

SoCalREN

DRAFT

Energy Efficiency Business Plan

Residential Sector Chapter

November 2016

Table of Contents

- A. SoCalREN’s Residential Sector Vision 1**
- B. SoCalREN’s Residential Sector Proposal Compared to Prior Cycles 2**
- C. Sector-Level Budget..... 5**
- D. Annual Net Savings from Potential Study 6**
- E. Sector Overview..... 6**
- F. Residential Sector Trends and Challenges 11**
- G. SoCalREN’s Approach to Achieving Goals 17**
- H. Leveraging Cross-cutting Resources 26**
- I. Integrated Demand Side Management (DSM)..... 27**
- J. SoCalREN and State Policy Goals 28**
- K. SoCalREN’s Partners and Commitment to Coordination 31**
- L. Metrics and EM&V Considerations 34**
- M. EM&V Preparedness and Research Needs..... 36**
- Appendix A: Stakeholder Feedback – Residential Sector A-1**
- Appendix B: Compliance Checklist B-1**
- Appendix C: Additional Supportive Data Material C-1**

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SoCalREN Residential Sector Chapter

A. SoCalREN's Residential Sector Vision

The California Energy Efficiency Strategic Plan (Strategic Plan), last updated in 2011, is the key driver behind SoCalREN's Residential vision and mission. The Strategic Plan describes a future where both existing and new buildings are Zero Net Energy (ZNE), and names energy efficiency (EE) with a focus on Market Transformation as its highest priority. SoCalREN's long-term vision directly flows from the plan, with an emphasis on the Southern California region and inclusivity of all residents. The vision also aligns with California's energy efficiency standards (Title 24), AB 32 and SB 350. SoCalREN's vision for the residential sector is for all Southern California housing stock to be as energy efficient as possible, enabling zero net impact on the grid. With this as our context, SoCalREN has developed a vision for the residential market in our service area:

SoCalREN's vision for the residential sector is for all Southern California residents to live in homes that are ZNE or ZNE-ready.

Over the next decade, Californians will face a shifting energy marketplace, including new service providers through Community Choice Aggregation, increased demand for plug-in electric vehicles, and increased adoption of rooftop solar. SoCalREN sees its role as establishing common efforts that local governments can adopt and nurture to drive energy efficiency adoption. Furthermore, SoCalREN believes that its focused efforts in hard-to-reach communities, and on piloting innovative new programs, will help all Californians navigate the path toward ZNE. With this context, SoCalREN has framed its goals and strategies to meet its mission and vision. Based on the guidance from the decision (D.)12-11-015,¹ SoCalREN has developed a mission for the residential market in our service area and will frame its understanding of the residential market, sector problem statements and barriers, and intervention strategies around this mission:

The SoCalREN Residential mission is to leverage the collective action of local governments and their communities to maximize the energy efficiency of homes across Southern California, focusing on hard-to-reach communities and innovative pilot programs.

SoCalREN's Residential Sector Goals

Over the next 8 years, SoCalREN will seek to achieve the following goals:

- Save XX MW, XX MWh and XX therms focusing on deep retrofit opportunities within multifamily properties.

¹ D.12-11-015, Ordering Paragraph (Op.) 2

- Save XX MW, XX MWh and XX therms focusing on retrofit opportunities within single family properties.

SoCalREN will also include and track the following secondary goals:

- Demonstrate public agency actions toward promoting energy efficiency, targeting a goal of X% increase of agencies making energy efficiency commitments.
- Drive program participation through local outreach and engagement about energy efficiency and ZNE, engaging X% additional potential program participants.
- Transform home improvement markets to apply whole house energy solutions to existing homes by integrating energy efficiency with other Distributed Energy Resources (DER) options within x% of residential buildings.
- Increase residential program implementation efficiencies by reducing administrative and marketing costs. Reduce residential energy efficiency program costs of \$/kW, \$/kWh and \$/therm saved by x% through the use of cost effective program models.

In addition to these goals, SoCalREN is also committed to addressing two of the strategic overarching Big Bold energy efficiency strategies. SoCalREN's efforts also seek to:

- Provide low-income customers an opportunity to participate in energy efficiency programs by engaging #x public agencies to offer EE programming in coordination with existing income-qualified community development programs.
- Transform the Heating Ventilation and Air Conditioning (HVAC) industry to ensure optimal energy performance in California by training 60 contractors annually on energy efficiency, ZNE, and tools available to offer high performance, above code HVAC upgrades to customers.

B. SoCalREN's Residential Sector Proposal Compared to Prior Cycles

To meet the goals laid out in the SoCalREN vision, five major intervention strategies have been identified. These intervention strategies are summarized below and further detailed in section G. *SoCalREN's Approach to Achieving Goals*. Emphasis will be on programs that can improve cost effectiveness compared to previous cycles and that can scale. SoCalREN will leverage the scale and reach of local government administered programs whenever possible.

1. **Integrate with Residential PACE to Drive Greater Energy Savings.** Residential PACE is transforming how consumers make decisions about home improvement projects. However, as an unregulated program, the projects contain uncaptured energy savings and possibly miss opportunities for greater efficiency and comprehensiveness. SoCalREN proposes to coordinate with local governments and residential PACE providers to co-promote regulated incentive programs, and capture reportable energy savings from projects that do not participate in an incentive program. This approach leaves behind the implementation of Home Upgrade and turns instead to greater integration with successful home retrofit programs.

- 2. Increase Access to Improvement Data that Demonstrates Benefits of Energy Efficiency.** Energy efficiency features are largely invisible to the average resident, home buyer, or real estate professional. Access to clear, consistent, and reliable data will help buyers factor in efficiency attributes and plan for cost-effective home upgrades. Energy benchmarking and monitoring will help address the high cost barrier in multifamily retrofits. It will demonstrate how efficient equipment improves a building's performance, saves money, and offsets upfront costs. Energy benchmarking and monitoring will help put multifamily buildings on the path to ZNE by providing concrete progress and real life case studies. This intervention strategy builds on the work accomplished in previous cycles and uses previously completed projects and trained real estate professionals to drive further energy efficiency.
- 3. Engage Public Agencies to Drive Energy Efficiency in Their Communities.** Partnering with public agencies and their communities was a guiding principle from the California Public Utility Commission (CPUC) when the RENs were established. The focus on public agency engagement is a cornerstone of SoCalREN's path toward reaching its goals. Public agency partnerships are established through written commitments supporting energy efficiency in the public agency's community. SoCalREN was authorized to leverage the collective action of local governments, so this is a continuing intervention strategy. In this cycle, SoCalREN will build in additional structure to capture metrics and report on collaborative efforts with public agencies. SoCalREN will continue to leverage public agency programs with a particular focus on serving hard-to-reach communities including multifamily properties. New in this cycle, SoCalREN will pilot ZNE demonstration projects.
- 4. Increase and Deepen Partnerships with Stakeholders to Drive Adoption of Energy Efficiency.** Partnerships with local governments will continue to be a strong part of SoCalREN's core service area, and the key to achieving our goals. Similar to engaging with public agencies, strong partnerships are one of SoCalREN's pillars. In this program cycle, SoCalREN plans to increase the number and deepen the existing partnerships with stakeholders. This includes partnering with community-based organizations and local employers to host energy efficiency workshops during lunch hour, financial organizations that offer financing solutions, real estate professionals that advise property owners. In this cycle, SoCalREN will also look at partnerships with water agencies to establish new pathways for properties to participate in both water and energy-saving programs.
- 5. Offer Technical Assistance to Increase Capacity for Program Participation.** Energy efficiency continues to be a difficult space to understand for most building owners. Technical assistance helps overcome the hurdle of limited understanding and nurtures building owners as they pursue each next step in improving their homes and facilities. Where prior cycles focused assistance on individual property owners and building professions toward their potential for discrete program participation, SoCalREN will now include technical assistance for community level assistance on efforts such as ZNE.

Key Learnings from Recent EM&V Reports of California's Residential EE Programs

There are common themes across evaluations of the RENs. One common and most conspicuous evaluation finding/recommendation was consistency and alignment with other program administrators (PAs). This included consistent reporting specifications across PAs, in particular common measure codes, which would enable evaluators to compare PAs with each other. Another common evaluation recommendation theme was for all PAs to be using the same workpapers.

Other considerations focus on strategy. For example, single family programs should focus on gas savings because programs like Home Upgrade are most effective at saving gas. Another reason to focus on gas is the vast majority (95%) of emissions in the residential sector came from natural gas.² This proportion has stayed relatively constant since 1980.³ Given Southern California's climate, SoCalREN should focus on inland regions, which shows greater capacity for savings than milder climates on the coast. This knowledge—and trends like air conditioning becoming the largest contributor to peak demand and recent development occurring inland—shapes SoCalREN's strategy to impact the region.

SoCalREN will consider expanding the information in its database. Evaluation studies specifically called out adding new tracking fields like more detailed participant information, measure details, pre-existing conditions, property systems, more detail on the property, and collecting meter numbers. SoCalREN has been tracking evaluator's recommendations, and has identified additional data to track not identified in the reports. This is data that is not currently integrated into the database which records more technical details like energy savings. Some additional fields are number of trainings, events, promotions, registrations, communication, satisfaction surveys, participant viability, activities supported by participants, referrals, attrition rates, and timelines.

The benefits of improved data collection are many. First and foremost, it will make reporting and future evaluations more meaningful. It can help SoCalREN track progress towards goals. It can track real time progress and measure the effect on participant behavior. Finally, it can inform program course corrections, future program planning and design.

SoCalREN received recommendations from the authors of the 2013-2014 REN-CCA Impact Assessment Study. Below is a list of these recommendations and SoCalREN's response.

Table 1. 2013-2014 REN/CCA Impact Assessment Recommendations

EM&V Impact Assessment Recommendation	Response
<p>Improve tracking data.</p> <ul style="list-style-type: none"> • Ex-ante data should be consistent across all PAs. • Check thoroughly before submission. • Financing programs should be differentiated. 	<p>All recommendations will be adopted. SoCalREN will align with statewide data and tracking recommendations as are provided by the CPUC or PCGs. SoCalREN will work with CPUC staff and data consultants to add flags</p>

² Citation needed

³ Citation needed

<ul style="list-style-type: none"> • Programs should be coded differently. • Well defined start and stop dates. • Identify and verify electric and gas account numbers. • Identify fuel type if possible. 	to differentiate financing programs, as recommended.
Ensure key fields are collected and easily accessible.	SoCalREN has adjusted data collection and tracking to ensure key fields are collected.
Collaborate with IOUs and agree on methods to estimate measure savings.	SoCalREN will leverage the convening capacity of the MF HERCC to develop a task group to identify and define consistent savings calculations.
Collect meter numbers to help match program and billing data.	SoCalREN will capture meter numbers to aggregate and analyze estimated savings and billing data. SoCalREN will leverage AB 802 to do so.
Collect building data to calibrate savings assumptions with actual customer bills.	SoCalREN will use AB 802 to do this.

SoCalREN will also use evaluations of other programs to inform strategy and program design. Financing is a significant factor for achieving major energy efficiency projects in the residential market, along with a program design that meets the needs of contractors.⁴ SoCalREN will leverage local government partnerships to develop pilots that integrate seamlessly with existing financing programs that fill gaps not currently met through ratepayer programs.

C.Sector-Level Budget

The following budget is a summary of SoCalREN's residential sector budget. These values are based on estimates of the proposed strategies outlined in section G. *SoCalREN's Approach to Achieving Goals*. As SoCalREN implements the strategies described in this business plan chapter, the budget will be reevaluated over time to respond to market changes, needs of the portfolio and regulatory directives. Further details on these changes will be reflected annually in SoCalREN's September Compliance filing as dictated by D.15-10-028.⁵

Table 2. SoCalREN Residential Sector Level Budget

Year	Budget	% of Portfolio
2018		
2019		
2020		

⁴ See

http://www.energydataweb.com/cpucFiles/pdaDocs/1625/HERO%20Program%20Profile_DRAFT%20Final%20Report.pdf

⁵ D.15-10-028, Op. 4

2021		
2022		
2023		
2024		
2025		
2026		
2027		

D. Annual Net Savings from Potential Study

SoCalREN will aim to achieve the following net savings residential multifamily goals as reported in the 2015 Potential Study.⁶

Table 3. Annual Residential Sector Net Goals

Year	Annual Net Goals					
	GWh	% of Portfolio	MW	% of Portfolio	Million Therms	% of Portfolio
2018						
2019						
2020						
2021						
2022						
2023						
2024						
2025						
2026						
2027						
Total						

E. Sector Overview

Target Audience

SoCalREN includes some of the most diverse communities in the nation and encompasses the second largest metropolitan region in the country. However, SoCalREN itself is not geographically designated in basic data sources like the US Census, and SoCalREN does not have access to utility customer data. Therefore, in order to understand the region’s target audience, this section

⁶ SoCalREN derived the net goals from the 2015 Navigant Potential and Goals study based on Net Savings potential of SCE/SCG

looks at geographical stand-ins like Los Angeles County, US Census Metropolitan Statistical Areas (MSAs), and publicly available data on Investor Owned Utility (IOU) territory.

The SoCalREN region is large and diverse. In 2012, there were an estimated 12.9 million people in the Los Angeles-Long Beach-Santa Ana MSA and 4.2 million households.⁷ Over half (50.7%) were female. Seventy-five percent were 18 and over, and the median age was 35.1⁸. The largest single age group was 25-29 year olds (7.6% of the population).⁹ Fifty-six percent were white (including Latino), 22.1% categorized their race as “other”, 16.3% were Asian, and 7.9% were black or African American.¹⁰

As the second largest metropolitan region in the United States, behind New York, there is considerable energy efficiency market potential in SoCalREN territory. The metropolitan region has over 4.5 million housing units. Los Angeles County alone has 3.4 million. And like the demographic breakdown, the housing stock is varied: it is split almost exactly in half between single-family detached (49.7%) and multifamily (50.4%).¹¹ It represents historical settlement patterns, where the vast majority of units were built after World War II. Seventy-four percent were built after 1950. It’s also expensive. The median home price in Los Angeles County is \$425,100. According to Zillow, nationally that figure is \$189,400.¹²

SoCalREN’s intervention strategies will reflect these and other unique characteristics, such as how at 46.5%, Los Angeles County property ownership rates are lower than the national average of 62.9%.¹³ Program and outreach design will reflect that, of owner occupied units, 82.0% live in a single-unit detached residence. Those who own their own homes earn more than renters, are more likely to live in housing built between 1940 and 1959, and are more likely to use gas to heat their home. Renters are more likely to use electricity. For owners, marketing and education materials will stress the impact energy efficiency measures have on the home’s value. SoCalREN will work with realtors who want to support their clients and differentiate themselves in new ways by teaching them how to speak to their clients about green/energy and upgrade opportunities.

Multifamily housing in California features four primary types of property owners (program customers):

- Market-rate, individual owner: Concerned with maintaining or improving the value of their property.
- Market-rate, investor-owned: Values making money and providing ROI to investors--often within a period of a few years.
- Affordable, for-profit owner: May be mission-driven, seeking to support tenants and improve quality of life.
- Affordable, non-profit owner: May be Mission-driven, seeking to support tenants and improve quality of life.

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The size and diversity mean SoCalREN will have to work hard to engage hard-to-reach residential customers. We refer to the CPUC's EE Policy Manual for definitions of how to define hard to reach residential customers: 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.¹⁴ 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

The scale of the opportunity to save energy suggests IOUs may be in the best position to realize savings. The market capacity represents a great opportunity for SoCalREN to leverage programs and be the drivers of more customers into the energy efficiency landscape. Energy intensity, which is a measure of the energy efficiency of a nation's economy, improved 2.3% globally in 2014.¹⁵ The greatest impact was on the residential sector, where appliances, lighting, and space heating showed the greatest reductions. Residential buildings account for 74% of global building energy use. In the United States, of the \$90 billion spent in 2014 in the residential and commercial building construction market, 2.4% was invested in building energy efficiency, up from 1.9% in 2009.

Much of the single-family building stock in Southern California is old and inefficient, seeing little penetration by energy efficiency programs. Three-quarters (75.6%) of structures in Los Angeles county were built before 1980, pre-dating California's energy efficiency standards. Approximately 200,000 single family homes statewide have earned a green or energy efficient label, including 163,000 Energy Star, 15,000 GreenPoint Rated, and an estimated 9,000 LEED Homes. SoCalREN will use this initial group to market high performance homes.

The multifamily market is similar. More than 70% of California's multifamily buildings were constructed before 1978, when energy standards were enacted. A 2012 study by the University of Arizona and Fannie Mae found that nationwide, the multifamily sector is engaged in a disproportionately small share of energy efficiency measures. In 2009, the study reported that there were 34% fewer energy efficient features in multifamily rentals compared to other housing types.

The potential for energy efficiency programs in California is significant. The 2012 California Lighting and Appliance Saturation Study sent out nearly 2,000 surveys to IOU customers in California, 793 of which were in SCE territory. Following is a sample of what they discovered:

- Heating Systems
 - Statewide 98.2% of homes have one or more heating system.

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- 40.8% are central split forced air.
- 17.9% are forced air furnaces with no air conditioner.
- 13.9% are wall furnaces.
- In SCE territory, 99.2% of systems are less than 90 AFUE
- Cooling Systems
 - Statewide two-thirds of homes have some type of cooling system.
 - 50% have central air conditioning; 15% have space conditioning.
 - In SCE territory, 95.1% of systems are less than 14 SEER.
- Building Envelope
 - Statewide the average attic R-value is 20.8.
 - 72% of homes have some type of wall insulation statewide.
 - In SCE territory, 91% of homes have less than R-38 attic insulation.
- Water Heater
 - In California 95.6% of water heaters had an energy efficiency of 0.639 or below.

One recent development has come from the financing sector, through PACE programs. Leaders in this industry include HERO and California FIRST, the former of which reached \$1 billion in PACE loans in 2015. PACE represents two opportunities; first, to integrate PACE programs with other energy efficiency programs, and second, expand the pool of homes that can be marketed as high performing.

Segment Overview and Energy Usage

In 2014, the Los Angeles County residential sector *alone* consumed more electricity (20.76 billion kWh) than the *combined* sectors of any other county in California. In 2014, the residential sector consumed 29.7% of all electricity in Los Angeles County. In 1990 it was 26.2%.¹⁶ The top five counties for residential electricity consumption were all in Southern California. In order they were Los Angeles, Orange, San Diego, Riverside and San Bernardino Counties, and collectively consumed over 46 billion kWh. That's half (51.0%) of California's residential energy consumption.

Los Angeles County was also the largest consumer of natural gas in the California residential sector, consuming over one billion therms in 2014, more than double San Diego and Orange County combined, which ranked second and third respectively (ECDMS). Five of the top six natural gas consumers by county are in Southern California. In order they are Los Angeles, San Diego, Orange, San Bernardino, and Riverside Counties. Unlike electricity, consumption of natural gas in the residential sector in Los Angeles County has declined over time. In 2014 it was about 37.7% of the total in Los Angeles County. In 1990 it was 55.9%.¹⁷ Nevertheless, Los Angeles and neighboring counties in SoCalREN territory, represent a substantial opportunity for energy consumption reduction.

Estimated statewide average electricity usage is 7,605 kWh per single family household. For SCE households the average is 6,444 kWh.¹⁸ Statewide average gas usage is 382 therms per single-family household. For SoCalGas households, the average is 425 therms per household. For multifamily units, the average annual electricity consumption per unit is 4,350 kWh. The

¹⁶ California Energy Consumption Data Management System (<http://ecdms.energy.ca.gov/>) (ECDMS).

¹⁷ Ibid.

¹⁸ CA Residential Appliance Saturation Survey, 2009

average annual natural gas consumption per multifamily unit is 187 therms. The average annual demand per multifamily unit is 1.2 kW¹⁹.

Annually, in Southern California Edison/ SoCalGas territory, the 2,139,455 multifamily units²⁰ consumed an average of 4,350 kWh per unit (over 9.3 billion kWh in total); 187 therms per unit (roughly 400 million therms total); and 1.2 kW of demand per unit (2.6 million kW total).²¹

Growing energy consumption represents major challenges and opportunities in achieving the state goal of reducing purchased energy by 30% in 75% of existing homes.²² Bold, innovative programs are needed to reach this goal. SoCalREN, working with public agencies, will leverage the real estate sector to advance these goals while putting communities on the road to a ZNE future.

Reduced energy costs will always be a mainstay benefit of energy efficiency, but the urgency of doing so is less than it once was. There has been no dramatic spike in the cost of energy in the last decade. The recession is largely responsible. The price of gas per therm actually decreased 49% from 2008 to 2009. The price of electricity, on the other hand, rose modestly in 2009, 2010, and 2011. Since 2006, the price of natural gas per therm has increased only 1.31%. Electricity prices have increased 7.1%, an average of less than 1% per year.²³

In 2013, California's residential sector emitted 27.7 million metric tons of CO₂, second only to New York, but 39th in per capita emissions. The vast majority (nearly 95%) of CO₂ emissions in the residential sector came from natural gas, a proportion that has stayed relatively constant since 1980 (EIA). In Southern California Edison/Southern California Gas territory, the greenhouse gas emissions associated with multifamily energy consumption is over 5.5 million tons of CO₂.²⁴

In 2010, LA County emitted 99.1 million metric tons of CO₂, approximately 21.7% of California's total. Per capita emissions were 10.1 metric tons. Building energy usage is the largest single portion (39.2%) of CO₂ emissions, followed by on-road transportation (33.5%). Stationary sources (heavy industrial sources) are also a significant contributor (19.7%) (IoES).²⁵

Energy efficiency programs are an opportunity to reduce greenhouse gas (GHG) emissions. In 2013, California's residential sector emitted 27.7 million metric tons of CO₂, second only to New York, but 39th in per capita emissions. The vast majority (nearly 95%) of CO₂ emissions in the residential sector came from natural gas, a proportion that has stayed relatively constant since 1980 (EIA).

Geography

[To be provided in the January filing.]

¹⁹ SoCalREN Workpaper.

²⁰ US Census

²¹ SoCalREN Workpaper

²² Pp. 20, EESP.

²³ Bureau of Labor Statistics (BLS).

²⁴ Citation TBD by Build It Green.

²⁵ "2015 Environmental Report Card for Los Angeles County". UCLA Institute of the Environment and Sustainability.

Energy Efficiency Potential

Navigant Energy undertook the 2015 California Potential and Goals Study to inform IOU goals, forecast additional achievable energy efficiency (AAEE) savings, understand how IOU programs can meet AB 32 goals, and provide analysis to support development of a strategic plan. It relied on data from the Database for Energy Efficient Resources (DEER) and evaluation, measurement, and verification studies. Below are findings relevant to SoCalREN programs:

- Cumulative Market Potential projections have decreased since 2013.
- Electric incremental market potential does not exceed 1.2%.
- Natural gas incremental market potential is even less, with no one sector (Residential, Commercial, Industrial, Agricultural, Mining) exceeding 0.8%.
- Residential:
 - For both electricity and natural gas, residential has the greatest incremental market potential of all sectors.
 - Lighting has the greatest potential, followed by appliance plug load, and whole building savings.
 - For natural gas, whole building savings save the most energy initially, but Hot Water Storage is projected to overtake it beginning in 2017.

Energy Usage Forecasts

[To be provided in the January filing.]

F. Residential Sector Trends and Challenges

Trends

Several trends influence SoCalREN programs and their design. Local governments strive to become more efficient and change building codes to do so. Building codes are connected to the creation of SoCalREN itself. In 2009, a section of the American Recovery and Reinvestment Act (ARRA) included statutory provisions linking State Energy Program funding to building energy code adoption and enforcement. In order to receive funds, the state had to comply with the ARRA administrator's terms. Building codes show the unique role local governments play in driving adoption of energy efficiency through efforts like codes and standards regulation.

Rapid growth has made air conditioning installations among the state's largest contributors to peak demand, and represents a tremendous opportunity for energy consumption reduction. In 1976, 25% of new homes in California had central air conditioning. Today the proportion is 95%. In the summer, air conditioning accounts for 30% of peak demand in California. Additionally, development has also moved into hotter inland regions.

The AB 802 energy disclosure will take effect in January 2017. Diagnostic capability is improving as audits become more sophisticated. Nationally, there is momentum in the real estate industry to increase standardization of MLS systems that are in compliance with the Real Estate Standards Organization's Data Dictionary.

Challenges

Despite growth in customer demand for energy efficiency, residential market transformation is not without its challenges. Below are some of the largest barriers to program success. Later on the chapter discusses SoCalREN's intervention strategies to overcome them.

- **Housing Affordability.** Over half of renters in Los Angeles County pay 35% or more of their salary in rent. Only 27% of households in Los Angeles County can afford to buy a median-priced house. In Los Angeles County, a prospective home buyer has to earn 172% of the median income to buy a median priced home. The growing share of housing costs eats into a homeowner's ability to pay for upgrades some see as costly and unnecessary. Green financing programs, like Homestyle and PACE, address this challenge, and fit into SoCalREN's emphasis on non-resource solutions.
- **Education.** Lack of knowledge of the benefits of energy efficiency is still pervasive. Energy upgrade features are largely unseen by single family and multifamily residents, and the benefits become obvious only over time. Contractors and other building industry professionals lack training in the benefits of whole building retrofits. After receiving training, many have difficulty integrating energy efficiency into their existing business models and have a need for continued training and support. Real estate professionals lack the training to communicate basic, credible information about the value and benefits of green home upgrades. On the sales side, most real estate professionals do not have the training to help sellers capitalize on their home's energy efficiency attributes. Inspectors, appraisers, and lenders are often also unaware of the benefits. Multifamily housing professionals do not understand the value of green features, how to evaluate them, or how to incorporate environmental benefits into the rehab process. Planning and documentation require technical skills. SoCalREN programs will be an effective channel through which to disseminate knowledge of energy efficiency principles.
- **Misplaced or split incentives.** Energy efficiency benefits do not always accrue to the person trying to conserve. Rental property owners have inadequate incentive to make green improvements because the benefits go to the tenants. Tenants do not want to make permanent improvements because they do not have a stake in the property and often do not stay long enough to recoup their investment and realize benefits. This is a barrier multifamily programs address by including incentives for the building owner alongside the benefits to the tenant.
- **Liquidity Constraints and Upfront Costs.** Homeowners are reluctant to take on expensive comprehensive energy efficiency projects, which reduces the need for financing. The average project cost is \$15,860 for SoCalREN (Energy Upgrade California Home Upgrade dashboard 2016). The cost of evaluating an existing home to obtain a HERS rating in California currently ranges from \$800 to \$1,500, which is cost-prohibitive in the context of most home sale transactions or home renovation projects. Simpler approaches to home ratings that can be done for \$150 or less will be much more palatable to consumers and the real estate industry. There is limited access to realistic capital limits, particularly in the affordable housing multifamily sector.
- **Market Structure.** Large and established firms may inhibit competitors from engaging in multifamily energy efficiency projects and adoption of cost effective products. Multifamily

programs in particular have been a great way to break through entrenched market structure.

- **Risk.** Property owners base their decisions on economic benefit, net cash flow, and/or profits. Currently, there is a great degree of perceived and/or real risk that investments in green and energy efficiency upgrades will not translate to the predicted economic benefit. Mortgage lenders in the multifamily segment will often not give consent because holders are unwilling to subordinate their lien positions. Single family applicants often do not meet the credit score or other underwriting credit requirements to receive attractive rates lowered by rate payer funded loan loss reserves. Green real estate programs, in particular, mitigate the perception of risk, by showing customers how their homes increase in value with efficiency upgrades.
- **Lack of Information.** Lack of well-documented business case information and standardized methodologies leave single family and multifamily property owners ill-equipped to evaluate the technical and economic potential for retrofitting their properties. Multifamily building owners lack easy access to data about energy use and retrofit performance. While the functional value of green single family home improvements is reasonably well documented in aggregate, the market value of those improvements remains under-studied. It remains challenging to predict the economic value of green improvements for a particular property.
- **Credibility.** Decision makers do not know which sources of information to trust and which to discount as potentially biased.
- **Time and Resources.** Energy efficiency improvements often compete with other priorities, such as capital-intensive projects and maintenance in both single family and multifamily sectors. For multifamily buildings, the required time and resources of building owners, managers, and occupants can be a challenging barrier. Development times for multifamily projects are very long. The short length of program cycles has impaired the ability of programs to serve the multifamily sector. Commercial PACE financing requires additional steps and various parties (property owner, residential building professional, ASHRAE auditor, mortgage bank, investor, and the County's Treasurer and Tax Collector) to complete a transaction.
- CPUC and stakeholder focus on the home performance approach was expected to result in statewide market transformation in the way contractors promote and sell replacement equipment and construction products, and lead to consumer demand for high-performing homes. As with Home Performance with Energy Star (HPwES) on a national level, home performance programs have failed to achieve any appreciable scale in California. SoCalREN recognized that the programs were deeply flawed—hindered by onerous requirements and restrictions—and has worked closely with Energy Division staff, stakeholders, and IOU staff to facilitate the evolution of home performance programs across California.

SoCalREN's vision to make Southern California's residential sector energy efficient focuses on the unique capabilities of local governments to serve constituents. Barriers to residential energy efficiency may vary only slightly statewide, but the regional differences are great enough that SoCalREN's local solutions create outcomes with impacts that reach underserved communities, create tailored piloting programs that can scale, and provide programs that larger investor owned

utilities cannot or will not offer. This local focus also means SoCalREN is well positioned to push residents toward a ZNE future.

Table 4. Sector Barriers and SoCalREN Intervention Strategies

Barrier	Problems & Challenges	Observed Impacts from Barriers	Potential Solutions	Intervention Strategies
Lack of knowledge of energy efficiency benefits among residential workforce	<ul style="list-style-type: none"> Residents are unfamiliar with EE improvements Reliance on single certification (e.g. BPI) Lack of training offerings and interest Absence of real estate industry institutional awareness of EE benefits 	<ul style="list-style-type: none"> Customers reluctant to incorporate EE efficiency in home repairs EE standards do not reflect regional climates With unfamiliarity, contractors are hesitant to adopt whole house approach Not enough contractors trained to perform whole house retrofits Contractors in field have limited technical expertise Institutional training does not target real estate professionals 	<ul style="list-style-type: none"> Promote best practice codes and standards across markets Programs that leverage metered data for program evaluation, measurement, and verification Contractors explain how EE upgrades complement existing non-EE needs Simplified rating certification Contractor education Connect contractors with real estate professionals 	<ul style="list-style-type: none"> Increase access to improvement data that demonstrates benefits of EE Offer technical assistance to increase capacity for program participation
Not enough rate payers pursue energy efficient goals	<ul style="list-style-type: none"> Program complexity Programs change Unfavorable economic environment Suspicion programs are scams Low priority relative to non-EE home improvements 	<ul style="list-style-type: none"> Customers resist EE because of economic anxiety Low consumer demand because programs are confusing Customers perceive programs to be a hassle Missed opportunities 	<ul style="list-style-type: none"> Increase adoption of EE improvements by multifamily segment Increase adoption of EE solutions by SF residential segment Create consolidated and simplified program offer Increase customer 	<ul style="list-style-type: none"> Integrate with residential PACE to drive greater energy savings Engage public agencies to drive energy efficiency in their communities

Barrier	Problems & Challenges	Observed Impacts from Barriers	Potential Solutions	Intervention Strategies
		for whole house improvements <ul style="list-style-type: none"> Contractors resist if program changes significantly 	confidence through trusted end-to-end advisory and technical assistance services <ul style="list-style-type: none"> Outreach focusing on economic benefits of EE, stressing simplicity Education on whole house benefits Program consistency 	
Pursuing energy efficiency is costly	<ul style="list-style-type: none"> EE equipment is more expensive than regular equipment High first cost Contractor training is expensive Changing business model is costly Costly because programs require administration support 	<ul style="list-style-type: none"> Payback (ROI) uncertainty Low desire for contractors to participate Marketing program is difficult Difficult to incorporate into existing business models Contractors cannot finish project within allotted time Contractors hire support staff 	<ul style="list-style-type: none"> Prove and capture contributory value of EE improvements to catalyze market transformation Educate contractors about EE benefits Flexibility and incremental approach to encourage adoption into business models Simplify administration 	<ul style="list-style-type: none"> Integrate with residential PACE to drive greater energy savings Offer technical assistance to increase capacity for program participation
Energy efficiency efforts are not coordinated.	<ul style="list-style-type: none"> Residential PACE admins do not coordinate with SoCalREN outreach and advertising Programs take place outside of regulated environment 	<ul style="list-style-type: none"> Unpermitted improvements Inaccurate or unreported savings Hesitancy to act due to customer confusion 	<ul style="list-style-type: none"> Develop mechanisms to integrate multiple programs leading to larger projects, verified energy savings, and deeper EE savings per project 	<ul style="list-style-type: none"> Integrate with residential PACE to drive greater energy savings Engage public agencies to drive energy efficiency in

Barrier	Problems & Challenges	Observed Impacts from Barriers	Potential Solutions	Intervention Strategies
	<ul style="list-style-type: none"> Fragmented program services Competing, confusing market offerings not consistent with EE principles like loading order Competing goals and demands Lack of project prioritization Customer conflates dishonest and legitimate programs 	<ul style="list-style-type: none"> Fragmented efforts to upgrade home Misalignment with overreaching efficiency goals Missed upgrade opportunities Residents may follow incorrect loading order, like installing solar before reducing consumption Customers reluctant to participate 	<ul style="list-style-type: none"> Streamline and simplify one-stop program approach to identify, implement, and manage programs Develop programs dedicated to providing consistent education across uncoordinated efforts 	<p>their communities</p> <ul style="list-style-type: none"> Increase access to improvement data that demonstrates benefits of EE
<p>Insufficient incentive for the owners who rent their property (split incentive)</p>	<ul style="list-style-type: none"> Landlords lack incentive to make EE upgrades that benefit renters Without equity, tenants unwilling to make improvements Lack of communication between tenant and owner 	<ul style="list-style-type: none"> Rental properties are not upgraded Limits type of buildings upgraded Excludes specific types of contractors Disconnect between real estate professionals in the rental market and ownership market Tenant and owner hesitant to work together 	<ul style="list-style-type: none"> Increase the adoption of EE solutions into existing unit-turnover models Develop separate education programs focusing on tenants and owners Outreach focused on communication between tenant and owner Diversify contractor base 	<ul style="list-style-type: none"> Offer technical assistance to increase capacity for program participation Increase access to improvement data that demonstrates benefits of EE
<p>Low adoption in hard to reach (HTR) communities</p>	<ul style="list-style-type: none"> Less existing equipment in HTR communities Focus on incentivizing replacement equipment, 	<ul style="list-style-type: none"> Customers do not install new equipment Few contractors to communicate with participants 	<ul style="list-style-type: none"> Increase adoption of EE in HTR communities Focus on strategic engagement with HTR 	<ul style="list-style-type: none"> Engage public agencies to drive energy efficiency in their communities

Barrier	Problems & Challenges	Observed Impacts from Barriers	Potential Solutions	Intervention Strategies
	<p>therefore programs are biased</p> <ul style="list-style-type: none"> • Access to trained professionals • Language barriers • Exacerbated financial demands • Geographical access to program centers 	<ul style="list-style-type: none"> • Difficult to find a qualified contractor • Face to face access with centrally located program representatives 	<p>stakeholders and decision makers</p> <ul style="list-style-type: none"> • Customized offerings to meet unique challenges such as lack of existing equipment • Connect customers with community contractors 	<ul style="list-style-type: none"> • Increase access to improvement data that demonstrates benefits of EE

G. SoCalREN's Approach to Achieving Goals

Strategic Interventions: Overview

SoCalREN's vision to educate and support building owners in their communities' path to ZNE includes a number of intervention strategies that address multiple barriers. SoCalREN intends to use the same intervention strategy to address a variety of market barriers.

Intervention 1 – Integrate with Residential PACE to Drive Greater Energy Savings

Residential PACE is transforming how consumers make decisions about home improvement projects. However, as an unregulated program, the projects are of uncertain quality and uncaptured energy savings. SoCalREN proposes to coordinate with local governments and Residential PACE providers to co-promote regulated incentive programs, and capture reportable energy savings from projects that do not participate in an incentive program, and drive upgrades to above code efficiency levels.

Unregulated energy programs, including residential PACE as offered by HERO and CaliforniaFIRST, have made a significant impact in the SoCalREN territory. As shown in Figure 1, the rate of uptake for residential PACE in LA County has outpaced regulated programs quickly by large magnitude. In effect, residential PACE is taking the first step in transforming the market for energy efficiency upgrades and adoption of renewable energy resources, but it currently has significant uncertainties in the actual energy efficiency gains. PACE finances comprehensive home audits, heating and air conditioning, windows, skylights, doors, [cool] roofs, [HVAC] ducts and ventilation fans, insulation for attics/walls/floors, air sealing, lighting and control systems, high-efficiency water heaters, pool pumps and much more. Many of the measures that PACE finances are eligible for ratepayer funded incentives and many others could be added, but most

PACE contractors clearly do not want to participate in rebate programs and do not rely on incentives to sell PACE projects. With a properly designed program that leverages existing PACE and Home Upgrade participating contractors, and limits officious regulatory requirements, SoCalREN believes that contractors can be influenced to sell up to higher levels of efficiency and more comprehensive projects. A calculation based on the approved Home Upgrade calculator, shows the attributable energy savings potential to be XX MW, XX MWh and xx therms for just those measures that are in both Home Upgrade and HERO programs.²⁶

Figure 1. SoCalREN Home Upgrade vs. LAC Residential PACE Participation

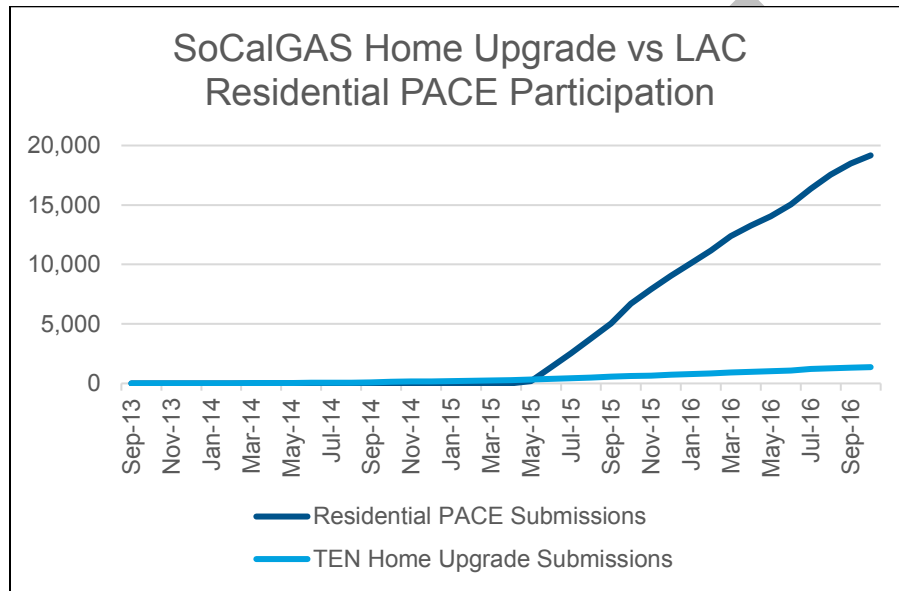


Table 5. Intervention 1 – Integrate with Residential PACE to Drive Greater Energy Savings

Intervention Strategy	Barriers	Example Tactics	Existing, Modified, or New	Short, Mid, Long-term
Integrate with Residential PACE to Drive Greater Energy Savings	Programs take place outside of regulated environment	Coordinate with local governments to develop pilot programs that capture verified energy savings for projects going through residential PACE financing	N	S, M, L
		Coordinate with local community development	E	S, M, L

²⁶ Please see Appendix C Additional Supportive Data Material

Intervention Strategy	Barriers	Example Tactics	Existing, Modified, or New	Short, Mid, Long-term
		and housing departments to offer whole home retrofits alongside rehabilitation programs		
		Joint outreach and co-branded literature	N	S, M, L
Partners: Partners: residential PACE providers, contractors, community development and housing departments				

Intervention 2 – Increase Access to Improvement Data that Demonstrates Benefits of Energy Efficiency

Energy efficiency features are largely invisible to the average person and difficult to financially evaluate. Developing reliable data on the value of energy efficiency, and ways to communicate that data, will help property owners and potential buyers make informed decisions.

SoCalREN aims to apply this intervention in two main areas:

- Transparency and Standardized Data.** Energy efficiency features are largely invisible to the average resident, home buyer, or real estate professional. Clear, consistent, and reliable data will help home buyers factor in efficiency attributes and plan for cost-effective home upgrades. Many Multiple Listing Services are not set up to accept green building inputs for a listing. In programs concerning larger projects, like multifamily, diverse ownership structure and building configurations mean costly customization for building owners.
- Energy Benchmarking and Monitoring.** Residential building professionals and participants are often uncertain of energy efficiency’s benefits. The high cost barrier will be addressed by energy benchmarking and monitoring by SoCalREN that will demonstrate how efficient equipment improves a building’s performance, saves money, and offsets upfront costs. Energy benchmarking and monitoring will help put buildings on the path to ZNE by providing concrete progress and real life case studies. This data strategy aligns with the Strategic Plan’s goal in the residential section of transforming home improvement markets to apply whole house energy solutions. Benchmarking is an effective way to show how whole house interactive effects impact energy savings, comfort, and indoor air quality.

Table 6. Intervention 2 – Establish Benchmarking Data

Intervention Strategy	Barriers	Example Tactics	Existing, Modified, or New	Short, Mid, Long-term
Increase Access to Improvement Data that Demonstrates Benefits of Energy Efficiency	High cost of participation and uncertainty of energy efficiency's benefits Inaccurate or unreported savings	Conduct valuation studies of single family and multifamily buildings that have undergone energy efficiency improvements to demonstrate that they have greater operating income and value than unimproved buildings	N	S, M, L
		Develop detailed profiles of residential building professionals and customers	N	S, M, L
Partners: Multiple listing agencies, property owners, real estate professionals				

Intervention 3 – Engage Public Agencies to Drive Energy Efficiency in Their Communities

Partnering with public agencies and their communities was a guiding principle from the CPUC when the RENs were established. The focus on public agency engagement is a cornerstone of SoCalREN's path toward reaching its goals. Public agency partnerships are established through written commitments supporting energy efficiency in the public agency's community. These agency-offered commitments can take a range of forms, and will enable SoCalREN to either coordinate or create the implementation of localized energy programs/services, and to support reach building standards by providing technical support for development and implementation. Aligning priorities early encourages trust, cooperation, processing runs smoother, and miscommunication is less likely. Local government partnerships also broaden the city and county's access to public-facing energy information, and expand the reach of SoCalREN marketing and outreach through the government's existing communication channels. These partnerships allow SoCalREN and public agencies to develop, launch, monitor, and continuously improve campaigns to raise demand for energy efficient homes locally, including home energy and/or carbon labeling programs.

These public agency partnerships will be largely used to target hard to reach and disadvantaged communities, reflecting the Strategic Plan goal of giving low-income households the opportunity to participate in energy efficiency programs. Many local governments have programs available to residents that provide housing assistance. Participation in these programs is a natural time to learn about energy efficiency and perform upgrades in conjunction with the housing program. SoCalREN will use its resources and local expertise to leverage local government agencies'

housing and community development programs and to organize events that explain the benefits of energy efficiency, connecting low-income residents with both the education and resources needed to take action.

This intervention also continues SoCalREN's existing work of offering incentives to end user participants, largely focusing on hard-to-reach audiences in both single and multifamily markets. Downstream incentives increase participation in energy efficiency programs by stimulating demand and reducing up-front cost. It is a proven strategy to encourage residents to install above code energy efficient equipment they otherwise might not. The more efficient equipment participants install because of incentives leads to less emissions and contribute to goals related to Assembly Bill 32.

In particular, SoCalREN has continuously delivered a whole building energy efficiency program in the hard-to-reach multifamily market since 2010. The County of Los Angeles launched a Department of Energy funded pilot version of the program that year; it was the first such program in the state. The pilot program, with its whole building approach, modeled energy savings, and tiered incentives, became the template that other program administrators started from in their own program designs. The pilot program was then expanded into a full program, and has been delivered continuously, since 2013 with the launch of SoCalREN. The program has seen increasing momentum from the hard to reach and underserved multifamily segment. There are nearly 17,000 units enrolled in the program with 2,000 units complete. In contrast, SCE and SoCalGas have only delivered a limited pilot program. In 2013, SCE and SoCalGas jointly launched a whole building multifamily program based on SoCalREN's program design with a limited target of 1,700 units complete. The IOU pilot program concluded in 2015 and their future delivery of a multifamily whole building program is uncertain.

Finally, SoCalREN proposes to complete demonstration pilot projects to further the development of ZNE in hard-to-reach communities. Pilot projects can vary in structure, but are a core part of SoCalREN's mission and goals: to test strategies and tactics that can be replicated throughout the region to drive energy efficiency. The goal is to partner with a public agency to demonstrate the benefits of the investment in energy efficiency to the surrounding community. An example might be showcasing a home or building that has recently undergone an energy retrofit, such as SoCalREN's current collaboration with South Claremont's Advanced Energy Communities project that will design a ZNE community fitting the disadvantage definition. More broadly, pilot projects involve responding to broadly observable trends in a selected area, testing actions that drive energy savings, and building case studies so that the energy saving actions can be replicated elsewhere. Pilots will examine what changes can be made in test areas, and provide conclusions for broader implementation.

Table 7. Intervention 3 – Engage Public Agencies to Drive Energy Efficiency in Their Communities

Intervention Strategy	Barriers	Example Tactics	Existing, Modified, or New	Short, Mid, Long-term
Engage Public Agencies to Drive Energy Efficiency in Their Communities	Program complexity and lack of familiarity	Organize events that explain the benefits of energy efficiency	E	S, M, L

Intervention Strategy	Barriers	Example Tactics	Existing, Modified, or New	Short, Mid, Long-term
	among property owners	Partner with community development agencies to develop business processes that promote joint participation in energy efficiency and home rehabilitation programs	M	S, M, L
	Low consumer demand among hard-to-reach audiences			
	High cost of energy efficiency			
	Difficult to engage low income communities in ZNE efforts due to high cost barriers	Multifamily downstream incentives to property owners	E	S, M, L
		Create ZNE community pilot projects in hard-to-reach community and create a case study	N	S, M, L
Partners: Local governments and their agencies, community based organizations				

Intervention 4 – Increase and Deepen Partnerships with Stakeholders to Drive Adoption of Energy Efficiency

Beyond just governmental partners, SoCalREN also sees the importance of partnering with key stakeholders that impact the adoption of energy efficiency.

First, above and beyond the program commitments established with public agencies to support hard-to-reach audiences, SoCalREN will establish Memorandums of Understanding (MOUs) with water utilities. This will address the problem of the high cost of energy efficiency by facilitating projects' ability to leverage multiple programs at one time, receiving streamlined support for both energy and water measures. These MOUs will help put projects on the path to ZNE by facilitating participation in multiple programs over several years.

Additional partnerships with supply-chain players will provide opportunities for mid-stream incentives to increase the adoption of energy efficient measures. Midstream incentives expand approaches SoCalREN has already implemented with downstream customers to encourage adoption of energy efficiency. By stimulating midstream market actors to promote energy efficient

products, SoCalREN can influence more of the supply chain towards market transformation. Midstream incentives will expand potential partners to include contractors, manufacturers, distributors, and retailers. It will counter market structures that may favor large, entrenched businesses, who do not prioritize energy efficiency. It will introduce a greater range of market actors, who collectively can influence the direction of energy consumption.

SoCalREN can also pilot midstream incentive programs that the IOUs are unable to administer by leveraging local government programs such as residential PACE. Contractors working in this high volume program can be incentivized to submit projects through a pilot designed to work seamlessly with the PACE financing option. By routing non-ratepayer funded projects through an approved pilot, SoCalREN can claim verifiable energy savings that have previously gone unverified.

Given the broad array of energy efficiency and water saving measures available for PACE financing, SoCalREN can develop an important testbed for addressing the water-energy nexus as it relates to residential end uses. SoCalREN will be collecting project level data for energy and water efficiency measures and working with the IOUs and Metropolitan Water District (MWD) to explore ways to leverage utility incentives with PACE. SoCalREN is in a unique position to influence homeowners to participate in a simple, straightforward program that encourages them to go above code using PACE financing.

Financing addresses the challenge of paying for equipment up front with little or no out of pocket expense. Financing offsets the initial cost of energy efficiency by spreading it over the life of the equipment. Although statewide financing pilots exist, SoCalREN currently provides a specific loan loss reserve product that is streamlined specifically to support whole house projects, serving a unique market needs. SoCalREN will continue to offer below market rate loans to customers until a statewide product is available to serve that demand.

Finally, SoCalREN will partner with trusted sources to provide education on energy efficiency resources. SoCalREN will partner with real estate professionals and contractor industry organizations to provide education that can be relayed to their customer base. SoCalREN will also target property owners through partnerships with community based organizations and local employers to hold educational events, including lunch and learns, meetings at community centers, and speakers who are experts in the field of energy efficiency.

Table 8. Intervention 4 – Increase and Deepen Partnerships with Stakeholders to Drive Adoption of Energy Efficiency

Intervention Strategy	Barriers	Example Tactics	Existing, Modified, or New	Short, Mid, Long-term
Increase and Deepen Partnerships with Stakeholders to Drive Adoption of Energy Efficiency	<p>Program complexity</p> <p>Inconsistent funding sources for power and water utilities</p>	Partner with industry organizations to provide a comprehensive, market-based approach to educating the residential program participants and workforce	M	S, M, L

Intervention Strategy	Barriers	Example Tactics	Existing, Modified, or New	Short, Mid, Long-term
	High up-front costs for comprehensive Projects	Establish MOUs with water agencies to layer programs for both power and water	N	S, M, L
		Loan loss reserve financing	E	S, M, L
	Perception programs are a hassle	Partner with local employers and organizations to host educational workshops for homeowners about the value and best-practices for energy efficiency improvements	E	S, M, L
Partners: Public agencies, industry organizations, financial institutions, community based organizations				

Intervention 5 – Offer Technical Assistance to Increase Capacity for Program Participation

Property owners, both single family and multifamily, are largely unaware of the energy savings potential of their properties. They are similarly unaware of the resources available to help them realize those savings. SoCalREN will continue its practice of offering technical assistance to residential participants. Technical assistance, generally implemented in the form of “Energy Advisor” services, help property owners overcome the perceived cost barrier of energy efficiency by providing an evaluation of their project potential. In hard-to-reach communities where property owners may not seek out this information independently, technical assistance programs bring resources to the property owner, driving action that may not have occurred otherwise. Technical assistance programs can also direct property owners to resources to help offset or financing the cost if their project if they choose to proceed. This facilitates the path to ZNE by charting how a project achieves ZNE over time, and the resources available to support improvements.

SoCalREN focuses on providing technical assistance both upon request, and marketing it as a service to attract potential building owners to make upgrades. To market technical assistance services, SoCalREN begins by identifying audiences with participation potential, contacting them with program information that is relevant and actionable, and following up to support participation. This targeted approach aims to overcome the low rate of adoption of energy efficiency improvements while managing marketing costs. Although tactics will be defined in the implementation plan, strategically SoCalREN will leverage its access to both public and proprietary datasets that can be used to identify property owners likely to participate in programs. Initial contact can be made through targeted outreach including direct mail, paid media, and community based outreach through organizations and local governments. SoCalREN also targets customers who are at certain trigger points in their home improvement process, such as searching for HVAC equipment or preparing a home for sale. Finally, follow-up is provided based on the consumer need and preference. This intervention extends to the building professionals SoCalREN serves by providing them with resources, such as marketing toolkits, that support their

growth with energy efficiency programs. Building professionals are on-site messengers who help increase the adoption rate of energy efficiency by providing clients with information at key trigger points, such as time of remodel, point of sale, or other transactions.

For example, the Green Real Estate Working Group meeting is a collaboration of green home and energy efficiency program implementers and sponsors across California. It is specifically market driven coordination, by engaging with the real estate community to increase awareness and opportunities. The goal is to continue to build on the goodwill and spirit of collaboration established over the past few years, and to maintain a strong service level for ratepayers seeking technical assistance.

Table 9. Intervention 5 – Offer Technical Assistance

Intervention Strategy	Barriers	Example Tactics	Existing, Modified, or New	Short, Mid, Long-term
Offer Technical Assistance	Property owners unaware of resources available to achieve savings	Employ “Energy Advisor” services	M	S
	Property owners in hard to reach communities don’t seek out information on their own	Provide trainings to the residential workforce on energy efficiency, whole house retrofits, sales, and marketing that helps transition the workforce from current practices to building science-based practices.	M	S, M
Partners: Community based organizations, contractors, local governments				

SoCalREN Residential Programs/Incentives Targeted by Intervention Strategies

Table 10. SoCalREN Sector Programs/Incentives by Strategy

	Single Family	Multifamily Incentives	PACE Integration	Single Family Financing	Energy Advisor
Coordination with Residential PACE	X		X		X
Establish Benchmarking Data		X			X
Engage Communities			X		X
Provide Incentives	X	X	X		X

Expand and Establish Partnerships			X		
Offer Technical Assistance	X	X	X		X

Within SoCalREN's *section G. Approach to Achieving Goals*, SoCalREN describes new and innovative strategies and tactics, some of which will lead to pilot efforts at the program level. SoCalREN believes they are essential to innovation and meeting aggressive goals like reducing purchased energy by 30% in 75% of homes. SoCalREN will address the Strategic Plan's goal of tailoring HVAC programs to address Southern California climates. Pilot programs will give SoCalREN opportunities to experiment with new programs on limited implementation runs. They are an opportunity to test out strategies like how and where to focus efforts, and how to engage contractors and other delivery channels. In addition, pilot programs provide tangible examples of specific customer segments achieving energy efficiency improvements, thereby addressing the problem of high cost. Pilot programs will likely include examples of how single and multifamily buildings can achieve ZNE and programs that integrate residential PACE. SoCalREN will explore the development and implementation a home rating system pilot for energy efficiency projects.

SoCalREN will describe any unique and innovative aspects of each program, as well as any pilots contemplated or underway, within its program-level implementation plans.

H.Leveraging Cross-cutting Resources

SoCalREN plans to make use of the following cross-cutting resources to achieve our goals.

Codes & Standards

While the Residential program offers services that aim to make energy efficiency improvements seem more enticing and available, the Codes & Standards program aims to clarify and ease adoption of the actual mandated energy efficiency requirements. These interrelated goals provide several opportunities for cross-cutting support. The greatest area of interaction is under the residential Intervention Strategy 3, engaging public agencies. Under the Codes & Standards program, SoCalREN will contact public agencies to offer support and training for code compliance, a perfect opportunity to introduce opportunities for public agencies to promote residential energy efficiency programs. Additionally, as SB 1414 requirements make permit closure a requirement for HVAC incentive programs, the Codes & Standards program will deliver key education to public agencies that supports residential incentives. Codes & Standards will also be leveraged under SoCalREN's Intervention Strategy 5, which offers technical assistance to property owners and contractors seeking information on how to best complete energy efficiency projects. Under the Codes & Standards program, SoCalREN will produce an online resource library that can be leveraged to support residential audiences in completing projects that meet updated code & standard requirements. The Residential program will provide Codes & Standards materials to contractors navigating residential programs, mutually supporting their capacity for participating and Codes & Standards' compliance enhancement activities.

Financing

For the residential sector, financing is a key agent of cross-cutting coordination. Financing programs have typically supported other incentive-based programs in their goals to capture energy savings. Support from financing cross-cutting resources will bolster SoCalREN's residential Intervention Strategy 1, Coordination with Residential PACE, and Intervention Strategy 2, Establish Benchmarking Data. SoCalREN sees the greatest potential for residential PACE integration with incentive programs, which allows residents to financing energy improvements while simultaneously participating in ratepayer-funded downstream rebate programs.

Workforce Education & Training (WE&T)

SoCalREN believes that the continuing education elements of WE&T will support Intervention 10, Offer Technical Assistance. Often residential building professionals receive training, only to not have time to apply it, and lose the knowledge rapidly. Continuing education means supplemental education for training already undertaken. It means maintaining relationships with contractors, raters and residential building professionals over time. It means developing expertise in designing education programs. Continuing education contributes to market transformation by instilling in building professionals lasting lessons that become a permanent part of the culture and business plan. It sets communities on the path to ZNE by building the workforce necessary to implement such projects.

Marketing, Education, and Outreach (ME&O)

Broad-based marketing is expensive, but property owners need additional support in identifying programs and converting into participants that produce verified energy savings. While SoCalREN plans a more targeted outreach approach to engage homeowners and communities, these targeted efforts will leverage the broad-reaching marketing executed by the statewide ME&O team that is designed to build awareness of energy management practices and drive leads to specific programs.

I. Integrated Demand Side Management (DSM)

Integrated demand side management (IDSM) is an essential set of energy solutions that will be leveraged in SoCalREN's public agency approach in the residential and multifamily markets. IDSM integrates energy efficiency, distributed generation, storage and demand response to ensure system reliability and address grid constraints. SoCalREN will identify communities that are impacted by constrained substations, and will focus marketing, education and outreach to single family homeowners and multifamily building owners to increase awareness and drive them to utility programs. SoCalREN will work with public agencies, cities, and councils of government to identify energy efficiency opportunities, and provide information about other IDSM solutions. IDSM will be a cohesive theme across all SoCalREN public agency activities, particularly as it relates to grid constraints and the transition to zero net energy (ZNE) communities.

Residential Market and TDSM

As part of its outreach to residential and multifamily customers, SoCalREN will highlight the importance of energy efficiency and other IDSM solutions in moving the community toward a ZNE future. Residential PACE will play a key role in advancing the adoption of energy efficiency and distributed generation in the residential market. SoCalREN will work with contractors and solar installers to ensure that residential customers receive the greatest benefit from combining energy efficiency measures with the installation of a solar system. SoCalREN will work with SCE to incorporate messaging about Time-Of-Use (TOU) rates as needed.

The recognition that energy efficiency is a valuable grid resource and partners effectively with demand response programs led SoCalREN to develop the Targeted Demand Side Management (TDSM) Program. This effort integrates both energy efficiency and demand response tools that partner to defer investments in transmission and distribution capacity, which in turn frees capital to fund other investments to ensure system-wide safety and reliability. To date, the residential energy efficiency programs have contributed to meeting load needs in more than ten regions across the service territory.

Residential and Distributed Energy Resources (DER)

The IDSM effort is conduit to better integrate controls and the power of data analytics into the operations of SoCalREN customers. SoCalREN leverages the following programs: Demand Response (DR) programs can take advantage of new controls to better integrate residential customers into DR programs building a more robust response to potential grid events and leveraging control over localized residential activities. Understanding the residential customer mix is important in offering the right DR program for their needs. Distributed Generation (DG) participation has been on the rise in the residential segment, specifically as it relates to solar. SoCalREN will continue to support the interconnection of solar systems in the residential market and as solar continues to rise; Storage will be an important element to maintain transmission reliability. Storage is one area where SoCalREN is preparing for future growth. As peak demand hours are shifting past the sunny times of the day, Storage will help keep the transmission lines less constrained so the customer can pull from the on-site energy storage directly. SoCalREN anticipates that the residential segment will be active in this emerging technology.

J. SoCalREN and State Policy Goals

SoCalREN will continue to respond to specific policy objectives set forth in CPUC documents, state legislation, and especially, the Strategic Plan. The Strategic Plan names energy efficiency, as its highest priority. In direct response to this, SoCalREN will continue to promote both IOU and SoCalREN single family and multifamily programs and commit resources and time to customer engagement, outreach and training.

SoCalREN will address two of the Strategic Plan's overarching four "Big Bold" energy efficiency strategies. The first is "Heating, Ventilation and Air Conditioning (HVAC) will be transformed to ensure that its energy performance is optimal for California's climate". Historically, this has been a central focus for SoCalREN's residential sector programs. Future efforts will continue to

ensure homeowners install the best, above code equipment for their climate zone through marketing, education, and outreach to residential building owners. Outreach and training will include technical staff speaking to homeowners and residential building professionals to educate them about which measures make the most sense for their location. SoCalREN will develop programs to capture unverified energy savings achieved through non-ratepayer funded programs. Historically these program have been outside the purview of IOUs. By leveraging the efforts of local governments, SoCalREN is uniquely capable of providing this service.

SoCalREN will respond to the second bold strategy, which is, “all eligible low-income customers will be given the opportunity to participate in the low income energy efficiency program by 2020”. SoCalREN will provide support to eligible low income and hard-to-reach customers to participate in ratepayer funded programs. The remaining two goals relate to new construction, which currently fall outside of SoCalREN’s focus.

SoCalREN will address the goals set forth in the Residential Section of the Strategic Plan, and in particular, goal number two: “Transform home improvement markets to apply whole house energy solutions to existing homes”. The goal lists shell upgrades, high efficiency HVAC units, financing, and moving focus from widget upgrades to whole house retrofits. SoCalREN will work with local governments to coordinate and encourage uptake of these energy efficiency efforts within their existing networks. SoCalREN will complement available rebates with financing and continue to educate residential building professionals through educational and information materials explaining the importance of a whole house approach.

SoCalREN will focus on and educate customers eligible for programs designed for low-income and hard to reach communities. SoCalREN has an established history of collaborating with IOUs and governments to share data and funds, and will continue those efforts.

SoCalREN responds to specific goals in the HVAC section, including a goal of 50% improvement in efficiency by 2020 and a 75% improvement by 2030. SoCalREN already qualified technicians in Southern California and recruits and educates new ones. SoCalREN will expand efforts to ensure quality installation and maintenance become the norm , thus supporting the needs of local governments to have in place a workforce educated on and capable of meeting ZNE goals. Educating and training both contractors and real estate professionals about whole house design and ZNE will help reduce heating and cooling loads. An outreach team will coordinate and engage stakeholders in the residential retrofit, building performance industry, and the HVAC supply chain.

SoCalREN responds to many of the goals set forth in the California Energy Commission’s Existing Building Action Plan as follows:

- Strategy 1.7 Local Government Leadership: Engage and recruit local governments to demonstrate leadership in energy efficiency through various programs, activities, and mechanisms.
- Strategy 3.1 Streamlined and Profitable Industry: Promote a sustainable and robust energy efficiency marketplace by providing effective program delivery and industry partner programs.
- Strategy 3.3.4 Efficiency Marketing Included in Workforce Training: Train contractors, real estate professionals and other market actors to sell energy efficiency. Integrate

customer acquisition, the provision of financing options, and other marketing activities into industry business models.

- Strategy 4.1 Real Estate Value: Work collaboratively with real estate industry, underwriters, and financial agents to adopt property asset-related energy characteristics in building valuation and to integrate energy efficiency into all transactions. Work with industry agents to advocate and expand the inclusion of the value of energy in appraisals. Incorporate energy efficiency into property and lease listings. Include energy asset ratings as soon as is practical.
- Strategy 5.2 Asset-Based Financing: Foster the development of easy-to-access financing mechanisms tied to building asset. Advocate for energy efficiency to be incorporated into the mortgage valuation and underwriting process. Promote and expand the use of energy efficiency mortgages by establishing a standard rating or value for underwriters. Support the implementation of Property Assessed Clean Energy financing (PACE) for residential and commercial properties. Assess and encourage new cost recovery mechanisms such as surcharge on tenant meters or “green leases” to surmount “split incentive” dilemma.
- Strategy 5.7 Establish Deeper Subsidies for Full Participation by Low-Income Households Integrate low-income household services with building owner eligibility for regular energy efficiency programs to increase efficiency levels in multifamily buildings with low-income occupants.

These efforts also address broader goals set forth in legislation. Assembly Bill 32 requires California to reduce greenhouse gas emissions to 1990 levels by 2020. Senate Bill 350 requires greenhouse gas emissions reductions of 40 percent from 1990 levels by 2030. All programs will conform to Title 24 standards, which aim to reduce energy consumption by establishing minimum technical standards for design, construction, and operation of residential and non-residential buildings. SoCalREN will work closely with city and county governments, which are responsible for the vast majority of Title 24 enforcement. SoCalREN programs will work to meet Senate Bill 350, which mandates doubling of statewide energy efficiency savings in electricity and natural gas end uses by 2030.

Table 11. SoCalREN State Policy Support

Policy Drivers	Guidance Given	SoCalREN's Support for Policy
SB350	<ul style="list-style-type: none"> • Double energy efficiency savings by 2030 <ul style="list-style-type: none"> ○ Address barriers for low-income customers to energy efficiency and weatherization investments ○ Include hard to reach and low income communities 	<ul style="list-style-type: none"> • Data analytics of customer segmentation to target customers with high savings potential and market transformation needs • Develop community-level initiatives • Education, outreach
AB 32	<ul style="list-style-type: none"> • Reduce GHGs to 1990 levels by 2020 	<ul style="list-style-type: none"> • Energy efficiency programs

Policy Drivers	Guidance Given	SoCalREN's Support for Policy
AB 802	<ul style="list-style-type: none"> Benchmarking Provide financial incentives and assistance for high opportunity projects Expands mandated energy disclosure to multifamily properties, making it easier to collect and report energy consumption data from utility companies. 	<ul style="list-style-type: none"> Using data to drive high value customers to incentive programs More sophisticated audits Increased standardization
AB 793	<ul style="list-style-type: none"> Educate on energy management technologies Help customers understand and manage energy 	<ul style="list-style-type: none"> Target education and outreach will help customers understand efficiency technology
AB 758	<ul style="list-style-type: none"> Access to data, partnering to increase awareness Recognized value of energy efficiency upgrades 	<ul style="list-style-type: none"> Train real estate professionals on the value of energy efficiency Technical support Coordinate or create implementation of localized energy programs and services
SB 1414	<ul style="list-style-type: none"> Collect proof of permit closure before paying rebates or incentives to customers or contractors for central air conditioning or heat pumps and their related fans. 	<ul style="list-style-type: none"> Educate building departments, contractors and homeowners about the value and need for closed permits for related energy efficiency work Collect proof permit closure before paying rebates or incentives to customers or contractors.
LTEESP	<ul style="list-style-type: none"> Collect proof of permit closure before paying rebates or incentives to customers or contractors for central air conditioning or heat pumps and their related fans. 	<ul style="list-style-type: none"> Educate building departments, contractors and homeowners about the value and need for closed permits for related energy efficiency work Collect proof permit closure before paying rebates or incentives to customers or contractors.

K. SoCalREN's Partners and Commitment to Coordination

Partnering is listed as one of SoCalREN's intervention strategies, but it's also a pillar of SoCalREN's operations. Since launching incentive programs in 2013 and developing a full calendar year of implementation in 2014, SoCalREN has successfully established an Advisory Committee comprised of key stakeholders across the region, as well as critical partnerships with industry organizations that shape the residential energy marketplace. However, these first steps are just that: initial relationships. To continue successfully piloting programs and supporting hard-to-reach audiences, and to strengthen the regional nature of SoCalREN, we've identified

partnering as a key component of our activities for the foreseeable future. A summary list reflecting both existing and potential partners is included below for reference.

Table 12. SoCalREN's Existing and Potential Partners

Partner Type	Existing Partners * Reflects existing relationships	Potential Partners * Representative only
Statewide	Statewide ME&O, CPUC, CEC	
Regulated Program Administrators	SCE, SoCalGas, SDG&E, PG&E, BayREN	Public Utilities, CCAs
Unregulated Energy Programs	HERO (Renovate America), California FIRST	
Industry Organizations	National Association of REALTORS®	Appraisers, brokers, inspectors, MLS
Building Professionals	SoCalREN's own Home Upgrade Participating Contractors, Efficiency First, IHACI	Trade organizations, manufacturers, distributors
County Government	Ventura County, Los Angeles County, Orange County	San Bernardino County, Inyo County
Councils of Government	South Bay Cities COG, San Gabriel Valley COG, Gateway Cities COG, Coachella Valley Association of Governments, Western Riverside COG, San Bernardino Association of Governments	Tulare County Association of Governments, Eastern Sierra Council of Governments
City Government	Culver City, Palmdale, Huntington Beach, Lakewood, Santa Clarita, Santa Monica	Tulare, Covina, Irvine
Water Agencies and Water Districts	Santa Ana Watershed Protection Authority	West Basin Municipal Water District, Orange County Water District
Community Based Organizations and Non-Profits	San Joaquin Valley Clean Energy Organization, Sustainable Claremont, CHERP, Sustainable Whittier	Repair Café, Sierra Club, Neighborhood and City-Specific Non-Profits

Statewide

SoCalREN will continue to work with the CPUC and regulators during planning, execution and evaluation stages of our programs, using this business plan as a guiding document. The design of the REN program structure provides the CPUC the unique opportunity to establish direction and provide feedback. SoCalREN sees this as part of our core and our vision and mission are directly shaped by the CPUC's Strategic Plan.

SoCalREN will also leverage the statewide broad marketing, education and outreach plans executed at the statewide level on the local level, drawing connections between awareness and program participation.

Program Administrators

Given the REN focus on partnership, coordination with regulated energy program administrators is critical to SoCalREN success. Fundamentally, SoCalREN operates in the service of ratepayers, and adds value to property owners by providing information and referrals to programs across all program implementers – even those outside of SoCalREN’s implementation focus. This requires positive mutual relationships with program implementers across the region.

Data sharing will be a key focus across the PA coordination process. For example, when the utilities host continuing education courses for contractors, SoCalREN promotes these classes, enabling participation across territories and maximizing resources for mutual impact. SoCalREN also sees opportunity in data-sharing across program implementers to identify potential focus areas for targeted marketing and outreach. However, privacy concerns constrain this coordination potential. Additionally, data sharing with un-regulated programs such as those operated by Renovate America and California FIRST offers significant opportunity for capturing and verifying achieved energy savings. Addressing this data sharing concern is an area of significant opportunity for SoCalREN.

As CCAs and public utilities enter the realm of program administration, SoCalREN anticipates opportunities for coordination with these key stakeholders as well.

Market Actors

As touched upon in the intervention strategies, SoCalREN plans to develop relationships with new partners who can open up opportunities for innovative programs and expansions. This includes market actors like unregulated energy programs including residential PACE. SoCalREN can also work to quantify the energy savings achieved through these programs, capturing energy savings information that may not have been verified previously.

SoCalREN also identifies building professionals and other industry stakeholders as critical relationships when shaping the residential marketplace. On the homeowner outreach side, real estate professionals continue to be a strong referral source for homeowners seeking home improvements, including energy improvements. On the contractor-facing side, manufacturers and distributors represent a new opportunity for SoCalREN. While partnerships with them in the past have been limited, we’ve identified this as an area for expansion as SoCalREN designs programs for different parts of the production and supply chain.

Stakeholders

Above all others, local governments including counties, councils of government, and city governments are SoCalREN’s foremost partnership type, and the key to reaching our goals. There are 88 cities in LA County alone, with hundreds of cities beyond, and each locality’s objectives are as diverse as the communities they represent. These cities are largely responsible for Title 24 enforcement through permitting, and programs that go beyond Title 24. They regulate the point of sale ordinances that are common in energy efficiency mortgages. Great power lies

with their ability to provide incentives or disincentives through zoning. They can lead by example by leveraging scale in government facilities to catalyze programs in the private market. They are the natural choices to provide energy leadership in communities. They adopt residential energy conservation ordinances (RECOs). Specific departments within local government, such as Housing Departments and Authorities can likewise have tremendous influence.

SoCalREN also identifies local water agencies as a key partner for future efforts. Strategically, drawing connections between energy- and water-saving programs increases the perceived value of each program, and improves the likelihood of participation across the board. Tactically, SoCalREN plans to explore partnerships with local water agencies to pilot bundling water and energy rebates, potentially using energy rebate participation as a lead generator for water rebate participation (or vice versa, depending on program strengths). However, the first step to identifying the tactic for implementation is focusing on building relationships with water agencies that serve the SoCalREN audiences.

Disadvantaged Communities

Part of SoCalREN's mission is to serve hard-to-reach communities by leveraging the power of local government partnerships. SoCalREN has a track record of success in partnering with local government agencies to execute on localized outreach efforts and to connect low-income residents to incentive programs. We've also identified partnerships with local community based organizations as a means to serve disadvantaged communities better by tapping into locally recognized and trusted sources.

L. Metrics and EM&V Considerations

Through its tenure as a program administrator, SoCalREN has recognized the value of quality metrics to EM&V, accurate tracking, and clear representation of programs. SoCalREN will continue to coordinate with CPUC and EM&V staff to hone the metrics collected and reported for the benefit of all stakeholders. SoCalREN offers a draft table of metrics below with the expectation that SoCalREN will provide final metrics in the January filing.

Evaluating SoCalREN is challenging within the traditional EM&V framework. By its very reason for existence, SoCalREN adopts programs that traditional IOUs are either unable or unwilling to undertake. Therefore, traditional EM&V, which have developed around evaluating decades old IOUS, may not be able to capture the full value of the SoCalREN. Often, EM&V efforts focus on energy saved from resource programs. Historically, the bulk of SoCalREN programs have been non-resource, technically generating no energy savings yet having an undeniable influence on resource programs. This characteristic is expected to continue. Therefore, in the future, SoCalREN will work with EM&V evaluators and IOUs to develop methodology that captures the full impact of non-resource programs on their resource counterparts.

Direct Effects from SoCalREN Efforts

Table 13. SoCalREN Residential Sector Goals, Intervention Strategies and Metrics

SoCalREN Goals	Intervention Strategies	Metrics	Baseline (or Benchmark)	Metric Source	Short Term Target (1-3 years)	Mid Term Target (4-6 years)	Long Term Target (7-8+ years)
Save XX kWh, XX kW, and XX therms	All	Electricity Saved	TBD	Annual Ex Ante Net Savings from Program Tracking	XX kWh	XX kWh	XX kWh
		Demand Saved	TBD		XX kW	XX kW	XX kW
		Therms saved	TBD		XX Therms	XX Therms	XX Therms
Increase residential program implementation efficiencies/ reduce program cost per energy savings	All	\$/Electricity Saved	TBD	Annual Ex Ante Net Savings from Program Tracking Annual expenditure reports	X% reduction	X% reduction	X% reduction
		\$/Demand Saved	TBD		X% reduction	X% reduction	X% reduction
		\$/Therms saved	TBD		X% reduction	X% reduction	X% reduction
Demonstrate public agency actions toward promoting energy efficiency, targeting a goal of X [number] of agencies making energy efficiency commitments	Engage Public Agencies to Drive Energy Efficiency in Their Communities Increase and Deepen Partnerships with Stakeholders to Drive Adoption of Energy Efficiency	Cumulative number of public agencies committed to energy efficiency	TBD	Program Tracking Databases	XX% increase	XX% increase	XX% increase
Drive program participation through local outreach and engagement about energy efficiency and ZNE	Engage Public Agencies to Drive Energy Efficiency in Their Communities Increase and Deepen Partnerships with Stakeholders to Drive Adoption of Energy Efficiency Offer Technical Assistance to Increase Capacity for Program Participation	Number of engagements with potential program participants	TBD	Program Tracking Databases	XX% increase	XX% increase	XX% increase

As a Regional Energy Network with a much narrower scope of programming and focus than traditional IOUs, SoCalREN's metrics do not primarily revolve around verified energy savings. SoCalREN's mission of leveraging local governments, focusing on hard-to-reach communities and innovative pilot programs better lend itself to secondary metrics that demonstrate the influence SoCalREN has on energy saving actions region wide. These energy savings may not be directly attributable to SoCalREN within conventional IOU reporting frameworks.

Overall Statewide Market Effects within the Sector

As part of a larger, statewide effort to improve energy efficiency in California, some market level cannot be evaluated exclusively on SoCalREN's efforts. While contributing in part, the following table suggests metrics that should be evaluated based on statewide efforts.

Table 14. Residential Market Effects and SoCalREN Strategies

Market Level Goals	Intervention Strategies	Market Effect Indicator	Baseline	Metric Source	Notes on Indicators
Assist in reaching the LTEESP goal of ZNE for 100% of all new residential construction by 2020 and 50% existing buildings by 2030.	Technical Assistance and Tools Financial Solutions	Proportion of all residential new construction that is ZNE	<X% in 2015	Tracking or EM&V Study	XX% (Study updated by end of year DATE)

M. EM&V Preparedness and Research Needs

EM&V Needs

SoCalREN will collaborate with CPUC and evaluation consultants to identify and collect the most appropriate and valuable data, along with close coordination on reporting such data. SoCalREN identifies a need for evaluators to improve measuring the impact of SoCalREN programs. By the spirit of its very creation, SoCalREN runs programs traditional administrators are either unable, or unwilling, to run themselves. The bulk of past evaluation efforts focused on traditional resource programs. Evaluators did not have as much experience evaluating the type of programs SoCalREN runs, and less experience measuring the impact of non-resource programs on resource programs. Therefore, there must be a conscious effort by evaluators to adapt established evaluation methodology to the end of capturing the full impact of SoCalREN.

SoCalREN will track and report the following residential sector data to apprise the CPUC and stakeholders of its progress, starting with monitoring efforts:

Monitoring: These efforts will focus on sector-level spending, sector-level savings, participation among single family and multifamily customers, partnerships with local governments, and progress towards metrics.

Embedded Evaluation: Program monitoring and evaluation is systematically incorporated into SoCalREN's established organizational structure to inform program design and direction for successful third party EM&V. This supports EM&V preparedness on an ongoing basis rather than toward the end or after a program cycle. The SoCalREN team will evaluate individual programs both independently and in relation to other SoCalREN programs. Specifically, SoCalREN will monitor, coordinate, and evaluate project activities and milestones, and key metrics that inform progress, such as budget, program impacts and risks, cost-effectiveness, and results verification against the metrics identified in this Business Plan.

Residential Sector Research Requirements

Expected research in the residential sector includes:

- AB 793 Research Needs
 - [SoCalREN to provide in the January filing]
- Zero Net Energy (ZNE) Research Needs
 - [SoCalREN to provide in the January filing]
- Market Studies Research Needs
 - [SoCalREN to provide in the January filing]
- Residential PACE Pilot Research Needs
 - [SoCalREN to provide in the January filing]

Appendix A: Stakeholder Feedback – Residential Sector

Issue #	Source	Topic	Issue	Reference Page #/Note
1	Issue Tracker	Business Plan Topic	Inclusion of consideration for AB 793 (energy management technology) in Business Plan	SoCalREN will educate ratepayers about energy management technology in its outreach to homeowners.
2	Issue Tracker	Business Plan Topic	Re MF programs--Does public housing belongs in the public or MF sectors?	If the public housing element is a multifamily building, it is served as part of the multifamily program sector.
3	Issue Tracker	Business Plan Topic	"Can we look at differential variations by climate zone in the Business Plan description of the challenges and solutions.	SoCalREN's Business Plan considers climate zone differences in reviewing proposed intervention strategies.
4	Voluntary Draft Ch. (Res)	Market Barrier	A major market barrier to whole house upgrades is lack of consumer understanding of their benefits. Please quantify the monetary benefits for the average home owner for doing a whole house upgrade.	SoCalREN aims to quantify the monetary benefits of energy efficiency upgrades as part of the Business Plan intervention strategies.
5	Voluntary Draft Ch. (Res)	Budgets	Proposed budgets need to align with program metrics	SoCalREN will align proposed budgets with program metrics in its Business Plan.
6	Voluntary Draft Ch. (Res)	Assertions of Fact	Assertions of fact or policy need to be fully supported by evidence and citation, not simply opinion	SoCalREN includes citations and evidence of claims in its Business Plan.
7	Voluntary Draft Ch. (Res)	Market Barriers	Characterizations of market barriers and program attributes/accomplishments are vague, and asserted without documentation.	Where feasible and/or where quantified data exists, SoCalREN cites characterizations of market barriers in its Business Plan.
8	Voluntary Draft Ch. (Res)	Metrics	Metrics are oriented to intermediate program outcomes but not to broader market effects	SoCalREN aims to address this in the business plan
9	Voluntary Draft Ch. (Res)	Intervention Strategies	Intervention strategies are less specific. They either largely mirror ongoing activities and/or could be outside PAs ability to implement	SoCalREN aims to focus its intervention strategies on what can be accomplished over the 10-year Business Plan period.

Issue #	Source	Topic	Issue	Reference Page #/Note
10	Voluntary Draft Ch. (Res)	Third Party Implementation	THE DRAFT BP'S DO NOT INCORPORATE THIRD PARTY PROCUREMENT REQUIREMENTS LAID OUT IN D.16-08-019.	This is not applicable to SoCalREN.
11	Voluntary Draft Ch. (Res)	Metrics	In almost every draft chapter, the metrics (where they were addressed at all) lack clear definition, fail to focus on desired outcomes, lack targets and require data that may not be regularly available	SoCalREN aims to address this in the business plan
12	Voluntary Draft Ch. (Res)	Strategies	THE BUSINESS PLANS SHOULD PROVIDE A ROAD MAP FOR EACH PA'S STRATEGY DEVELOPING ENERGY EFFICIENCY PROGRAMS, AND PROVIDE CLEAR METRICS AND MILESTONES TO ALLOW FOR MEANINGFUL REVIEW.	The Business Plan is SoCalREN's roadmap to developing energy efficiency programs. Metrics and milestones for specific programs will be established in Program Implementation Plans.
13	Voluntary Draft Ch. (Res)	Justification	Coherency, clear reasoning, and justification for activities, I am confused on how THIS BP works in relation to the IOU Service area BP – e.g. where some program activities are offered by the REN and perhaps other activities for the same market segment(s) are offered by IOUs. Further, how do these 2 relate to a “statewide” residential sector strategy?	SoCalREN has clarified areas where potential overlap may occur, and how the RENs and IOUs interact with the statewide residential sector activities.
14	Voluntary Draft Ch. (Res)	Strategies	Not all the strategies are “key strategies” and in fact some sound like supporting activities. Nest or bundling as appropriate, and indicate where you have certain implementing tactics or supporting activities.	SoCalREN aims to distill intervention strategies to their core, listing specific tactics underneath those strategies, in the Business Plan.
15	Voluntary Draft Ch. (Res)	Multifamily	In Multifamily we need to know more about ownership profiles relative to the strategy for pursuing on-going relationships – would this be for a specific building, or with owners who have portfolios of buildings? I look forward to seeing more about how market demand will be driven via	SoCalREN believes this question is best addressed on a programmatic level as part of Program Implementation Plans. However, study of green labels and MLS data is included as part of the Business Plan intervention strategies.

Issue #	Source	Topic	Issue	Reference Page #/Note
			traction and success on green labels and MLS data.	
16	Voluntary Draft Ch. (Res)	LTSEEP	PA Business Plans should identify strategies to advance Strategic Plan / market transformation objectives (and other policy guidance), particularly as advanced in upstream/midstream interventions.	SoCalREN's Business Plan clearly identifies how our strategies advance the Strategic Plan.
17	Voluntary Draft Ch. (Res)		Business Plans should clearly outline anticipated connections between SW up/mid-stream initiatives and long-term SW C&S initiatives, and how they will collaborate in support of the SP MT goals.	Does not apply to SoCalREN
18	Voluntary Draft Ch. (Res)	LTSEEP	Clarify terminology in Plans to cite specific SP MT goals where these are discussed, rather than a general desire for market transformation.	SoCalREN's Business Plan clearly denotes when specific market transformation goals are discussed.
19	Voluntary Draft Ch. (Res)	LTSEEP	For each SP MT goal that the PAs plan to promote, provide specific information on the investment level needed to achieve which SP MT goals via which specific strategies as outlined in the two Commission guidance documents cited above.	SoCalREN aims to address this in the business plan
20	Voluntary Draft Ch. (Res)	Market Assessment & Gaps Analysis Issue	PAs residential business plans should explicitly address the idea of real estate engagement. There has been substantial investment in this area over the last 5 years, particularly through the RENs and it's highlighted in the Energy Commission's Existing Buildings Energy Efficiency Action Plan (strategy 4.1). Not clear in Market Assessments and Gaps that IOUs are considering this.	SoCalREN's Business Plan continues to identify opportunity in real estate engagement.
21	Voluntary Draft Ch. (Res)	Intervention Strategies & Metrics	Suggestion of several "trigger points" to be considered in assessing residential market strategies	Although this will be covered in more detail in program Implementation Plans, SoCalREN does include a limited discussion of trigger points in its Business Plan.

Issue #	Source	Topic	Issue	Reference Page #/Note
22	Voluntary Draft Ch. (Res)	Intervention Strategies & Metrics	<p>The volume and pace of residential EE retrofits is low compared to California's ambitious energy reduction goals as set forth in SB 350, AB 32, AB 802, AB 758, the California Long-Term Energy Efficiency Strategic Plan. If California is to realistically achieve its long term goals, the current approach to realizing energy efficiency in the residential sector will need significant overhaul.</p> <p>Increased commitment to workforce education and training whether as part of a Market Transformation program or a WE&T program. Strategies might include improving access to technical training, job shadowing, mentoring, sales training, process improvement consulting, and other consultative activities. In addition, use program funding for Loan Loss Reserve (LLR) in order to buy down interest rate for homeowners and drive deeper market penetration. Similar programs have fixed interest rates starting at 2.75% APR.</p> <p>Appropriate Metrics: Penetration of market, participating contractors, savings per site on a segmented basis.</p>	SoCalREN includes a Loan Loss Reserve program in its Business Plan.
23	Stage 2 input	Market Assessment & Gaps Analysis Issue	<p>PAs residential business plans should explicitly address the idea of real estate engagement. There has been substantial investment in this area over the last 5 years, particularly through the RENs and it's highlighted in the Energy Commission's Existing Buildings Energy Efficiency Action Plan (strategy 4.1). Not clear in Market Assessments and Gaps that IOUs are considering this.</p>	SoCalREN's Business Plan continues to identify opportunity in real estate engagement.
24	Stage 2 input	Market Assessment & Gaps	<p>PAs residential business plans should explicitly address the idea of real estate engagement. There has been</p>	SoCalREN's Business Plan continues to identify opportunity in real estate engagement.

Issue #	Source	Topic	Issue	Reference Page #/Note
		Analysis Issue	substantial investment in this area over the last 5 years, particularly through the RENs and it's highlighted in the Energy Commission's Existing Buildings Energy Efficiency Action Plan (strategy 4.1). Not clear in Market Assessments and Gaps that IOUs are considering this.	

DRAFT

Appendix B: Compliance Checklist

Reference Section/Page # in SoCalREN BP	Business Plan Element	SoCalREN Notes
	Chapter: Residential Sector	
	Summary tables	
	<i>Table with CE, TRC, PAC, emissions, savings, budget</i>	SoCalREN to provide in the January filing
Section L	<i>Metrics for sector</i>	
Section E	Market characterization (overview and market/gap and other analysis)	
	<i>Electricity/NG</i>	SoCalREN to provide in the January filing
Section J	<i>State goals include acknowledgement of goals set by Strategic Plan, SB 350, AB758, guidance as appropriate)</i>	
Section E.	<i>EE potential and goals</i>	
Section F	<i>Customer landscape (e.g., segments/subsegments, major end uses, participation rates, etc.)</i>	
Section F	<i>Major future trends that are key for the PA and its customers</i>	
Section G.	<i>Barriers to EE and other challenges to heightened EE (e.g., regulatory, market, data)</i>	
	Description of overarching approach to the sector	
Section A and G	<i>Goals/strategies/approaches</i>	
Section G	<i>How portfolio meets Commission guidance</i>	
Section G.	<i>Description of how this chapter addresses the performance challenges/barriers</i>	
Section G.	Intervention strategies (detailed)	
Section G	<i>What specific strategies are being pursued (e.g., near, mid, long AND existing, modified, new)</i>	
Section G	<i>Why specific strategies were chosen (e.g., ID current weaknesses, best practices, or other rationale to support choice)</i>	
Section F	<i>How approaches advance goals discussed above</i>	
Section B	<i>How strategies use lessons learned from past cycles and EM&V</i>	

Reference Section/Page # in SoCalREN BP	Business Plan Element	SoCalREN Notes
Section B	<i>How will interventions support/augment current approaches or solve challenges</i>	
Section O	<i>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.</i>	
Section O	<i>Future expectations for intervention strategies</i>	
[x]	<i>Description of pilots</i>	
Section K	<i>Key Partners</i>	
	Compare/contrast to past cycles	
	<i>Budget changes as appropriate</i>	SoCalREN to provide in the January filing
[x]	<i>Modification to sector strategies</i>	
Section H	Cross-cutting (sector chapters and ME&O)	
Section H	<i>Program Administrator marketing and integration with SW MEO as applicable</i>	
Section H	<i>Workforce, education, and training</i>	
	<i>Emerging Technologies</i>	
[x]	<i>Codes & Standards</i>	
	Cross PA and Offering Coordination	
Section K	<i>How strategies are coordination among regional PAs</i>	
Section K	<i>Proposal of statewide program administrator/approaches for this sector</i>	
Section K	<i>How the sector strategies are coordinated with statewide program activities</i>	
Section K	<i>How are strategies coordinated with other state agencies and initiatives (e.g., AB 758)</i>	
Section L	EM&V Considerations (statement of needs)	
Section L	<i>Data collection needs</i>	
Section L	<i>Anticipated study needs</i>	
Section I	Demand Response	
Section I	<i>How EE measures use up-to-date DR enabling technologies to be "DR ready"</i>	
Section I	<i>How duplication of costs for ME&O, site visits, etc. is avoided for dual-purpose technologies</i>	
Section I	<i>How strategies facilitate customer understanding of peak load, cost, and opportunities to reduce</i>	
	Residential Rate Reform	Not Applicable to SoCalREN

Reference Section/Page # in SoCalREN BP	Business Plan Element	SoCalREN Notes
	<i>How BPs will help reduce load during TOU periods</i>	
	<i>How BP will diminish barriers to load reduction during TOU periods</i>	
	<i>How strategies will provide info to customers and/or provide a tool to show how program may impact customer energy usage during different TOU periods</i>	
	<i>How strategies will analyze whether a customer may experience greater savings by switching to a different, opt-in TOU rate</i>	
	<i>ME&O re: rate reform</i>	
Section I	Integrated Demand Side Resources	
	Zero-Emission Vehicles(EVs)	
	Energy Savings Assistance (Multi-family Focused)	
Appendices	Appendices	
	<i>Additional Customer Data</i>	
	<i>Cited research</i>	
	<i>CAEECC stakeholder input resolution</i>	

Appendix C: Additional Supportive Data Material

Table C-1. List the Residential PACE energy savings potential based on projects in Los Angeles County since June 2015 participating the HERO program. Savings are calculated using the approved Home Upgrade calculator with the following assumptions: Climate Zone 9, Vintage of Pre-1978, Crawlspace Floor Construction, single story, and 1,600 square feet of conditioned combined floor area.

PACE Measure Name	Home Upgrade Measure Name	PACE Data Record Count	kWh	kW	Therms
Exterior Windows	Windows (U-Factor \leq 0.32, SHGC \leq 0.25)	5,057	624,539.50	1,633.41	128,953.50
Central Air Conditioner	Central Air Conditioner (\geq SEER 15)	2,020	1,226,544.00	2,009.90	(3,030.00)
Duct Replacement	Duct Sealing (\leq 6%)	1,778	363,245.40	709.42	38,404.80
Attic Insulation	Attic Insulation and Plane Sealing (\geq R-44)	1,222	266,884.80	172.30	57,556.20
Wall Insulation	Wall Insulation (\geq R-13)	577	(7,385.60)	113.67	28,330.70
Gas Tankless Water Heater	Gas Tankless Water Heater (EF \geq 0.82)	359	-	-	37,695.00
Furnace	Central Furnace (\geq 95 AFUE)	304	(12,403.20)	-	9,971.20
Air Sealing	Whole Building Air Sealing (\geq 30%)	147	2,690.10	9.85	2,175.60
Under Floor Insulation	Floor Insulation (\geq R-19)	138	(16,684.20)	0.83	2,484.00
Duct Sealing	Duct Sealing (\leq 10%)	75	13,125.00	25.58	1,387.50
Natural Gas Storage Water Heater	Gas Storage Water Heater (\geq EF 70)	12	-	-	550.80
Electric Heat Pump Water Heater	Electric Water Heater (EF \geq 2.00)	2	-	-	-
Total		11,691	2,460,555.80	4,674.96	304,479.30