrator. This definition is not intended to apply to non-utility program administrators. [source: Decision 16-08-019 August 18, 2016]

Total Resource Cost Test (TRC) -- The TRC test measures the net resource benefits from the perspective of all ratepayers by combining the net benefits of the program to participants and non-

participants. The benefits are the avoided costs of the supply-side resources avoided or deferred. The TRC costs encompass the cost of the measures/equipment installed and the costs incurred by the program administrator. (See Standard Performance Manual)

Unit Energy Consumption -- Unit Energy Consumption (UEC) is the expected annual energy consumption of a technology, group of technologies, or process.

Unit Energy Savings -- Unit Energy Savings (UES) is the estimated difference in annual energy consumption between a measure, group of technologies or processes and baseline, expressed as kWh for electric technologies and therms for gas technologies

Upstream – relating to programs or elements thereof that primarily address manufacturers ~~or retailers~~ in order to encourage their production and sales of high efficiency products, in contrast to the Midstream or Downstream. [initial proposed term based on [source: Decision 16-08-019 August 18, 2016]

Upstream Incentives -- Incentives provided to manufacturers in order to encourage their production and sales of high efficiency products, in contrast to the downstream incentives, which are provided directly to customers as rebates. [source: Decision 16-08-019 August 18, 2016]

Workpapers -- Documentation prepared by the program administrators or program implementers that documents the data, methodologies, and rationale used to develop ex-ante estimates that are not in already fully contained in the Database for Energy Efficiency Resources (DEER) (D.10-04-029, footnote page 20).

Zero Net Energy (ZNE) -- Zero Net Energy is defined as the implementation of a combination of building energy efficiency design features and on-site clean distributed generation such that the amount of energy provided by on-site renewable energy sources is equal to the energy consumed by the building annually, at the level of a single “project” seeking development entitlements and building code permits. Definition of zero net energy at this scale enables a wider range of technologies to be considered and deployed, including district heating and cooling systems and/or small-scale renewable energy projects that serve more than one home or business. (D.07-10-032, Footnote 42.)

Appendix D. CPUC Checklist

Business Plan Review Checklist		
Map to NRDC Compilation Document	**Business Plan Element**	**BayREN Section/ Indicate Complete**
Portfolio Summary		
0	**Executive Summary**	Overview, Page 1.1
	Company description	BayREN Organization Introduction, Page 1.1
	Definition of market	BayREN Organization Introduction, Page 1.2
	Mission Statement	BayREN Organization Introduction, Page 1.1
	Purpose of Business Plan	BayREN Organization Introduction, Page 1.1
I.A.1, II.D.2	**Overview**	Overview
	About EE/DSM	N/A
	CA Energy Needs	Page 1.3
	Regulatory Requirements	Page 1.5
	Strategic Plan	Page 1.8
	Legislation (e.g., AB 758, SB 350, AB 802, AB 793)	Page 1.8
	IOUs/PAs/CPUC/etc. overall role	Page 1.5
I.A.2	*Broad socioeconomic and utility industry trends relevant to PA's EE programs (population, economics and markets, technology, environment/climate)*	Page 1.8
I.B.1	*Vision (e.g., How PA thinks about and uses EE over next 10*	Page 1.11
I.5	*Compare/contrast to past cycles*	Portfolio Changes, Page 1.15
I.B.2	**Goals & Budget**	Vision and Business Plan Framework, Page 1.11; Portfolio Budget Overview Page 1.16
I.B.2 & I.C.2.a	*Energy Saving Goals*	Portfolio Level Target Metrics, Page 1.20
I.C.2.a	*Portfolio Budget (sector and portfolio level per xls checklist)*	Portfolio Budget Overview Page 1.16
I.C.2.a, I.C.2.d	*Cost-effectiveness (sector and portfolio level per xls checklist)*	Evaluation and Benefits Framework, Page 1.19
I.C.2.b	*Explanation of Admin Budgets (e.g., Direct/Indirect Labor, Professional/Admin personnel)*	Page 1.16
I.C.2.c	*Explanation of accounting practices*	Page 1.17
I.C.3 and I.C.4	**Intervention strategies (high level)**	Vision and Business Plan Framework, Page 1.11
	Overall issues/challenges/barriers	Key Issues, Trends and Experience Informing Business Plan, Page 1.9

	High level summary of strategies and tools (e.g., AMI data, AB 802, procurement model, up/mid/downstream, etc.)	Business Plan Tactics, Page 1.13
I.C.4; I.D	**Solicitation plan**	Solicitation Plan, Page 1.23
I.C.4	*Solicitation strategies/areas that could be SW*	N/A
I.D; II.F	*Proposal for transitioning the majority of portfolios to be outsourced by the end of 2020*	N/A
Sector Chapter commercial, residential, public, agricultural, industrial, cross-cutting		*See Specific Section for Each Sector:*
II.A	**Summary tables**	
II.A	*Table with CE, TRC, PAC, emissions, savings, budget*	"Sector Budget"
I.C.7; II.E.1.b	*Metrics for sector*	"Sector Metrics"
II.D	**Market characterization (overview and market/gap and other analysis)**	"Market Characterization and Trends"
II.D.1	*Electricity/NG*	
II.D.2	*State goals (include acknowledgement of goals set by Strategic Plan, SB 350, AB758, guidance as appropriate)*	Throughout chapters
II.D.3	*EE potential and goals*	Not available for BayREN territory
II.D.5	*Customer landscape (e.g., segments/sub segments, major end uses, participation rates, etc.)*	Provided
II.D.6	*Major future trends that are key for the PA and its customers*	Provided as appropriate
II.D.7	*Barriers to EE and other challenges to heightened EE (e.g., regulatory, market, data)*	See Sector Specific Table "Problems and Market Barriers"
II.2.a	**Description of overarching approach to the sector**	"Sector Summary"
	Goals/strategies/approaches	"Vision, Intervention Strategies and Objectives"
I.C.6; I.D	*How portfolio meets Commission guidance*	Provided in each sector, throughout
II.C	*Description of how this chapter addresses the performance challenges/barriers*	"Vision, Intervention Strategies and Objectives" and "Problem and Market Barriers" and "Strategies and Tactics" narrative
I.C.4 a-c	**Intervention strategies (detailed)**	"Strategies and Tactics"
II.D.2.a; II.E.3	*What specific strategies are being pursued? (e.g., near, mid, long AND existing, modified, new)*	"Strategies and Tactics"
I [cmt with excerpt]	*Why specific strategies were chosen (e.g., ID current weaknesses, best practices, or other rationale to support choice)*	"Strategies and Tactics"
II.E.1.a; II.E.4	*How approaches advance goals discussed above*	"Strategies and Tactics"
I.C.4; I.E; II.D.4	*How strategies use lessons learned from past cycles and EM&V*	When appropriate, provided in chapter "Evolving Programs" Many strategies are new and do not have lessons from past cycles
I	*How will interventions support/augment current approaches or solve challenges*	When appropriate, provided in chapter "Evolving Programs" Many strategies are new and do not have lessons from past cycles
II.D.2	*Explanation for how these strategies address legislative mandates from AB 802, SB350, and AB 793, as well as other Commission directives for this sector, including strategic plan.*	Provided throughout sector chapters

I.C.4	*Future expectations for intervention strategies*	"Strategies and Tactics"
I.C.1; II.E.6	*Description of pilots*	N/A
II.F	*Key Partners*	"Key Partners/Coordination"
I.C.5; I.D; II.B;	**Compare/contrast to past cycles**	"Evolving Programs"
	Budget changes as appropriate	Provided as appropriate
	Modification to sector strategies	"Evolving Programs"
	Cross-cutting (sector chapters and ME&0)	See Specific Section for Each Sector:
II.E.2; II.H, II.K	*Program Administrator marketing and integration with SW MEO as applicable*	"Coordinating Activities: Marketing, Education & Outreach"
II.E.5; II.H	*Workforce education and training*	"Coordinating Activities: Workforce Education & Training"
II.H	*Emerging Technologies*	N/A
II.H	*Codes & Standards*	Separate Chapter and Cross cutting in Sector Chapters
II.G	**Cross PA and Offering Coordination**	"Coordinating Activities"
II.G	*How strategies are coordinated among regional PAs*	See Overview, "BayREN Governance" and Narrative in "Coordinating Activities"
II.G	*Proposal of statewide program administrator/approaches for this sector*	N/A
II.G	*How the sector strategies are coordinated with statewide program*	N/A
II.G	*How are strategies coordinated with other state agencies and initiatives? (e.g., AB 758)*	Provided throughout sector chapters
II.I	**EM&V Considerations (statement of needs)**	**"Coordinating Activities: EM&V Efforts"**
II.I	*Data collection needs*	"Coordinating Activities: EM&V Efforts"
II.I	*Anticipated study needs*	"Coordinating Activities: EM&V Efforts"
II.J	**Demand Response**	N/A
II.K	**Residential Rate Reform**	N/A
II.L	**Integrated Demand Side Resources**	N/A
II.M	**Zero-Emission Vehicles(EVs)**	N/A
II.N	**EnergySavings Assistance (Multi-family Focused)**	N/A
	Appendices	N/A
	Additional Customer Data	N/A
	Cited research	N/A
	CAEECC stakeholder input resolution	Attached Separately; posted to caeecc.org