

RESEARCH BRIEF SERIES

Issue No. 2, October 2022



The Costs of Energy Savings and Energy Burdens

(Part II of II: Challenges and Opportunities for the Inland Region)

In Issue Brief #1 of this research brief series, we examined the potential costs to organizations and utility ratepayers for implementing energy-efficiency programs. This second brief observes the relationship between climate change and energy needs, in addition to the measures that are currently implemented and needed to alleviate energy burdens.

EXECUTIVE SUMMARY:

- According to the U.S. Census Bureau's Housing Pulse Survey (HPS), the Riverside-Ontario-San Bernardino Metropolitan Statistical Areas (MSA) ranked first in the nation in households' inability to pay energy bills over a period of one year (2021-2022) among the 15 most populous MSAs in the country.
- Calculated Affordability Ratios, which measure a households' utility expenditures relative to income remaining after paying for housing and other essentials, reveals that utility bills in the eastern portion of the Inland Region are proportionately higher for households making less than 20% of the area median income (AMI) compared to households with similar socioeconomic characteristics in the western portions of the Inland Region and in coastal counties.
- Current climate models suggest that the eastern regions of Riverside and San Bernardino Counties could experience higher temperature increases compared to the western portions in the future. This may make the eastern region's low-income households even more susceptible to energy insecurity due to future increased energy needs.

Introduction

Climate change has compelled policymakers to make significant changes by introducing bold policies that will significantly alter our energy infrastructure. For example, California Senate Bill 100, which was signed into law in 2018, requires that by 2045 100% of the state's electricity will be generated from zero-carbon resources (CEC 2021). Due in part to this Senate bill, modern policies and utility companies play a vital role in achieving California's goals. For example, utility companies are encouraging their clients to move towards greater energy efficiency (which is needed to support a robust electricity grid) by providing incentives to reduce consumption. Additionally, building codes are increasingly implementing stricter energy efficiency requirements, and mandating the use of clean energy in newly constructed single-family residential homes (2019 Building Energy Efficiency Standards). Although these strategies do reduce energy use, extreme temperatures as a result of climate change are expected to increase the demand for energy in the Inland Region.

Thus, households should be increasingly aware of the importance of efficiency to keep energy bills affordable. Unfortunately, the Riverside-Ontario-San Bernardino Metropolitan Statistical Areas (MSA) has one of the worst energy insecurity rates compared to the other 14 most populous MSAs in the United States (Housing Pulse Survey 2022). Given that climate effects are expected to increase energy needs, the changing climate may intensify social inequities experienced by households prone to energy insecurity. To prevent the widening of this inequity gap, the Inland Region needs to address these energy challenges.

One strategy used to encourage energy savings is the promotion of financial incentives to residents and property owners to improve the energy efficiency of housing units. Households that partake in such programs benefit from reduced energy usage and the financial compensation reaped from incentives. However, a review of statewide data suggests that participants who benefit from energy-saving programs tend to be households with incomes greater than \$100,000, and typically own or reside in single-family homes. These characteristics do not necessarily reflect the composition of the general population (Nowak and Frank 2016, Reames 2020).

In this brief, we look at the characteristics of the Inland Region that influence the energy needs of Riverside and San Bernardino counties. Further, we look at projected climate trends for the region, the relationship between income and energy affordability, and the types of energy assistance programs that low-income residents in Riverside and San Bernardino Counties rely on. This overview may influence how policies are crafted to address the Inland Region's climate resiliency while simultaneously ensuring that energy accessibility is not compromised.

Challenges for the Inland Region

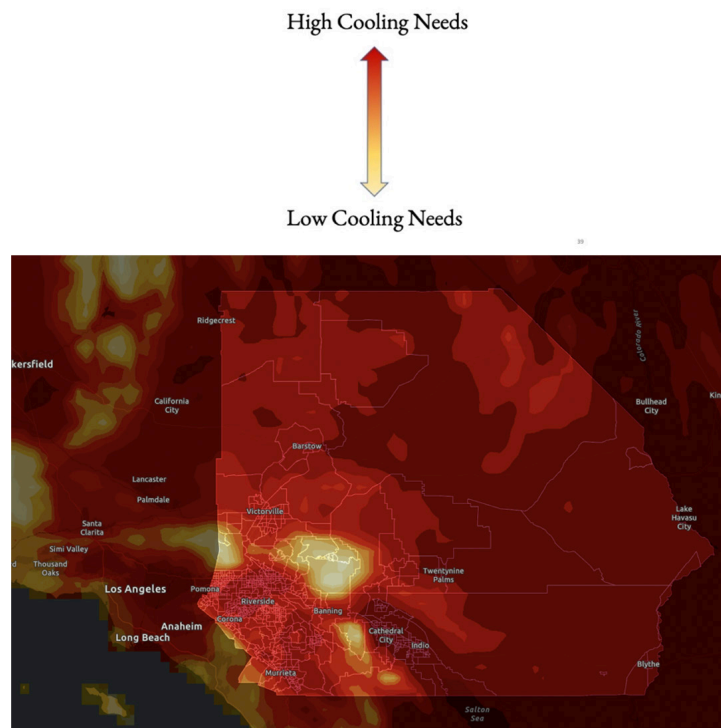
Extreme Climate

As climate change progresses, energy costs are expected to commensurately rise due to increased extreme weather events as well as from more gradual temperature fluctuations. Scientists measure the extent of cooling needs by calculating "cooling degree days" (CDDs). CDDs measure how many degrees are needed to cool an

area to maintain a standardized comfortable temperature. For example, if the temperature outside is 100° F, but the desired temperature of a home is 70° F, the area needs to be cooled by 30° that day, and hence, there are 30 CDDs. However, if the temperature outside is 75° F, there are only 5 CDDs for that day. In the former case, the high CDD value would require that more energy—through air conditioning—is required to achieve comfortable temperatures, whereas in the latter case, the low value would require that less energy is needed to achieve the same temperature.

Areas with high CDD values typically utilize more energy than areas with low CDDs. Figure 1 displays the projected cooling needs in the Inland Region from 2036 - 2065. Low CDD values (shaded yellow areas) indicate where less energy will be needed to keep temperatures comfortable. The Inland’s eastern region is projected to have higher CDD values; these areas are represented by the darker shades of red. The eastern regions will likely use more energy compared to the western region as climate change progresses if retrofits to existing structures and construction of new buildings are not prioritized. According to the same climate model, the mountain areas of the Inland Region, including the San Bernardino and San Jacinto mountains, are projected to be less impacted, and as such are depicted by the yellow colors in Figure 1.

Figure 1. Projected Number of Cooling Degree Days in the Inland Region (2036 - 2065)



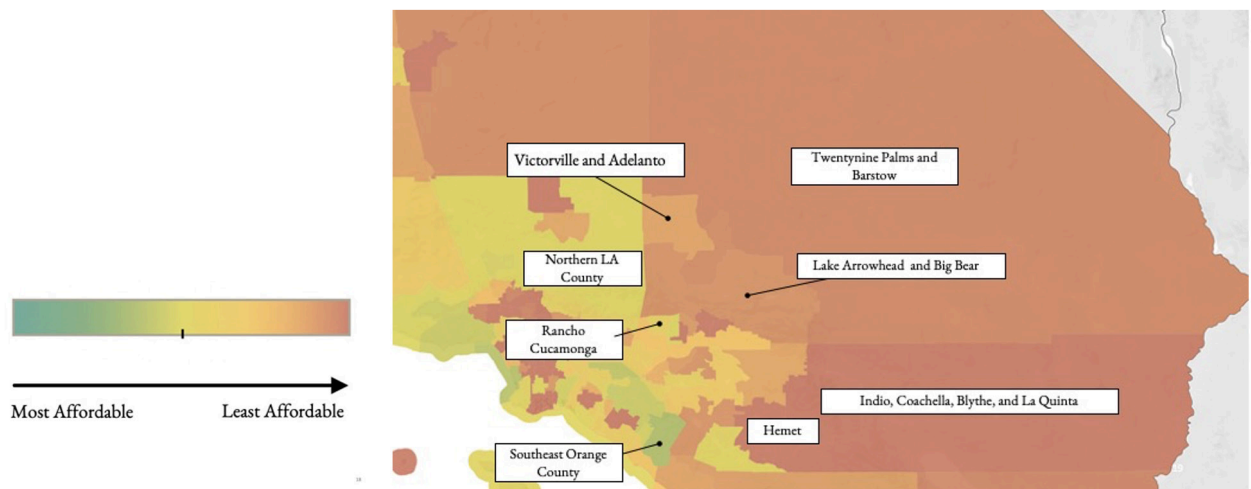
Source: U.S. Global 4th National Climate Assessment, CA RASS

Figure 1. From the period of 2036 - 2065, the eastern areas of the Inland Region are projected to use more energy to cool their homes due to increasing temperatures. The western regions of the Inland Region will have more modest cooling needs comparatively.

Trends in Energy Insecurity

One of the metrics that the California Public Utilities Commission (CPUC) uses to quantify the affordability of utility expenditures is the affordability ratio (AR), which compares a household's utility costs to their remaining income after paying for other essentials. Using this definition of affordability, Figure 2 depicts that energy is mostly unaffordable to households making less than 20% of the area median income (AMI) in the eastern region compared to similar households in the western region. Energy costs in the western region tend to be more affordable for LMI households. However, when comparing LMI households in the western portion of the Inland Region with similar households in Los Angeles or Orange Counties, LMI households in the western region still generally pay more on utilities as a proportion of available income (albeit some areas in the coastal counties do have high unaffordability).

Figure 2. Affordability Ratios for Households Making 20% or Less of the AMI (2019)



Source: CPUC

Figure 2. Affordability ratios reveal that energy affordability is less attainable for low-income households in the eastern regions compared to those in the western regions of San Bernardino and Riverside Counties. When comparing energy affordability in the Inland Region to the coastal counties, energy costs in the coastal counties tend to be more manageable for low-income households.

According to the U.S. Department of Energy's (DOE) Low-Income Energy Affordability Data (LEAD) Tool, although San Bernardino and Riverside Counties' average energy burdens are comparable to the statewide average energy burden (which is 2% of household income), energy burdens and the amount that households pay for utilities are not distributed homogeneously (see Figures 3 and 4). Figure 4 shows that it is relatively common for households in the eastern regions of the Inland counties to experience annual expenditures of \$3,000 or more on utilities. This is much higher than the state's average energy costs, which amount to about \$1,773 (U.S. Department of Energy 2018).

Figure 3. Average Annual Energy Burdens as a Percentage of Income (2018)

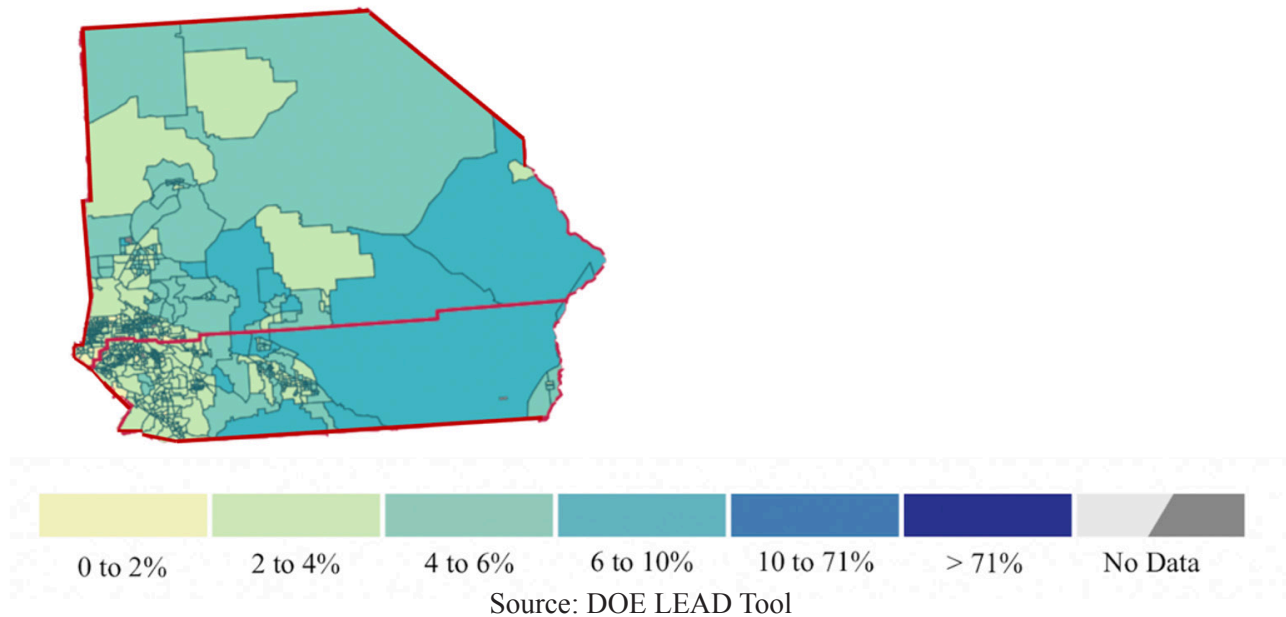


Figure 3. Energy burdens are not homogeneously distributed. The average annual burdens in the eastern regions are generally higher than the western regions.

Figure 4. Average Annual Expenditures on Energy Bills (2018)

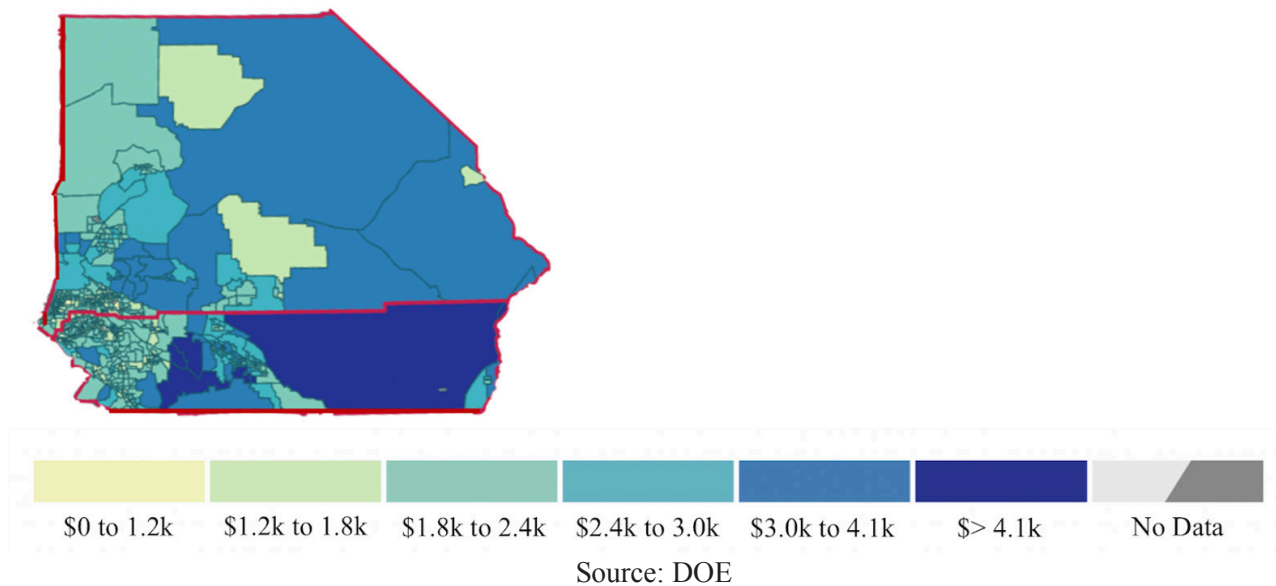


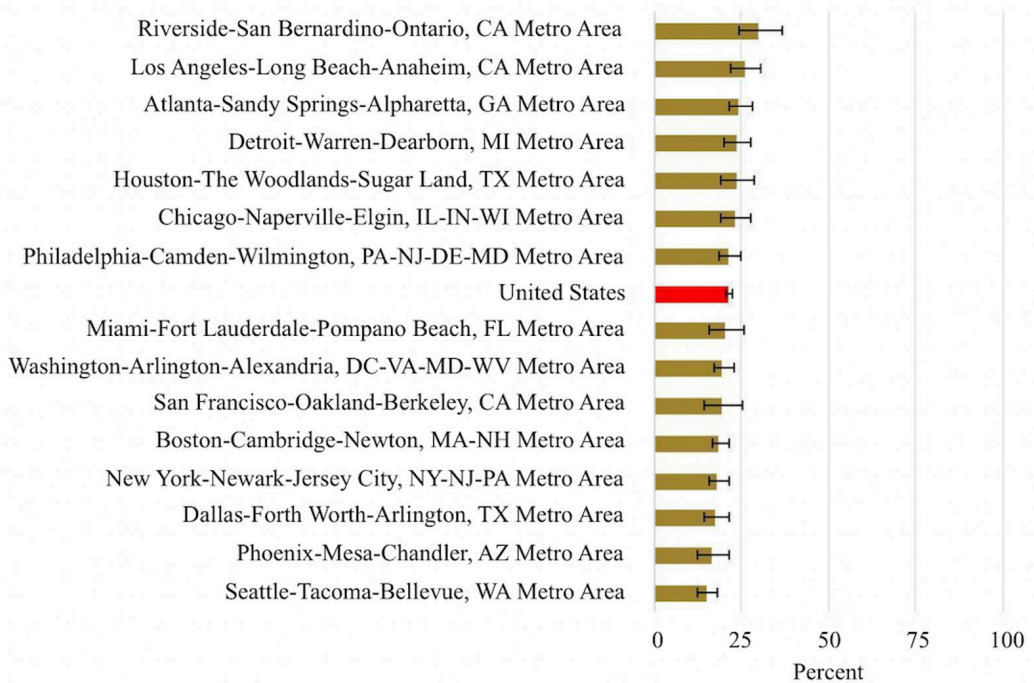
Figure 4. Some portions of Riverside County have average energy expenditures that are greater than \$4,000. In general, households in the eastern portion of Inland Southern California incur higher energy expenditures compared to the western region.

The Inland Region’s energy burdens are higher than the national average and the averages of neighboring MSAs. The average national energy burden is 3.1%, whereas the Inland Region’s is 3.6%, and the neighboring Los Angeles-Long-Beach-Anaheim MSA is 2.2%. The Inland Region’s LMI households have greater energy burdens – 8.7% compared to the national average of 8.1%, and the Los Angeles-Long Beach Anaheim MSA’s average of 6% (Drehobl 2020). Moreover, the Inland region ranks as one of the nation’s metropolitan areas with the highest share of households that cannot pay their total energy bill (I-REN 2021). To illustrate this, Figure 5 lists the MSAs in the United States that were most vulnerable to energy insecurity. According to the Household Pulse Survey, the Riverside-San Bernardino-Ontario MSA had the highest concentrations of households that were behind on energy bill payments within the last 12 months (the survey was conducted from March 30th and April 11th, 2022).

Figure 5. Percentage of Households that were Unable to Pay an Energy Bill in Full in the Last 12 months to Date from March 30th - April 11th, 2022

Unable to Pay Energy Bill, Household Pulse Survey: Week 44

Adults in households that were unable to pay an energy bill in full in the last 12 months



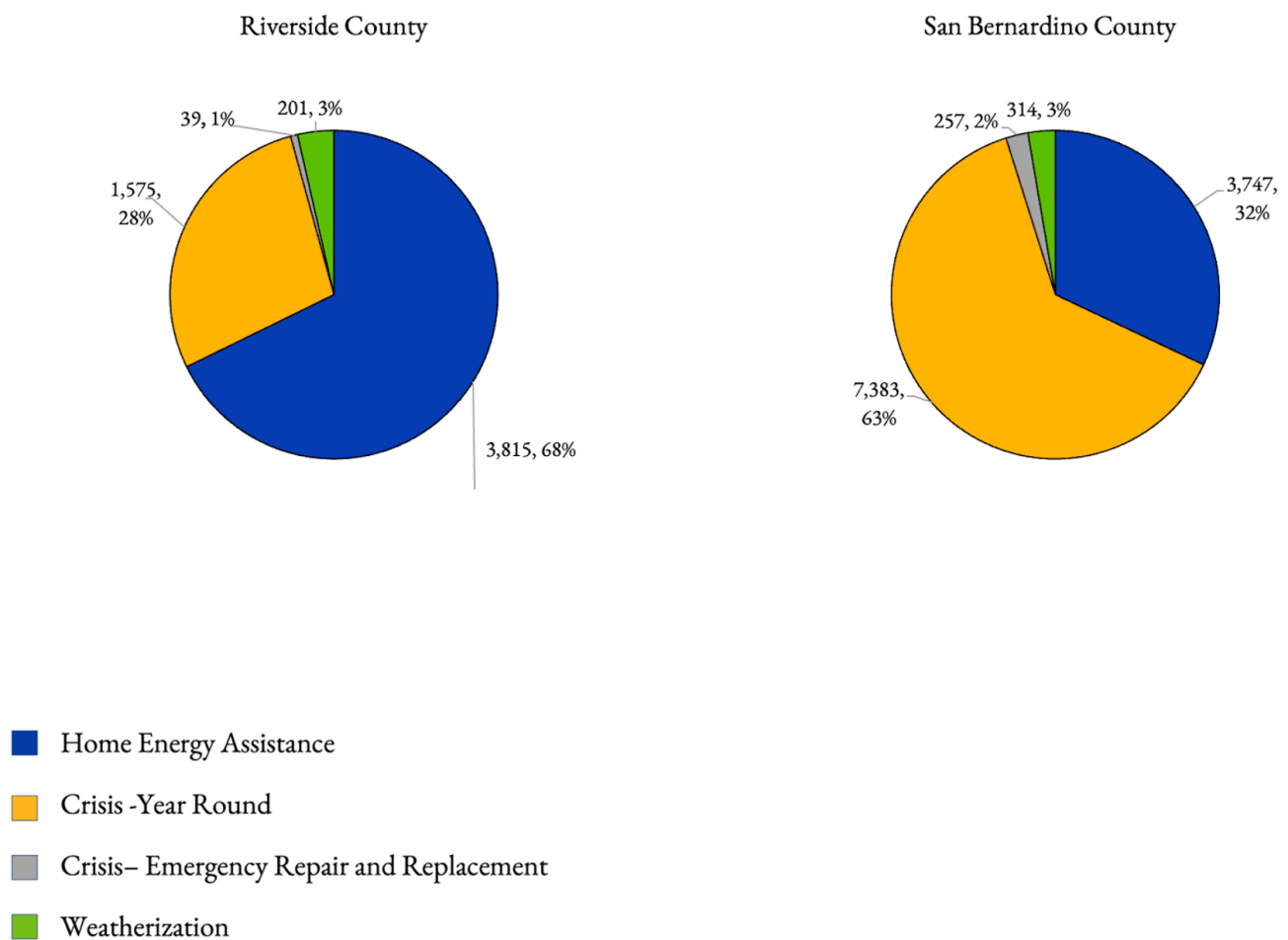
Source: U.S. Census Bureau, Household Pulse Survey

Source: Housing Pulse Survey

Figure 5. According to data collected between March 30th - April 11th, 2022, the Riverside-San Bernardino-Ontario MSA had the highest percentage of households that could not sufficiently pay their energy bills in the past year compared to the other 14 most populous MSAs in the United States.

The Low Income Home Energy Assistance Program (LIHEAP) provides federal funding to non-profit organizations and local governments to be distributed for weatherization projects, repairs, energy bills, and urgent emergencies of eligible low-income households. According to LIHEAP data on funding allocation, households that are 75% below the federal poverty line in Riverside and San Bernardino Counties may have differing energy needs that conflict within the region. Figure 6 depicts that San Bernardino County uses a majority of LIHEAP funds for crisis events, whereas Riverside County allots most of their LIHEAP funds to provide extra financial assistance to maintain the affordability of energy bills. It is unclear why the two counties' distribution of LIHEAP funds are markedly different from each other.

Figure 6. Number and Percentage of Households that Received LIHEAP Funds in Riverside and San Bernardino Counties Per Assistance Type for Households that are 75% below the Federal Poverty Level + Fund Utilization



Source: California Department of Community Services & Development

Figure 6. In Riverside County, the majority of funds from LIHEAP were used to provide financial assistance in paying energy bills for financial assistance. In San Bernardino County, more funding was allocated for crisis events.

Discussion and Future Research

In this brief, we have observed that energy affordability (when quantified by affordability ratios) is not homogeneous throughout Southern California; low-income households in Los Angeles and Orange Counties have energy bills that are more affordable to low-income residents. This trend does not hold for Riverside and San Bernardino Counties, where low-income residents face energy affordability challenges. Census tract-level data shows that energy burdens and expenditures in the eastern areas of the Inland Region are greater than the western areas.

Energy-efficiency programs have the potential to decrease energy consumption by as much as 30% (U.S. Department of Energy, 2018). For low-income households, this may yield potential energy savings and thereby reduce the risk of energy-insecurity. In the past, California has seen an increase in disconnection rates (Verclas and Hsieh 2018) accompanied by rising energy rates (CPUC), and no decrease in energy burdens (Brown et al. 2020). With energy consumption projected to increase in the near future (Doman 2017), energy insecurity is becoming a more prevalent issue for low-income households generally, and perhaps more so, for those who reside in the Inland Region. Our observation based on the utilization of LIHEAP funds for the two counties implies that low-income households may have differing energy needs based on the types of LIHEAP claims reported. If this is the case, effective and efficient programs must be specifically designed to meet the unique energy challenges of communities. In order to determine whether current efficiency programs appropriately address local energy needs, their efficacy in reducing energy burdens must first be understood. This can be done by characterizing the socioeconomic and demographic profiles of beneficiaries for each program, determining their accessibility, and assessing the net decrease in energy burdens for all income levels. Once community energy challenges are identified, programs can be reformed, if necessary, to improve results. Such studies, however, are easier said than done because access to relevant data is often limited and remains to be a critical challenge for researchers (Crandall and Gilleo 2018, Brown et al. 2020).

Another point of contention is whether existing and potential new energy-efficient program offerings are escalating or mitigating the energy-equity gap between socioeconomic levels. Because energy consumption is significantly influenced by the physical properties of a dwelling, the ability to financially invest in home improvements is key to reducing household energy burdens. As suggested by current research, beneficiaries of energy-saving programs tend to be higher income households - this pattern does not reflect the socioeconomic and demographic makeup of the Inland Region, or California more generally. It is therefore likely that many current programs pose a systemic barrier to accessing affordable energy. For example, the 2019 Energy Code in place today requires that construction of new, low-rise residential buildings have photovoltaic (PV) systems. This requirement will potentially add about \$8,000 - \$10,000 to the cost of each new housing unit (Gillies 2019). Could such additional costs further impede households with modest incomes from purchasing newer homes? Similar to the challenge of identifying community energy needs, questions as such are difficult to answer without sufficient public data available.

Some jurisdictions recognize the need for improved data collection, and as a result, have implemented public policies that require building performance data to be reported. Washington D.C. and New York City are two such localities that have demonstrated that data can be utilized to leverage their ability to invest in energy efficiency (Weeks 2018). Washington DC was able to utilize collected data to prescribe climate actions for their

Clean Energy DC plan, with the goal of making DC carbon neutral and climate resilient by 2050. In New York City, data on building performance was studied alongside sociodemographic data and health risks to identify buildings that were in need of energy efficiency retrofits. Other jurisdictions can follow Washington DC's and New York City's lead by taking advantage of the "Putting Data to Work" toolkit provided by the non-profit organization Institute for Market Transformation (IMT), whose purpose is to encourage local governments to collect data to create effective solutions for addressing energy challenges. NYC and DC have demonstrated that with increased transparency and willpower, energy affordability can be accessed by all households regardless of income and location.

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