Energy Equity in California: The Role of Regional Energy Networks in Bringing Energy Efficiency Programs to Underserved Communities

Simran Kaur, California Public Utilities Commission
Lullit Getachew, DNV
Lorre Rosen, DNV
Rachel Hursh, DNV

ABSTRACT

Energy efficiency programs can be an effective tool to address the relatively high energy burden of low-income households. However, energy efficiency programs in California have historically underserved the state's hard-to-reach and disadvantaged communities (Frank and Nowak 2016). In 2012, the California Public Utilities Commission (CPUC) published Decision 12-05-015: the Decision Providing Guidance On 2013-2014 Energy Efficiency Portfolios and 2012 Marketing, Education, and Outreach, which approved the development of Regional Energy Networks, or RENs. The decision states that the purpose of the RENs is to address gaps in the energy efficiency program offerings of investor-owned utilities (IOUs) and serve hard-to-reach (HTR) markets. This paper assesses the RENs' success in reaching HTR residential customers and disadvantaged communities. The paper will also illustrate how the RENs have addressed gaps in energy efficiency program offerings and outreach by serving communities that IOUs cannot or will not serve. This paper will focus on the three oldest RENs in California: Bay Area REN, Southern California REN, and Tri-County REN. Using participant and program data, this paper will provide insight into how the RENs contribute to California's energy, climate, and equity goals. The findings presented in this paper can serve as a guide for other jurisdictions seeking to advance equity and promote energy efficiency in hard-to-reach and disadvantaged communities.

Introduction

The Uneven Distribution of Energy Efficiency Benefits

Energy efficiency programs have proven to be an effective tool in curtailing energy demand and costs; however, the benefits of energy efficiency initiatives have not been realized uniformly across communities. In California, energy efficiency programs have historically underserved non-white, lower- and middle-income, not college-educated, and non-English-speaking households (Frank and Nowak 2016). These customers face a unique set of challenges in accessing energy efficiency savings, including, but not limited to, language barriers, time constraints, and high upfront costs (Xu and Chen 2019). Low-income customers who reside in multifamily housing are further prevented from accessing energy efficiency savings by the lack of utility-led multifamily energy efficiency programs. Although multifamily, rental units tend to be less energy efficient, utility-led energy efficiency programs have historically focused on single-family, owner-occupied housing (Xu and Chen 2019; Pigman, Deason, and Murphy 2021). Mainstream, unrestricted energy efficiency programs offered by utilities struggle to engage HTR and disadvantaged customers because they often overlook the unique set of challenges faced by these groups. However, utility-led energy efficiency programs designed to

specifically serve HTR and disadvantaged populations also struggle to attract their targeted customers (Forster et al. 2022).

HTR and disadvantaged customers experience disproportionately higher energy burdens (Drehobl and Ross 2016), yet they face greater barriers to accessing and participating in energy efficiency programs that can reduce their energy bills.

The History of Regional Energy Networks in California

Regional Energy Networks, or RENs, are coalitions of local governments that administer energy efficiency programs in their jurisdictions. In 2011, the Local Government Sustainable Energy Coalition (LGSEC) proposed the creation of RENs and asked the CPUC to direct a portion of ratepayer funds collected by the IOUs to support REN programming. The LGSEC contended that local governments are better equipped to engage their residents and target local communities that have not historically participated in energy efficiency programs. The organization claimed that RENs would allow local governments to be more directly involved in the development and delivery of energy efficiency programs in their communities, resulting in programs better suited to meet the needs of their respective communities.

In 2012, the Commission approved LGSEC's request to allocate ratepayer funds for RENs and solicited proposals for REN pilot programs. In a later decision, the Commission explained, "RENs…have the unique opportunity to be able to leverage not only multiple local government entities into a single program delivery channel, but they also may be able to utilize funding from multiple sources to deliver more comprehensive and holistic programs, especially to hard-to-reach customers" (CPUC 2019).

In 2012, the CPUC also approved the creation of California's first two RENs: Bay Area REN (BayREN) and Southern California REN (SoCalREN or SCR). BayREN is administered by the Association of Bay Area Governments and serves the nine Bay Area counties: Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, Santa Clara, Solano, and Sonoma counties. SoCalREN is administered by the County of Los Angeles and serves the following counties: Imperial, Inyo, Kern (partial), Kings (partial), Los Angeles, Mono, Orange (partial), Riverside, San Bernardino, Tulare (partial), Santa Barbara (partial), and Ventura counties (CPUC 2012).

In 2017, the CPUC approved Ventura, Santa Barbara, and San Luis Obispo counties application to form Tri-County REN (3C-REN or TCR) (CPUC 2019).

In more recent years, the CPUC has approved the formation of Inland REN and RuralREN. As the number of RENs in California has grown, so has the amount of ratepayer funds allocated to the RENs' energy efficiency programs.

Regional Energy Networks and Hard-to-Reach Customers

As stated in CPUC Decision 19-12-021, REN proposals and programs are required to "demonstrate new and unique value toward California's energy, climate, and equity goals". CPUC Decisions 12-11-015 and 19-12-021 explain that REN programs may demonstrate "new and unique value" by complying with one or more of the following criteria:

- Offer activities that utilities or community choice aggregators (CCAs) cannot or do not intend to undertake.

- Pilot activities where there is no current utility or CCA program offering, and where there is potential for scalability to a broader geographic reach, if successful.
- Serve hard-to-reach (HTR) markets, whether or not there is another utility or CCA program that may overlap.

In partnership with DNV, the CPUC carried out a study that evaluated REN energy efficiency programs against the objectives finalized in CPUC Decision 19-12-021. The Evaluation, Measurement, and Verification (EM&V) study examined Program Year 2022 energy efficiency programs administered by BayREN, SoCalREN, and 3C-REN. Inland REN, which was created in 2021, was also a program administrator in 2022. However, the study focused on the program offerings of the three, more established RENs.

This paper does not offer a comprehensive overview of the EM&V study conducted by the CPUC and DNV. Rather, it focuses on REN energy efficiency programs that generate "new and unique value" by serving HTR residential markets. The Commission defines "HTR residential customers" as "customers who do not have easy access to program information or generally do not participate in energy efficiency programs" due to a combination of barriers, including, but not limited to, geography, language, income, and housing type (CPUC 2023). By focusing on programs that target HTR residential markets, this paper explores the RENs' efforts to promote energy efficiency in historically underserved communities and create a more equitable energy efficiency landscape.

Table 1 lists and provides a summary of the PY2022 REN residential energy efficiency programs that were examined in this study.

Table 1. Residential single-family and multifamily program summaries

Program	Program summary
BAYREN02 / BAYREN02-A, Multifamily	Offered no-cost technical assistance and rebates for energy saving and electrification technologies to low- and moderate-income multifamily property owners.
BAYREN08, Single Family Residential Energy Efficiency Program	Provided a variety of service offerings to underserved single-family homeowners and renters including rebates, an online energy evaluation, no-cost energy efficiency kits, in-home education, and direct install services.
SCR-RES-A1, Multifamily Program	Provided an energy and green building consultant to identify cost-effective upgrades and applicable incentives to improve the efficiency of multifamily buildings, primarily properties classified as HTR or located in Disadvantaged Communities.

Program	Program summary
SCR-RES-A4, Residential Kits for Kids	Introduced third- and fourth-grade students from participating schools within SoCalREN's territory to energy efficiency and how it can help their families save money and improve their comfort and safety at home.
TCR-Res-002, Multifamily	Provided owners of existing HTR multifamily properties with a no-cost energy assessment, rebates for high-energy heat pump water heaters or furnace replacement, and whole building rebates.
TCR-Res-003, Single Family NMEC	Offered contractor incentives for energy saving projects, using a Normalized Metered Energy Consumption program design, with an emphasis on HTR and underserved communities.

Methodology

The CPUC's evaluation of the RENs examined PY2022 programs administered by BayREN, SoCalREN, and 3C-REN. Our team conducted a process evaluation that drew from primary and secondary data sources. The primary source data collection included interviews with program administrators (PAs) and implementers and property managers, surveys of single-family customers, and site visits to multifamily and single-family sites. We collected secondary data through documentation review, which included previous studies into the RENs. Using this data, the team identified if and how the RENs are reaching HTR customers and the value the RENs provide to these customers.

Data Collection

The following table summarizes the components of the primary data collection process that provided insights into the RENs' residential program offerings.

Table 2. Summary of primary data collection efforts

Target group	Data collected	Frame source	Mode	Stratification approach	Sample frame	Targeted sample size

PAs and implementers	Program outreach and features, coordination with other PAs, program gaps and overlaps, and customer participation trends	REN program data and PA program tracking data	In-depth interview (IDI)	N/A	35	Census
Property manager participants	Program influence – net-to-gross (NTG), program awareness, motivation for participation, experience, barriers, and building characteristics	REN program data	Phone survey	Program and savings level	77	54
Residential single-family participants	Program influence – NTG, demographic data, occupancy, program awareness and experience, and participation in other programs	PA program tracking data	Web survey	Census	5,329	Census
Multifamily sites	Verify measure installation and use and determine installed measure quality	REN program data and PA program tracking data	Site visit	Program	77	28
Single-family sites	Verify measure installation and use, determine installed measure quality, and HVAC and water heating characteristics	REN program data and PA program tracking data	Site visit	Program	1,329	5

PA and Implementer In-Depth Interviews

DNV conducted in-depth interviews with REN staff and program implementers to supplement the information gathered from the program documentation review. The team met with each REN twice. During the first set of interviews, they met with program administrators. During the second set of interviews, they met with program administrators and program implementers.

Multifamily Property Manager Phone Survey

The evaluation looked at two multifamily programs: BayREN's Multifamily/Multifamily Electrification Program and SoCalREN's Multifamily Program. Both programs targeted multifamily property owners and managers. DNV conducted a telephone survey of property owners and managers who participated in the multifamily programs.

BayREN and SoCalREN provided DNV with a list of multifamily program participants, which DNV used to create a stratified random sample, grouping participants by REN (i.e., BayREN or SoCalREN). DNV targeted a relative precision of ±10% at a desired confidence level of 90% for each stratum.

The telephone survey took place over a period of approximately six weeks, from late December 2023 to early February 2024. The evaluators attempted to contact participants via phone and email. To incentivize participation, DNV offered participants the chance to win one of five $200 gift cards. Table 3 summarizes the disposition of the multifamily survey.

Table 3. Multifamily property manager phone survey sample disposition

Multifamily participants	Total	BayREN MF / MF Electrification	SoCalREN MF
Sample frame	77	19	58
Attempted calls	77	19	58
Completed surveys	34	12	22
Response rate	44%	63%	38%

Single-Family Web Survey

DNV surveyed participants of BayREN's Single Family Residential Energy Efficiency Program. The evaluators used a census approach, attempting to collect data from every program participant with a valid email address.

The web survey was open for approximately four weeks, from December 2023 to January 2024. The invitation email and the survey questions were written in English and Spanish to encourage responses from Spanish-speaking, HTR customers. To incentivize participation,

program participants were offered the chance to win one of five $150 gift cards. Table 4 summarizes the sample disposition of the single-family survey.

Table 4. Single-family participant web survey sample disposition

Single-family participants	Total
Sample frame (invitations emails sent)	5,329
Partially completed surveys	103
Completed surveys	676
Response rate	13%

Site Visits

DNV conducted site visits to single-family homes that participated in BayREN's Single-Family Program. Participants who completed the single-family web survey were asked if they were willing to participate in follow-up site visits. Those who were selected received a $50 gift card. DNV visited five single-family sites to verify installation of measures and collect information on HVAC and water heating characteristics in place. The single-family site visits took place between December 2023 and January 2024.

Multifamily survey participants were also asked to participate in site visits, and selected participants were offered a $200 gift card. DNV completed 13 site visits to multifamily properties that participated in BayREN and SoCalREN's multifamily programs. The evaluators verified if the incentivized measures were installed and still in use. The multifamily site visits occurred between January to February 2024.

Findings

The CPUC's evaluation of REN programs provides key insights into the RENs' efforts to promote energy efficiency in HTR and historically underserved communities. The data collected by DNV illustrates the RENs strategies for attracting and engaging HTR customers. It also reveals how successful the RENs have been at reaching HTR customers. The evaluation identifies effective components of REN programs and strategies, as well as potential issues.

Program Participation – Multifamily

The evaluation assessed two REN multifamily programs: BayREN's Multifamily/Multifamily Electrification Program and SoCalREN's Multifamily Program. The study revealed that the multifamily programs served a higher proportion of HTR participants than are present in the service territories of where the programs operated. DNV compared the demographic profile of REN multifamily program participants to the demographic profile of the total multifamily population in BayREN and SoCalRENs' service territories. The data shows that

29 percent of REN multifamily program participants were HTR, but only 24 percent of their service territories' multifamily population was HTR.

The evaluation also revealed that BayREN and SoCalREN multifamily programs targeted buildings in which residents would benefit the most from energy efficiency upgrades. During the multifamily phone survey, DNV collected data on whether electricity and gas use at the properties was individually or master-metered and if tenants are responsible for paying their utility bills. Table 5 summarizes the responses to these survey questions. The data from the multifamily survey indicates that most of the properties served by the REN multifamily programs are individually metered. Therefore, the installation and use of energy efficiency equipment has a direct impact on tenants' utility bills. The survey results also indicate that more than half of the multifamily buildings served by the RENs were built before 1979. This means that energy efficiency upgrades, namely building envelope measures, have the potential to generate high levels of energy savings.

Table 5. Participating multifamily building and participant characteristics

Characteristic	Response	(n = 34)
Responsibility for utility bill	Tenant responsible for gas and electricity utility bills	62%
	Tenant responsible for electric but not gas utility bills	24%
	Utility bills included in the rent	5%
	Other	7%
	Don't know	2%
Meter Type	Electric individually metered	94%
	Gas individually metered	70%
Building vintage	Before 1979	53%
	1980-2000	29%
	2000+	17%
	Don't know	2%

Program Participation – Single Family

The evaluation found that BayREN's Single Family Residential Energy Efficiency Program served a smaller proportion of HTR customers than are present in its service territory. BayREN's service territory, which is comprised of the nine San Francisco Bay Area counties, has a single-family population that is 6 percent HTR. However, only 4 percent of BayREN single-family participants were HTR.

The single-family web survey revealed that BayREN's single-family program served more affluent single-family households than it intended to reach. Table 6 summarizes participants' responses to the survey's questions about economic characteristics. It provides information on the education attainment, household income, and the level of energy insecurity reported by the participants. The survey responses reveal that:

- BayREN single-family program participants had high levels of educational attainment. More than 78% of single-family participants had a bachelor's degree or higher, a significantly higher proportion than in the Bay Area. The proportion of people with a bachelor's degree or higher in BayREN counties ranged from 35.9% (Napa County) to 70.5% (Solano County), averaging around 52%. Even given the high average educational attainment of the area, the single-family program participants were more educated than average.
- The income distribution of BayREN single-family participants skewed towards the higher end. Excluding participants who did not wish to say, 53% reported incomes above $121,681. Counties served by BayREN have median household incomes that ranged between $99,266 (Sonoma County) to $165,762 (Santa Clara County), averaging around $130,000 a year in the nine counties.
- Single-family households experienced energy insecurity in line with the state average. Approximately a quarter of BayREN single-family participants faced some form of energy insecurity, and 12% reported keeping their homes at an unsafe or unhealthy temperature. These proportions closely resembled the rates of energy insecurity observed in the state, as indicated by Census data.

Table 6. Economic characteristics of BayREN single-family participants

Characteristic	Participants (n=676)
Education level	
Graduate or professional degree	45%
Bachelor's degree	33%
Some college, associate degree, or trade school	13%
High school diploma or less	3%

Prefer not to answer	6%
Income	
Over $163,801	30%
$121,681 up to $163,800	7%
$70,281 up to $121,680	19%
Less than $70,280	14%
Prefer not to answer	31%
Energy insecurity	
Burdened in any of the following ways	24%
Unable to pay for household necessities	19%
Kept household at an unsafe or unhealthy temperature	12%
Unable to pay for energy bill	8%

The single-family web survey also found that BayREN's single-family program served households whose primary language is not English in proportion to their presence in the population. Table 7 summarizes the demographic data captured from the single-family web survey. It includes data on the age composition, ethnic makeup, and primary language of the participating single-family homes. The information indicates that:

- Most participants' primary language is English, but a notable proportion have other primary languages. Approximately 11% of participants reported a primary language other than English in a similar proportion to their presence in the population. The most common primary language other than English was Chinese, which included Mandarin and Cantonese
- BayREN single-family program participants come from diverse ethnic and cultural backgrounds. One-third of participants who reported their race identified as a minority. Roughly 30% of participants who reported their race identified as Asian.

Table 7. Demographic characteristics of BayREN single-family participants

Characteristic	Participants (n=676)
Age composition	
Seniors 65 and up	42%
Children 17 and under	27%
Children under 5	11%
Primary language	
English	87%
Chinese (including Mandarin and Cantonese)	4%
Spanish	1%
Other	5%
Prefer not to answer	2%
Race	
White	61%
Asian	27%
Black or African American	2%
American Indian or Alaska Native	1%
Other	4%
Prefer not to answer	10%

Outreach

Table 8 summarizes the target audience for each REN PY2022 residential energy efficiency program.

Table 8. Target markets of PY2022 REN residential programs

Program	Target market
BAYREN02 / BAYREN02-A, Multifamily	Targeted buildings traditionally not served well by EE programs, including buildings with fewer than 100 units, independently owned or owner-occupied properties, deed-restricted or unsubsidized affordable housing, properties with residential ownership structures like HOAs, and those in DACs.
BAYREN08, Single Family	Focused on reaching underserved populations, particularly moderate-income households, which include single-family households exceeding income-qualification thresholds but still falling below the median income. It also targeted households where English is not the primary language.
SCR-RES-A1, Multifamily	Targeted HTR / DAC participants, ranging from individually owned single properties to corporate-owned multi-site properties with five or more units.
SCR-RES-A4, Residential Kits for Kids	Targeted DAC and rural HTR school districts with historically low participation in utility programs. It aimed for 50% of schools in the program to be Title 1 or DAC. Title 1 schools have a high concentration of students from low-income households.
TCR-Res-002, Multifamily	Targeted multifamily property owners and managers in HTR communities.
TCR-Res-003, Single Family NMEC	Available to all single-family homes but provided aggregators serving HTR/DAC participants with incentive multipliers to encourage participation in HTR communities.

Direct outreach was a common theme across the RENs' marketing and outreach strategies for residential energy efficiency programs. The RENs commonly used mail campaigns, phone calls, and site visits to reach residential customers. Partnerships with organizations serving or associated with program target segments were also a key part of the RENs' outreach efforts. The RENs collaborated with rental housing associations, affordable housing organizations, local associations of realtors, community and local organizations, installation contractors, other PAs,

and local government organizations (municipalities, counties, regional public agencies) to reach residential customers.

The RENs employed innovative methods to reach HTR customers. This includes advertisements and programming segments in Spanish and Chinese media outlets. SoCalREN's Multifamily Program conducted site visits to multifamily properties in its service territory. 3C-REN partnered with the Santa Barbara-based Promotores Network to serve geographically isolated Spanish-speaking communities.

Program Features

The CPUC's evaluation of the RENs identified two key features that make REN residential programs attractive to HTR customers: better incentives/financing and hands-on support.

BayREN used the layered incentive approach to provide customers with greater financial incentives. The BayREN single-family program layered incentives with Bay Area Air Quality Management District funded efforts and CCAs. 3C-REN provided three times higher incentives to HTR customers than it did to non-HTR customers. REN multifamily programs also provided larger incentives for in-unit measures that allowed tenants to better realize the financial benefits of energy efficiency upgrades. These program features can help HTR customers overcome the financial barriers often associated with energy efficiency upgrades.

Knowledge barriers are another obstacle to accessing energy efficiency upgrades. Hands-on, customized support, which was a common feature of REN program offerings, can help address this barrier. BayREN's single-family program connected customers with Energy Advisors who acted as educators, facilitators, and advocates. SoCalREN's multifamily program offered direct measure recommendations based on customers' unique situations. 3C-REN's multifamily program embedded program staff within the community to help with scoping projects and identifying funding sources.

Conclusion

The findings of this evaluation demonstrate that the RENs are engaging and serving HTR customers. The RENs employ innovative strategies and leverage the relationships of local government to conduct outreach to HTR customers who have been underserved by other energy efficiency program offerings. The demographic data collected in this study demonstrates that the RENs' outreach efforts have been effective, as a meaningful portion of the RENs' customer base can be classified as HTR under the current CPUC definition. The RENs tailor their programs to fit the needs of HTR customers. The RENs place a greater emphasis on reaching customers in multifamily housing, a group that has been historically underserved by utility-sponsored energy efficiency programs. The RENs consider factors such as split incentives and renter equity in their program design to ensure that multifamily customers can better realize the benefits of energy efficiency measures. Furthermore, REN residential programs offer more attractive financing options and incentives, as well as greater hands-on support. These factors make it easier for HTR customers to access energy efficiency savings.

Despite their ability to reach HTR communities, the RENs still struggle to ensure that their programs serve their intended customers. This study revealed that the BayREN Single-Family Program, which aims to serve low- to moderate-income households, serves a high proportion of households who are above this income level and would have installed the measures

without program support. The RENs also struggle with many of the same obstacles faced by other energy efficiency program administrators, including budget limitations, lack of customer awareness, and pandemic-related challenges.

This evaluation of REN programs can inform other jurisdictions aiming to expand energy efficiency programs in HTR and historically underserved communities. The RENs leverage the unique knowledge and connections of local government to effectively engage HTR communities. They use this knowledge to develop programs that are uniquely tailored to the needs of their communities, offering more comprehensive financing and hands-on support. By engaging and serving HTR communities, the RENs help address a gap in California's current energy efficiency landscape.

References

California Public Utilities Commission. 2012. Decision 12-05-015: Decision Providing Guidance on 2013-2014 Energy Efficiency Portfolios and 2012 Marketing, Education, and Outreach.

California Public Utilities Commission. 2019. Decision 19-12-021: Decision Regarding Frameworks for Energy Efficiency Regional Energy Networks and Market Transformation.

California Public Utilities Commission. 2023. Decision 23-06-055: Decision Authorizing Energy Efficiency Portfolios for 2024-2027 and Business Plans for 2024-2031.

California Public Utilities Commission and DNV. 2024. Group A Regional Energy Network Evaluation Report.

Drehobl, A., and Ross, L. 2016. "The US Low-Income Energy Affordability Landscape: Alleviating High Energy Burden with Energy Efficiency in Low-Income Communities." *Proceedings of ACEEE 2016 Summer Study on Energy Efficiency in Buildings*. Washington, DC: ACEEE.

Forster, H.A., Leaver, C., Ward, D., and Karlin, B. 2022. "Understanding Utility Awareness and Engagement among Low Income Customers." *Proceedings of the ACEEE 2022 Summer Study on Energy Efficiency in Buildings*. Washington, DC: ACEEE

Frank, M., and S. Nowak. 2016. "Who's Participating and Who's Not? The Unintended Consequences of Untargeted Programs." *Proceedings of the ACEEE 2016 Summer Study on Energy Efficiency in Buildings* 2:1-13. Washington, DC: ACEEE.

Pigman, M., J. Deason, and S. Murphy. 2021. "Who is Participating in Residential Energy Efficiency Programs? Exploring Demographic and Other Household Characteristics of Participants in Utility Customer-Funded Energy Efficiency Programs." Berkeley, CA: Lawrence Berkeley National Laboratory. escholarship.org/content/qt12v2603q/qt12v2603q.pdf

Xu, X., and Chen, C. 2019. "Energy efficiency and energy justice for U.S. low-income households: An analysis of multifaceted challenges and potential." *Energy Policy* 128: 763-774.