The 129 kWh per Month Lifestyle: What Outliers Reveal About Energy Norms and Comfort

Kara Marshall and Gregory Romine, Eversource

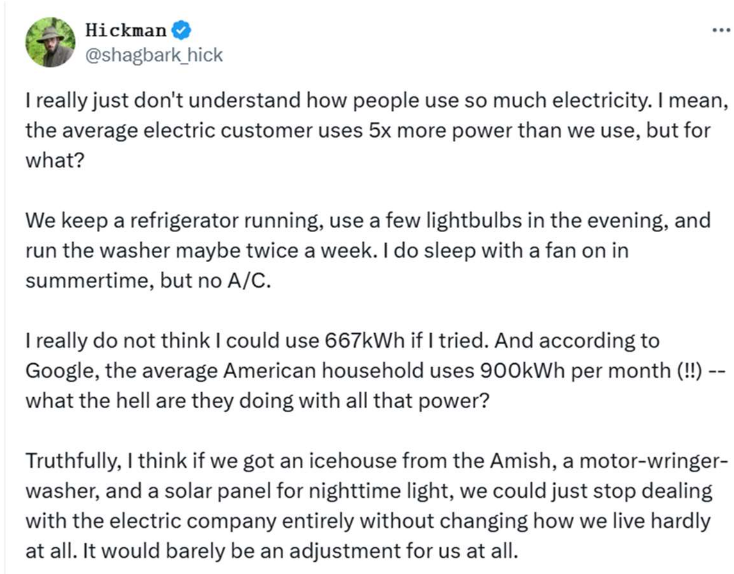
ABSTRACT

When segmenting customers, energy efficiency program administrators often treat residential customers as a homogenous mass market, segmenting only by income, home ownership, and dwelling type (single-family vs. multi-family), and other dwelling characteristics such as building age. In contrast to the commercial and industrial sectors, residential energy use is often treated as homogeneous, yet it varies across different lifestyles, standards for comfort, and norms. We have found that energy consumption among households is highly variable in ways that may represent different lifestyle expectations. Social norms have long been used to drive behavioral energy savings, but average usage does not tell the whole story, and expectations for comfort can vary widely. This paper will use data on the range of energy consumption within the residential customers of an electric and gas utility in the northeastern United States, along with third-party customer demographics and housing characteristics, in an attempt to infer what attitudes may be driving energy consumption. This will be combined with a review of studies of behavioral energy efficiency programs based on social norms as well as literature on consumer attitudes towards energy use and comfort. The paper will conclude with a discussion of how insights from this work can be used to improve residential customer segmentation, targeting, and positioning to drive energy savings through energy efficiency and active demand response programs.

Introduction

Every now and then, a perfect example of how people think about energy emerges from the wilds of social media. Figure 1 is a screenshot of a post on X.com in which a user shares his three-bar Home Energy Report graph showing his extremely low summer electricity use. He wonders, "I just don't understand how people use so much electricity," and goes on to point out that he does not use air conditioning (Hickman 2025). Another user posted in response that the comfort provided by year-round constant temperature justifies the higher energy consumption (Figure 2). It is hard to find a more effective demonstration of how different attitudes and expectations around energy use and comfort can be. Current energy efficiency program design may underestimate the diversity in energy consumption and lifestyles among households. Enhanced understanding of that diversity could improve outcomes for both overall energy efficiency and energy affordability. This understanding could be then applied to market segmentation for energy efficiency programs designed to save energy through rebates, weatherization, and behavioral interventions.

Eversource's approach to residential segmentation has largely focused on weatherization programs and has relied on segmenting by housing characteristics (Rodgers 2016), and we have assumed that residential energy consumption is too homogenous to make customer segmentation based on energy use worthwhile. This is in contrast to a very successful approach to segmenting commercial and industrial (C&I) customers based on energy consumption. Internal Eversource research has found that 2% of the C&I customers account for 75% of electricity consumed in our service territory. This concentration has allowed Eversource to drive savings among the largest users by dedicating account executives to those helping the largest industrial, commercial and institutional customers establish individual plans for deep savings (Kirchman et al. 2021). At the same time, Eversource encourages participation in mass market turnkey and midstream programs that efficiently serve smaller businesses and nonprofits. This segmentation by energy consumption has enabled Eversource to hit very high energy efficiency goals in Massachusetts over the past decade.


Hickman
@shagbark_hick

I really just don't understand how people use so much electricity. I mean, the average electric customer uses 5x more power than we use, but for what?

We keep a refrigerator running, use a few lightbulbs in the evening, and run the washer maybe twice a week. I do sleep with a fan on in summertime, but no A/C.

I really do not think I could use 667kWh if I tried. And according to Google, the average American household uses 900kWh per month (!!) -- what the hell are they doing with all that power?

Truthfully, I think if we got an icehouse from the Amish, a motor-wringer-washer, and a solar panel for nighttime light, we could just stop dealing with the electric company entirely without changing how we live hardly at all. It would barely be an adjustment for us at all.

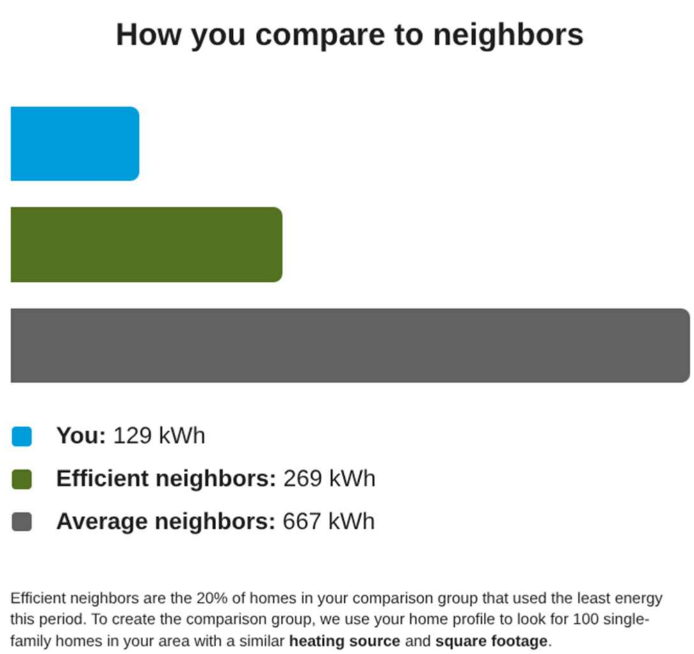


Figure 1: Post on X.com reacting to a Home Energy Report (Hickman 2025)[1]

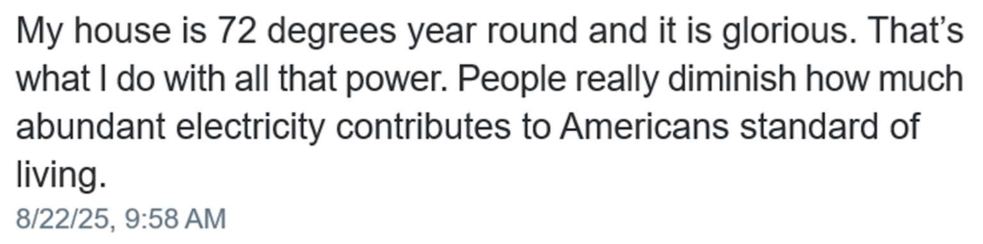


Figure 2. Response to the post featured in Figure 1 (Castle Hill Mom 2025)

If residential customer attitudes and energy use vary as much as these social media posts suggest, it is worth exploring how to effectively segment residential customers based on differing energy use patterns, similar to Eversource's successful C&I segmentation approach. Are we leaving savings on the table by not addressing households with high energy consumption with specifically designed programs? Could we be driving households with low energy lifestyles to consume more by comparing them to higher consuming neighbors?

Behavioral programs, particularly Home Energy Reports (HER) as featured in Figure 1, may in particular benefit from further exploration of the diversity of household energy use. These reports draw on insights from behavioral science, which indicate that people are motivated to save energy when they receive feedback on how their homes perform relative to neighbors with similar homes (Munson et al. 2022). They have been part of Massachusetts energy efficiency programs since 2009. They have successfully saved energy but have elicited negative responses from high users (ODC 2011). This pushback may justify further application in diversity of energy consumption.

This paper will explore the diversity of household energy consumption, the use of social norms within energy efficiency programs, and present recommendations for program design based on these observations.

Residential Energy Use Background

Residential Energy Consumption Survey (RECS)

We will start the exploration of these questions by trying to understand what energy use patterns and housing stock can tell us about what is statistically normal. Eversource serves Connecticut, Massachusetts, and New Hampshire. For ease of analysis, we will focus on Massachusetts. Table 1 provides a comparison between Massachusetts and United States average characteristics using the 2020 Residential Energy Consumption Survey (RECS, EIA 2023). These numbers give us an initial high-level definition for normal consumption. Despite having a higher average home size, Massachusetts is shown to have lower average annual electricity consumption. It also has a lower percentage of single-family detached homes and lower proportion of homes built in 2000 or later. All of these factors will be explored as potential drivers in variation in electricity consumption later in the paper.

---

[1] A.M. Hickman, author of *Hickman's Hinterlands*, who is in many ways not a typical American consumer **substack.com**

Table 1. Comparison of Average Massachusetts to Average United States

	Massachusetts	United States
Annual Site Electricity Consumption (kWh)	7,237	10,566
Monthly Site Electricity Consumption (kWh)[2]	603	881
Air Conditioning use (kWh)	1,231	2,315
Monthly Air Conditioning use (kWh)	103	193
Annual Expenditure on Air Conditioning ($)	$249	$299
Housing Unit (Square Feet)	1,853	1,818
Cooled Space (Square Feet)	849	1,335
Cooled Space (%)	46%	73%
Households Using Air Conditioning (%)	87%	89%
Households with Central Air Conditioning (%)	32%	67%
Single Family Detached Homes (%)	51%	62%
Home Built in 2000 or Later	12%	21%

Air Conditioning Use

Comparison of Massachusetts and national averages related to air conditioning presence, energy consumption, and expenditures laid out in Table 1 supports the indication in the social media posts shared in Figures 1 and 2 that presence and use of air conditioning may be a major driver in variation in energy consumption. Table 1 demonstrates that 87% of Massachusetts households use air conditioning in some form but that only 32% have central air conditioning. This indicates that 55% of homes in Massachusetts are using some form of window or room air conditioner that cools only part of the home. If 13% of homes have no air conditioning and 55% of homes are only partially cooled, two thirds (68%) of homes in Massachusetts have at least some uncooled rooms. A more recent Massachusetts report designed to inform ratemaking estimated that "46% of Massachusetts households have central AC, 33% have room AC, 3% use heat pumps, and about 18% of households have no AC at all" based on the National Renewable Energy Laboratory's ResStock tool (E3 2024, 38). This study also demonstrates the general assumptions that larger homes use more energy because they "have greater air volume and thus require more energy for space heating and space cooling," and single family homes are assumed to use more energy because they "tend to be larger in area than apartments in multi-family building complexes and have more surface area exposed to outside air, and subsequently have higher energy demands and energy expenses" (E3 2024, 18). Finally, the study found that low- and moderate-income households are associated with multi-family homes, smaller single-family homes, and older homes overall. Low-income homes were also more likely to have electric resistance heating and no air conditioning.

[2] Where annual averages were provided, monthly averages were calculated by dividing by 12. Where data was presented only in BTU, conversions to kWh were made using https://www.eia.gov/energyexplained/units-and-calculators/energy-conversion-calculators.php

Energy Burden and Affordability

The U.S. Department of Energy considers any household spending more than 6% of annual income on energy as a “high energy burden household” (DOE 2026). This threshold has become a widely used affordability heuristic. For example, the Massachusetts Department of Public Utilities uses 6% as the maximum target threshold in its affordability proceedings (E3 2024, 34). This same analysis found that “low-income households are observed to exhibit different energy demands in response to weather patterns and energy prices compared to moderate- or high-income households” (E3 2024, 48). The authors of this report also express concerns for the negative health effects caused by “low-income households restricting cooling or heating energy use” (E3 2024, 53).

In an effort to better understand our customers, Eversource worked with Oracle to calculate the energy burden of all households. Where customers were dual fuel electric and gas customers with Eversource and where income data was available, we were able to utility data to calculate energy burden. Where Eversource provided only one fuel (gas or electricity), and where income data was unavailable, data from open-source government data sets was used to provide estimates based on the Census area where the customer was located. This analysis did not consider transportation costs. This analysis found that 15% of all customers had a high energy burden. As would be expected, over half of low-income customers have high energy burdens and 30% of moderate-income customers have high energy burdens. What may be more surprising is that 10% of high-income customers also had high energy burdens (Figure 3, Lin et. al. 2019).

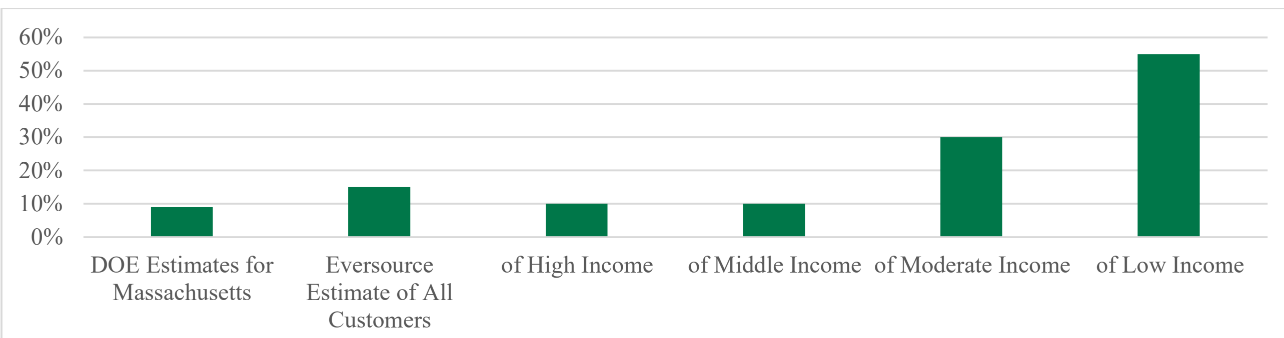


Figure 3. Percentage of Eversource Customers with High Energy Burden (Lin et. al. 2019)

High energy burden is frequently assumed in program design to prompt energy users to change energy behavior. Low- and moderate-income customers receive enhanced offers and support from energy efficiency programs in Massachusetts. Among other goals, the programs seek to reduce the need for customers to risk their health due to energy poverty.

Social Norms Background

Use of Social Norms in Energy Efficiency Programs

Energy efficiency program administrators seek to prompt changes in energy use through behavioral energy efficiency programs. The three-bar graph shared by the poster in Figure 1 appears to be from a Home Energy Report (HER) provided by Opower. It is worth exploring the history of these programs in order to understand how they work and what norms they promote.

Cialdini et al. (1990) laid the foundation for the application of norms to the promotion of pro-environmental behaviors by demonstrating that people respond to norms regarding littering. That is, they adapted their behavior to be consistent with the perceived norm – littering more in littered environments and littering less in clean environments. They defined the concepts of *descriptive norms* and *injunctive norms*. Descriptive norms demonstrate to people how everyone else *is* behaving around them while injunctive norms set the tone for how everyone *ought* to behave.

Schulz et al. (2007) applied the use of social norms to energy consumption by reading household electric meters directly and providing norm-based feedback to households. The researchers identified 290 homes in San Marcos, California with outdoor electric meters. They then read the meters to establish household average daily electric use and provided written feedback to the household indicating the household use and the average of each individual study participant to provide a descriptive norm directly to the household. For half the households they also provided an injunctive norm by writing a happy face on the note if the customer used less than average, and a sad face indicated if they used more than average. In the households that received only the descriptive norm feedback, higher than average consumers reduced consumption and lower than average consumers *increased* consumption. When the injunctive norm was added, lower than average consumers *maintained* their consumption rate.

In a follow up study, Nolan et al. (2008) surveyed Californians about what motivated them to conserve energy, then conducted a repeat messaging and meter reading experiment in San Marcos. This study found that while normative messages were perceived to be least likely to motivate energy conservation, the households that received norm-based messaging were the most likely to save energy.

Goldstein et. al. (2008) also applied normative messaging to promote pro-environmental behaviors, this time reuse of towels in hotel rooms in order to save water and energy. They found that not only were hotel guests more likely to reuse towels when told that most other guests also did so, the effect was even stronger when the norm was linked to the specific room in which they were staying. The distinguished this as a *provincial norm,* or “the norms of one’s local settings and circumstances” (p.476).

National Grid began the HER program in Massachusetts as a pilot in 2009. An evaluation in 2011 found that overall, these reports were driving savings. Higher energy users saved more, but they were also more likely to express concerns about being compared to neighbors. Savings came from “conservation actions,” installation of measures “outside of rebate programs,” and through participation in “existing National Grid programs.” This study also recommended adding more affirmations, more “household-specific” information, and self-comparisons to the program (ODC 2011).

Ashby et al. (2012) surveyed five early HER programs across the United States. They found that small homes and homes with pools saved more than average, but that large homes saved the most of any group. One of the utilities, Commonwealth Edison, looked at savings by income and found that customers with “intermediate” income saved the most. Another, Southern California Edison, found that a large portion of households with very low baseline consumption reduced the overall savings from the experiment, and they were excluded from the savings analysis.

Munson et al. (2022) compared evaluations from HER programs across the country for over a decade. They found on average electric customers saved 88 kWh annually or 1.16% of usage. Utilities typically only claim these savings for a year. However, Caputo et al. (2022) demonstrate that even behavioral energy efficiency programs with short measure lives can have big impacts on avoided carbon emitted to the atmosphere.

Eversource began testing a more personalized Delivered Energy Insights (DEI) program in 2020, partly motivated a desire to see if they could address the concerns expressed by high energy users in the 2011 evaluation about being compared to neighbors. These individualized reports compared a customer's monthly usage to the previous month and previous year (Romine and Findlay 2022). Evaluations of this study found that it did indeed result in higher satisfaction from customers, but it did not yield statistically significant savings (Young et al. 2024). This effectively provides another demonstration that descriptive norms are important. Eversource ended DEI as a standalone program intended to drive energy savings but continues to use targeted and customized outreach to drive participation in its energy efficiency programs through direct marketing to households.

Expectation for Comfort

Echoing Shulz et al. (2007), Moezzi & Lutzenhiser (2010) caution: "In communicating 'normal' levels of temperature in demand response, households may learn to consume more rather than less," and they recommend considering "the quality of information used to determine 'correct' choices" and taking "a sufficiently broad view of what 'correct' means" (p. 7-215). If there are people, such as the first poster on X from Figure 1, who are content to live without air conditioning and actively choose to do so, should energy efficiency program administrators still encourage the installation of an energy-efficient model, either through behavioral or rebate programs? As Moezzi & Lutzenhiser put it, "who decides what is good and for whom, and where to draw the line in producing normative pressure?" (p. 7-216).

Some of the assumptions about the norms being promoted are embedded within policy documents. For example: "Energy affordability can be defined as the ability of households to access reliable and sufficient energy services and maintain *comfortable living conditions* without compromising their financial well-being, influenced by energy costs, energy usage, efficiency, and *access to modern energy technologies*" (E3 2024 p. 18 emphasis added). This is a statement from a study exploring the impact of electrification on rates in Massachusetts. The state policy is to promote conversion of fossil fuel heating to electric heating through the use of heat pumps. However, not all existing homes in Massachusetts have air conditioning, and heat pumps provide both heating and cooling. The addition of cooling is seen as a "clear benefit" to policy makers especially when households install heat pumps as opposed to other air conditioning technologies, (E3 2024, 38). They acknowledge the potential that adding heat pumps could increase household electric costs for those households without air conditioning but could lead to savings for those with partial cooling using room or window air conditioners. E3's analysis showed that a household inhabiting an apartment in a multi-family building in Boston would save by installing a heat pump for the whole apartment when replacing a room AC that previously cooled 60% of the apartment. While they identify an instance where affordability and comfort are not in tension, they do not discuss in detail other cases where adding heat pumps could reduce affordability for individual households, such as in older, larger single-family homes.

Moezzi & Lutzenhiser (2010) raise concerns about this type of top-down policy assumption. They point out that energy efficiency has become positioned "as a premium add-on to ‘normal’ goods” (p 7-208) and that “higher efficiency does not necessarily translate to lower consumption or emissions, and houses (and ‘lifestyles’) with less efficient goods may use less energy than those with more efficient goods” (p 7-213). Finally, they point out “The problem is that assumptions about behavior are often based on unverified theories about behavior, broad averages, and overall optimism about the energy benefits of technological change” (p 7-214). The advantage of HERs in this respect is that while they offer tips, they are not narrowly prescriptive. The feedback and social comparison provide motivation, but it is up to the household to take action, and they can take the initiative to make choices that they feel are best for their specific household. The randomized control trial design is the mechanism for energy efficiency programs to claim savings. On the other hand, HER programs measure savings across hundreds of thousands or millions of customers, which homogenizes effects. Diversity of response by different types of customers may be missed.

In *Comfort, Cleanliness and Convenience: The Social Organization of Normality,* Elizabeth Shove (2003) explores the cultural forces that drive Western conceptions of energy use norms in the areas of home heating and cooling as well as bathing and laundry. She argues that market forces and policy makers have created a very narrow vision of comfort. Human physiology was used to establish the idea that comfort was the “natural condition” and generated precise definitions and specifications that led to the conclusion that air conditioning is necessary to human comfort and aided industry in specifying systems (p 31). One leading researcher in the field, Ole Fanger, worked through laboratory studies in controlled environments with measurement of skin temperature and surveys to record participants’ subjective experience in order to specify optimal thermal comfort. Fanger’s research was used to establish ASHRAE’s standard 55 as a single cultural standard of comfort, despite local variations in climate and the cultural adaptations to that climate. With this standard, expectation of air conditioning is designed into buildings, and ultimately this leads to the ability to achieve a year-round indoor temperature of 72 degrees Fahrenheit and the cultural expectation that this is normal, as expressed in the post in Figure 2. Shove argues that environmentalists “should do all that can be done to engender multiple meanings of comfort, diverse conventions of cleanliness and engender multiple meanings of comfort, diverse conventions of cleanliness and forms of social order less reliant on individual modes of co-ordination” (Shove 2003, 199). Behavioral interventions like HER could flatten the wide variety of human behavior into a single metric of monthly energy consumption that may miss the multiple meanings of comfort that Shove identifies.

Active Comfort Management

Behavioral interventions like HER provide tips that instruct households on how to manage energy use, and energy efficiency program administrators have leaned into promoting measures with larger savings potential (Ashby et al 2012), turning HERs into cost effective marketing for other rebates. However other program interventions may be possible.

For example, Heinemeier (2022) lays out a pathway through which highly engaged homeowners (whom she calls “tweakers”) in Davis, California may manage home comfort through opening windows, pre-cooling air conditioning in the morning, and allowing temperatures to rise during the afternoon. Savings can be measured and claimed through the use of coaching, thermostats, rates, and specialized low-capacity air conditioning. Heinemeier’s specific recommendations are tailored for the California climate, but there may be opportunities to encourage active comfort management in other climates. Van Moeske et al. (2024) describe a similar effort in Europe which sought to explore whether a reduction in energy used for heating could be achieved by providing “Personal Comfort Systems” (PCS) such as heated blankets to allow participants to explore alternatives that would heat the person instead of the space. They describe this as an “energy sufficiency” approach. Participants were encouraged to reduce the overall heat in their homes by using PCS in static situations and adapting clothing and physiology to cooler temperatures. The experiment measured temperatures in homes and conducted a bill study to measure energy savings. The authors conclude “the basic need for thermal wellbeing should not be equated with home heating, which is only one way of addressing it” (Van Moeske et al. 2024, 345).

Energy efficiency program administrators may shy away from promoting such active programs specifically in fear of reactions similar to that of the poster in Figure 2 above. The challenge is to identify the “tweakers” in advance and work with them to actively manage energy consumption.

Methodology

Data Sources

Eversource’s analysis of variation in household energy usage was conducted using monthly billing data from 2024. Eversource began rolling out Advanced Metering Infrastructure in 2025 and more granular interval data was not available at the time this analysis was conducted. Data from the customer information system used in this analysis were customer name, address, commodity consumption (kWh), dollars billed, and bill read date. Not all bills are read on the same day, and occasionally meters are read twice in one month and not at all in the other. For example, it is not uncommon for a customer to have two bill readings in March and none in February. While it is possible to infer seasonal usage from monthly billing data by normalizing usage across month, we focused on annual consumption for this analysis for simplicity.

Billing data was supplemented and enriched using demographic data purchased from Experian Marketing Services. Experian matches data to Eversource customer name and service address and then returns an enriched file containing modeled data on both the home and the customer demographics. Data elements relevant to the home used in this analysis were: year built, unit square footage, dwelling type (i.e., single or multifamily), and home ownership. Data elements relevant to customer demographics used in this analysis were: number of people in the household, State Median Income Index, and Green Aware Score. Experian estimates the household income for the individual and returns it as a number. A score of 100 indicates that Experian estimates the household makes exactly the state median income ($103,960 in 2024, Census 2026), a score of 60 indicates that the customer makes 60% of state median income (approximately $62,000), and a score of 200 indicates that the customer makes twice state median income (approximately $200,000). Experian also provides a GreenAware segmentation model. They use consumer attitudes, opinions, buying behavior, and media usage to assign scores to individual households. The values are defined in Table 2. While this segment is something of a black box given the proprietary nature of the Experian segmentation model, it does provide an interesting attitudinal element. Eversource routinely uses it to target energy efficiency program promotions and has found it a somewhat effective predictor of propensity to participate.

Table 2. Experian GreenAware Segmentation Model (Experian 2026)

GreenAware Segment Value	Segment Definition	% Eversource Population
Behavioral Greens	thinks and acts green, holds negative attitudes toward products that pollute, incorporate green practices on a regular basis	24.7%
Think Greens	thinks green but does not necessarily act green	28.8%
Potential Greens	neither behave nor think along particularly environmentally conscious lines, and remain on the fence about key green issues	30.9%
True Browns	not environmentally conscious and may in fact have negative attitudes about the green movement	15.3%
Unmatched	Eversource account holder was not matched to Experian database	0.03%

Data Cleaning and Segmentation

In 2024, there were 1.95 million active residential electric accounts in the Eversource Massachusetts service territory. We segmented these customers into quintiles based on annual energy consumption. First, we cleaned the data to focus on true residential household accounts, since there are many entities on residential rates that do not represent household consumption, such as condo common area meters, farms, and nonprofits, such as houses of worship. These were removed by eliminating customers with null first or last names in the billing system or accounts otherwise associated with previously identified commercial entities. We also excluded customers who were active for only part of the year, using only those with a minimum of 320 billing days or a maximum of 400 billing days and a minimum annual consumption of 300 kWh. This resulted in a data set of 903,179 billing accounts. These accounts were ranked based on consumption, then divided into 5 groups of equal consumption but not equal in number of customers referred to below as Quintiles 1-5 with Quintile 1 being the highest consumers.

Results

Quintiles

Quintile 1 represents the 57,856 customers who consumed 20% of the electricity in 2024. This is consistent with analysis conducted by Moezzi and Lutzenhiser (2010) which found that "the most consumptive quarter of households account for a full half of residential energy use" based on the 2005 RECS (p. 7-208). The mean annual consumption for members of Quintile 1 was 17,694 which is twice the annual median consumption of members of Quintile 3 and six times the annual median consumption of Quintile 5 (Figure 4). The average Massachusetts annual consumption from RECS of 7,237 kWh (Table 1) falls within Quintile 3. When the consumption for the "Average" and "Efficient" neighbors presented in Figure 1 are annualized, they fall within Quintiles 3 and 5 respectively. The alignment of these three sources increases our confidence that the Quintile analysis reveals differences in customer behaviors.

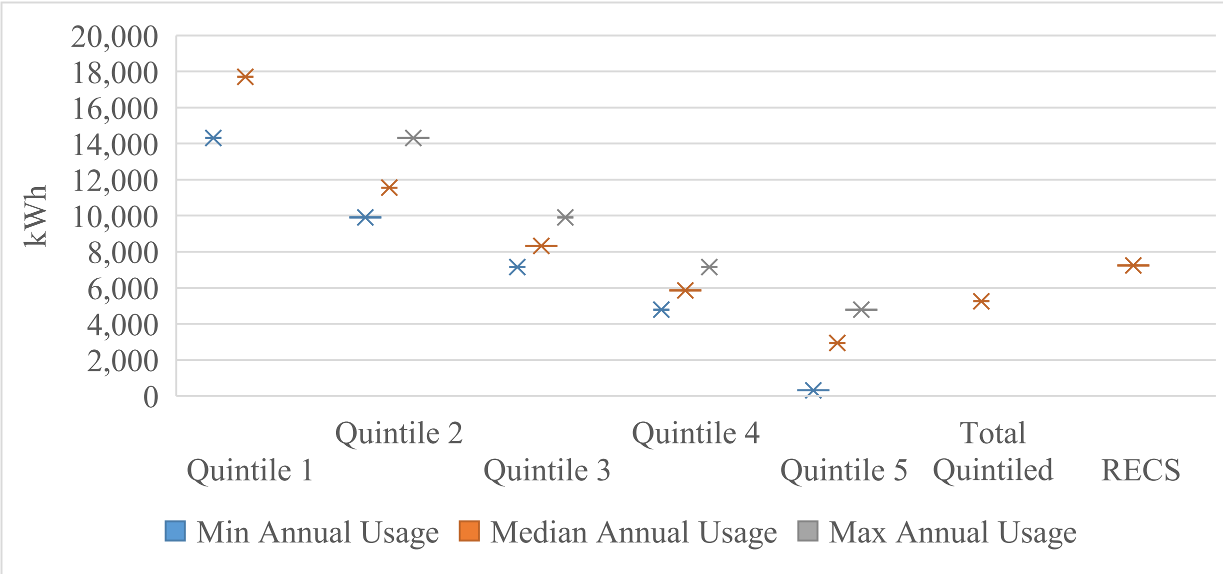


Figure 4. Minimum, Median and Maximum annual kWh usage by Eversource Electric customers in Massachusetts. Please note, Maximum annual usage for Quintile 1 was 627,600 kWh. This was omitted to enhance chart readability.

Demographics

Useful trends emerge when we examine the consumption patterns and add in third party demographic data. Table 3 provides median characteristics by quintile. This table indicates that customers in Quintiles 1 and 2, who consume more energy, are more likely to live in newer, larger homes, have higher incomes ($160,000-$200,000), and live in households with more people.

Table 3. Mean and Median housing and demographic characteristics by quintile

	Mean Year Built	Median Square Footage	State Median Income Index	Median Number of People
Quintile 1	1967	2500	198	4
Quintile 2	1965	2000	157	4
Quintile 3	1964	1800	151	3
Quintile 4	1963	1600	129	3
Quintile 5	1961	1300	103	2

Customers consuming the least, Quintile 5, were more likely to live in a multi-family home of five or more units and customers consuming the most were more likely to live in single family homes (Figure 5).

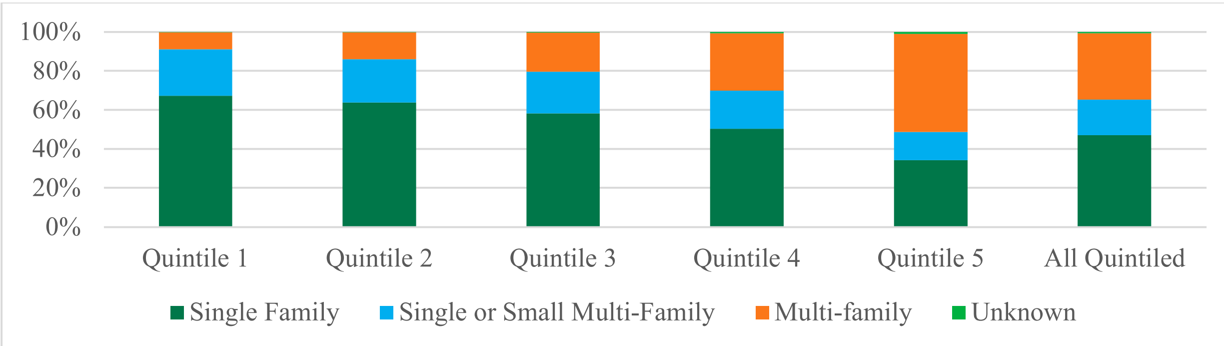


Figure 5. Distribution of housing type by Quintile

GreenAware segmentation also appears to be broadly aligned with energy consumption. Each segment is distributed across all quintiles, but "Behavioral Greens" make up a greater proportion of lower consuming Quintile 5 (29%) when compared to Quintile 1 (21%) and "True Browns" make up a greater proportion of Quintile 1 (24%) when compared to Quintile 5 (13%). (Figure 6).

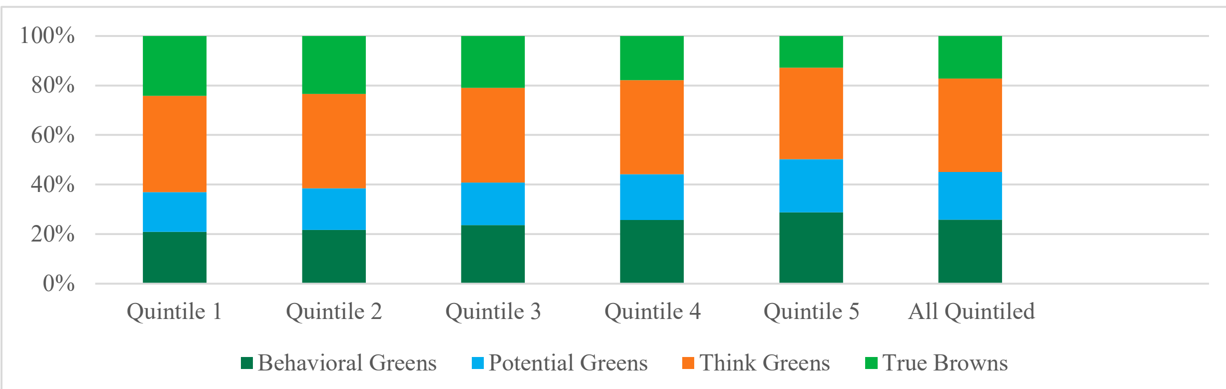


Figure 6. Distribution of pro-environmental attitudes by Quintile

Finally, members of Quintile 1 were more likely to own an electric vehicle (EV) (Figure 8). It is not surprising that EV ownership, which switches energy consumption associated with transportation from fossil fuels to electricity, drives higher electric bills. This also indicates that there may be more than one factor driving high energy consumption.

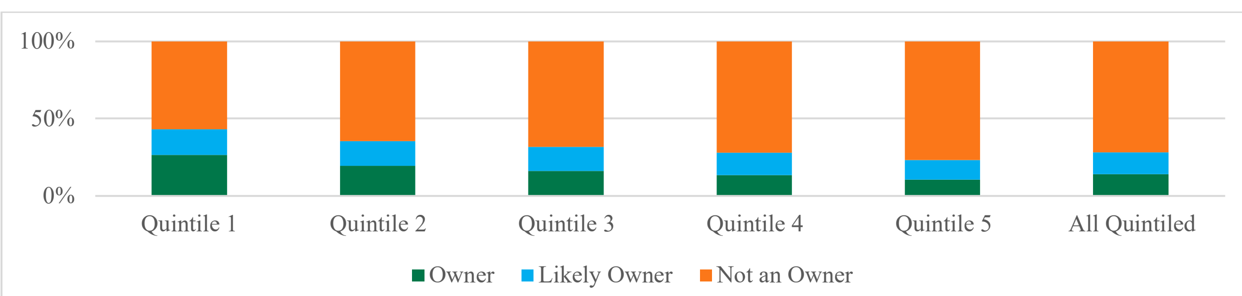


Figure 8. Likelihood of EV Ownership by Quintile

Eversource offers a low-income discount electric rate in Massachusetts, and customers enrolled in that rate are flagged in our databases as "income eligible" for marketing low-income energy efficiency programs. Income-eligible customers are relatively evenly distributed among the quintiles, representing 9% of Quintile 1 and 11% of Quintile 5 (Figure 9).

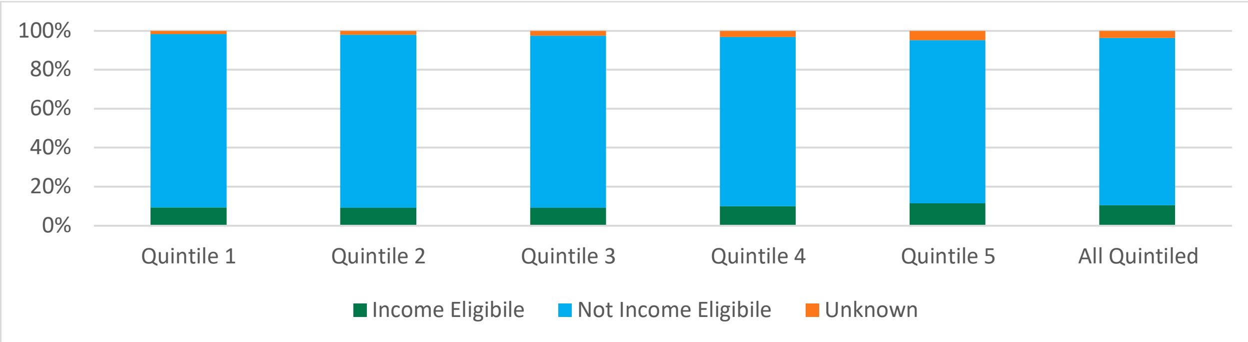


Figure 9. Distribution of qualifications for the low-income discount rate.

Conclusions

We May Be Leaving Savings on the Table

Schulz et al.'s original intervention in San Marcos, California, explicitly tested descriptive and injunctive norms, but implicitly it may have also taken advantage of provincial norms as well. The study worked with only 290 households, and the intervention required researchers to physically travel to homes, read the meter, and leave the note with feedback. This implies a very constrained geographic region. As HER type programs have scaled up to cover hundreds of thousands of homes within a program administrator's service territory such provincial norms may be lost. Anecdotally, the authors of this paper have had friends and neighbors question the accuracy of the reports and wonder whether their neighbors are the best comparison because they perceive their neighbors as having different homes and household characteristics. Better understanding what social group is most resonant to a household may be beneficial in improving savings and satisfaction from HER.

Beyond social identity, focusing on more specific communities or regions may enable other program interventions. Households within a tighter geographic area may share microclimate characteristics, housing characteristics, income, or ethnicity that make up both social identity, housing type, and energy use patterns. The characteristics of housing type may also be beneficial in understanding the constraints and opportunities faced by households in their efforts to manage energy and comfort. Older homes, designed before mechanical cooling was widespread, could be conducive to this sort of active management. This may require finely grained attitudinal research to identify the "tweakers" who may be willing to take on the active management.

The social media examples with which this paper began demonstrate that households are willing to adopt low-consumption lifestyles, but at the same time low consumption lifestyles can be extremely repellant to others. The challenge for energy efficiency program administrators tasked with delivering energy savings to every household is determining how to design programs that reflect this diversity of needs and motivations. How can program administrators reach more customers while measuring energy savings attributable to program actions? We have more work to do in this area

No, We're Likely Not Driving People to Consume More with HER

Behavioral programs like HER guard against driving low users to use more through the use of injunctive norms and by avoiding tips that specify specific set points for air conditioning.

More Refinement of Segmentation is Needed

Eversource's quintile analysis does not go far enough in helping us understand what is driving energy consumption in order to set the correct norms for households. The quintile analysis shows how hard it can be to untangle effects. While averages indicate that higher energy users are more likely to be higher income and live in larger homes, they are not exclusively so. Customers with similar monthly electric consumption may live in very different homes and have very different household characteristics. For example, there are low-income households across every quintile, even the largest energy users. More work is needed to understand who those households are and what's driving their consumption. Similarly, the fact that there are high income customers with high energy burdens also complicates program and policy interventions that may assume that high energy burden is faced only by low-income households.

As the mature energy efficiency programs in Massachusetts transform into decarbonization programs, it is becoming even more important to understand household variations in energy use. As we seek to personalize our outreach and help customers achieve deeper energy savings and decarbonization it will be beneficial to comprehend what's driving those variations. Moezzi & Lutzenhiser caution that, "Residential customers have tended to be seen as generic *consumers* who are either forced to adopt (standards and codes) or voluntarily adopt energy efficiency because of the engineering, economic, or psychological values doing so provides. (Moezzi & Lutzenhiser 2010, 7-210). Understanding residential energy customers as people with agency to control their energy use (or to understand what may interrupt that agency) may help energy efficiency program administrators meet the increasing pressures to deliver on a variety of policy goals.

References

Ashby, K., H. Forster, B. Ceniceros, B. Wilhelm, K. Friebel, R. Henschel, and S. Samiullah. 2012. "Green with Envy: Neighbor Comparisons and Social Norms in Five Home Energy Report Programs." In *Proceedings of the 2012 ACEEE Summer Study on Energy Efficiency in Buildings* 7:22-34. Washington, DC: ACEEE. https://www.aceee.org/files/proceedings/2012/data/papers/0193-000218.pdf#page=1

Castle Hill Mom (2025) Post on X.com https://x.com/castlehillmom/status/1958891514794270729?s=46

Caputo, S., D. Siddiqui, and C. Buck. 2022. "Busy BEE: Scaling Utility Action in Decarbonization. In *Proceedings of the 2022 ACEEE Summer Study on Energy Efficiency in Buildings* 8:70-83. Washington, DC: ACEEE. https://www.aceee.org/sites/default/files/summerstudy/2022/event-data/authors/--/1

Census (United States Census Bureau) 2026. "QuickFacts Massachusetts." https://www.census.gov/quickfacts/fact/table/MA

Ciandini, R., R. Reno, and C. Kallgren. 1990. "A Focus Theory of Normative Conduct: Recycling the Concept of Norms to Reduce Littering in Public Places." In *Journal of Personality and Social Psychology.* 6:1015-1026. CITY: American Psychological Association

DOE (Department of Energy) 2026. "Low-Income Energy Affordability Data (LEAD) Tool." https://www.energy.gov/scep/low-income-energy-affordability-data-lead-tool

E3 (Energy and Environmental Economics, Inc.). 2024. *Near-Term Rate Design to Align with the Commonwealth's Decarbonization Goals: Prepared for the Massachusetts Interagency Rates Working Group.* Cambridge, MA. https://www.mass.gov/doc/irwg-near-term-rate-strategy-report-e3/download.

EIA (Energy Information Administration). 2023. *Residential Energy Consumption Survey: 2020 RECS Survey Data.* Washington, DC: EIA. https://www.eia.gov/consumption/residential/data/2020/index.php?view=state#hc

Experian (Experian Marketing Services). 2026. https://www.experian.com/business/solutions/data-solutions

Goldstein, N.J., R.B. Cialdini, and V. Griskevicius. 2008. "A Room with a Viewpoint: Using Social Norms to Motivate Environmental Conservation in Hotels. In *Journal of Consume Research.* 35(3): 472-482.

Heinemeier, K. 2022 "Triumph of the Tweakers: Engaged Homeowners Optimizing Air Conditioning Energy Use." In *Proceedings of the 2022 ACEEE Summer Study on Energy Efficiency in Buildings* 8:319-334. Washington, DC: ACEEE. https://www.aceee.org/sites/default/files/summerstudy/2022/event-data/authors/--/1

Hickman, A.M. 2025. Post on X.com https://x.com/shagbark_hick/status/1958887274331914512?s=46

Kirchman, T., R. Nadolny, J. Siegel, and J. Strano. 2021. "Industry in Pandemic: Who's up? Who's down? Where to Focus. " In *Proceedings of the 2022 ACEEE Summer Study on Energy Efficiency in Industry* Washington, DC: ACEEE. https://www.aceee.org/sites/default/files/pdfs/ssi21/panel-4/Siegel.pdf

Lin, J., K. Rodgers, S. Kabaca, M. Frades, and D. Ware. 2020. "Energy affordability in practice: Oracle Utilities Opower's business Intelligence to meet low and moderate income need at Eversource" In *The Electricity Journal* 33 (2): 106687 https://www.sciencedirect.com/science/article/abs/pii/S1040619019302921?via%3Dihub.

Moezzi, M. and L. Lutzenheiser. 2010. "What's Missing in Theories of the Residential Energy User." In *Proceedings of the 2010 ACEEE Summer Study on Energy Efficiency in Industry* 7:207-221. Washington, DC: ACEEE. https://www.aceee.org/files/proceedings/2010/data/papers/2145.pdf#page=1

Munson, T., M. Galport, K. Quaye, and C. Sloan. 2022. "Behavioral Programs Come of Age: Analyzing Savings from Recent Home Energy Report Program Studies." In *Proceedings of the 2022 ACEEE Summer Study on Energy Efficiency in Industry* 7:207-221. Washington, DC: ACEEE. https://www.aceee.org/sites/default/files/summerstudy/2022/event-data/authors/--/1

Nolan, J. M., P.W. Schulz, R.B. Cialdini, N.J. Goldstein, and V. Griskevicius. 2008. "Normative Social Influence is Underdetected." In *Personality and Social Pyschology Bulletin.* 34(7): 913-923.

ODC (Opinion Dynamics Corporation). 2011. *Massachusetts Cross-Cutting Behavioral Program Evaluation: Volume I.* Waltham, MA: Massachusetts Energy Efficiency Advisory Council. https://ma-eeac.org/wp-content/uploads/Cross-Cutting-Behavioral-Program-Evaluation-Volume-1-Final-Report-June-2011.pdf

Rodgers, K. 2016. "Preaching to the Choir: Using Utility Data to Create Relevant Promotions for Energy Efficiency Programs." In *Proceedings of the 2016 ACEEE Summer Study on Energy Efficiency in Buildings* 7:1-12. Washington, DC: ACEEE. https://www.aceee.org/files/proceedings/2016/data/papers/7_841.pdf#page=1

Schulz, P., J. Nolan, R. Cialdini, N. Goldstein, and V. Griskevicius. 2007. "The Constructive, destructive, and reconstructive Power of Social Norms." In *Psychological Science.* 18 (5):429-434

Shove, E. 2003. *Comfort, Cleanliness and Convenience: The Social Organization of Normality*. Oxford, UK: Berg.

van Moeseke, G., de Grave, D., Anciaux, A., Sobczak, J., & Wallenborn, G. (2024). New insights into thermal comfort sufficiency in dwellings. In *Buildings and Cities* 5(1): 331–348. https://doi.org/10.5334/bc.444

Young, E., J. Lines, and D. Basak. 2024. *PY 2023 Delivered Energy Insights Impact Results.* Boston, MA: Guidehouse

AI-assisted tools used: Copilot.
Used for: Search for sources. Copy Editing. Formatting
Extent: [citation research / brainstorming/ light editing].
Human review: The authors reviewed and verified all content, calculations, and citations.

The 129 kWh per Month Lifestyle: What Outliers Reveal About Energy Norms and Comfort

Kara Marshall and Gregory Romine, Eversource

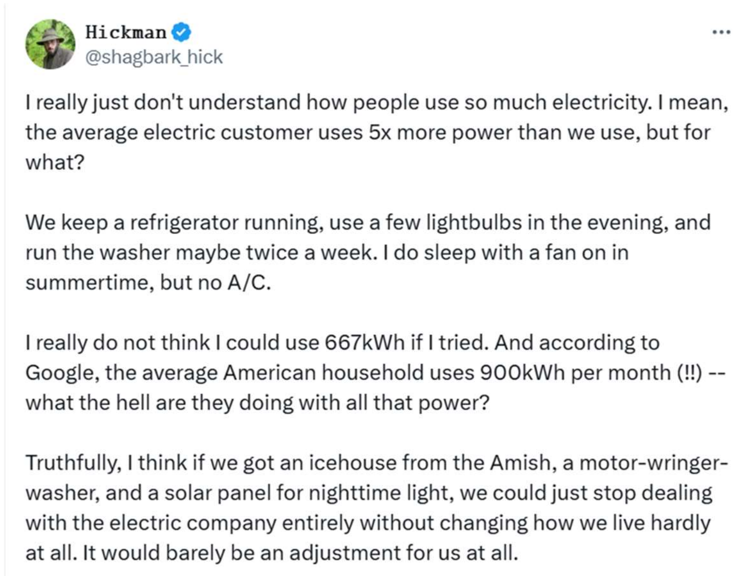
ABSTRACT

When segmenting customers, energy efficiency program administrators often treat residential customers as a homogenous mass market, segmenting only by income, home ownership, and dwelling type (single-family vs. multi-family), and other dwelling characteristics such as building age. In contrast to the commercial and industrial sectors, residential energy use is often treated as homogeneous, yet it varies across different lifestyles, standards for comfort, and norms. We have found that energy consumption among households is highly variable in ways that may represent different lifestyle expectations. Social norms have long been used to drive behavioral energy savings, but average usage does not tell the whole story, and expectations for comfort can vary widely. This paper will use data on the range of energy consumption within the residential customers of an electric and gas utility in the northeastern United States, along with third-party customer demographics and housing characteristics, in an attempt to infer what attitudes may be driving energy consumption. This will be combined with a review of studies of behavioral energy efficiency programs based on social norms as well as literature on consumer attitudes towards energy use and comfort. The paper will conclude with a discussion of how insights from this work can be used to improve residential customer segmentation, targeting, and positioning to drive energy savings through energy efficiency and active demand response programs.

Introduction

Every now and then, a perfect example of how people think about energy emerges from the wilds of social media. Figure 1 is a screenshot of a post on X.com in which a user shares his three-bar Home Energy Report graph showing his extremely low summer electricity use. He wonders, “I just don’t understand how people use so much electricity,” and goes on to point out that he does not use air conditioning (Hickman 2025). Another user posted in response that the comfort provided by year-round constant temperature justifies the higher energy consumption (Figure 2). It is hard to find a more effective demonstration of how different attitudes and expectations around energy use and comfort can be. Current energy efficiency program design may underestimate the diversity in energy consumption and lifestyles among households. Enhanced understanding of that diversity could improve outcomes for both overall energy efficiency and energy affordability. This understanding could be then applied to market segmentation for energy efficiency programs designed to save energy through rebates, weatherization, and behavioral interventions.

Eversource’s approach to residential segmentation has largely focused on weatherization programs and has relied on segmenting by housing characteristics (Rodgers 2016), and we have assumed that residential energy consumption is too homogenous to make customer segmentation based on energy use worthwhile. This is in contrast to a very successful approach to segmenting commercial and industrial (C&I) customers based on energy consumption. Internal Eversource research has found that 2% of the C&I customers account for 75% of electricity consumed in our service territory. This concentration has allowed Eversource to drive savings among the largest users by dedicating account executives to those helping the largest industrial, commercial and institutional customers establish individual plans for deep savings (Kirchman et al. 2021). At the same time, Eversource encourages participation in mass market turnkey and midstream programs that efficiently serve smaller businesses and nonprofits. This segmentation by energy consumption has enabled Eversource to hit very high energy efficiency goals in Massachusetts over the past decade.



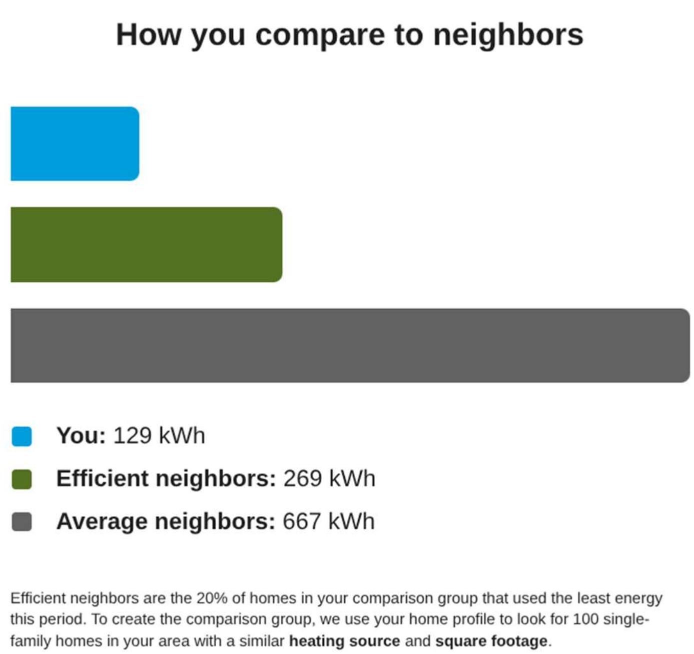


Figure 1: Post on X.com reacting to a Home Energy Report (Hickman 2025)[1]

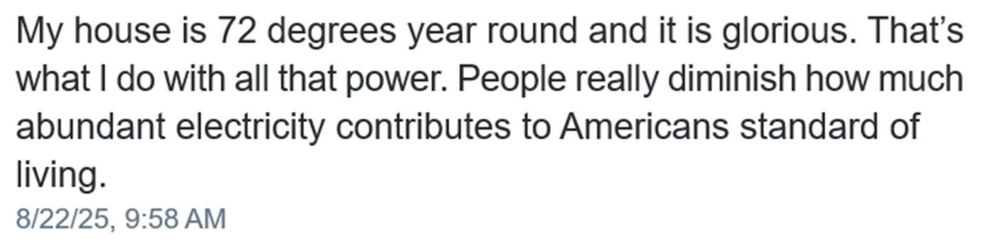


Figure 2. Response to the post featured in Figure 1 (Castle Hill Mom 2025)

If residential customer attitudes and energy use vary as much as these social media posts suggest, it is worth exploring how to effectively segment residential customers based on differing energy use patterns, similar to Eversource's successful C&I segmentation approach. Are we leaving savings on the table by not addressing households with high energy consumption with specifically designed programs? Could we be driving households with low energy lifestyles to consume more by comparing them to higher consuming neighbors?

Behavioral programs, particularly Home Energy Reports (HER) as featured in Figure 1, may in particular benefit from further exploration of the diversity of household energy use. These reports draw on insights from behavioral science, which indicate that people are motivated to save energy when they receive feedback on how their homes perform relative to neighbors with similar homes (Munson et al. 2022). They have been part of Massachusetts energy efficiency programs since 2009. They have successfully saved energy but have elicited negative responses from high users (ODC 2011). This pushback may justify further application in diversity of energy consumption.

This paper will explore the diversity of household energy consumption, the use of social norms within energy efficiency programs, and present recommendations for program design based on these observations.

Residential Energy Use Background

Residential Energy Consumption Survey (RECS)

We will start the exploration of these questions by trying to understand what energy use patterns and housing stock can tell us about what is statistically normal. Eversource serves Connecticut, Massachusetts, and New Hampshire. For ease of analysis, we will focus on Massachusetts. Table 1 provides a comparison between Massachusetts and United States average characteristics using the 2020 Residential Energy Consumption Survey (RECS, EIA 2023). These numbers give us an initial high-level definition for normal consumption. Despite having a higher average home size, Massachusetts is shown to have lower average annual electricity consumption. It also has a lower percentage of single-family detached homes and lower proportion of homes built in 2000 or later. All of these factors will be explored as potential drivers in variation in electricity consumption later in the paper.

---

[1] A.M. Hickman, author of *Hickman's Hinterlands*, who is in many ways not a typical American consumer **substack.com**

Table 1. Comparison of Average Massachusetts to Average United States

	Massachusetts	**United States**
Annual Site Electricity Consumption (kWh)	7,237	10,566
Monthly Site Electricity Consumption (kWh)[2]	603	881
Air Conditioning use (kWh)	1,231	2,315
Monthly Air Conditioning use (kWh)	103	193
Annual Expenditure on Air Conditioning ($)	$249	$299
Housing Unit (Square Feet)	1,853	1,818
Cooled Space (Square Feet)	849	1,335
Cooled Space (%)	46%	73%
Households Using Air Conditioning (%)	87%	89%
Households with Central Air Conditioning (%)	32%	67%
Single Family Detached Homes (%)	51%	62%
Home Built in 2000 or Later	12%	21%

Air Conditioning Use

Comparison of Massachusetts and national averages related to air conditioning presence, energy consumption, and expenditures laid out in Table 1 supports the indication in the social media posts shared in Figures 1 and 2 that presence and use of air conditioning may be a major driver in variation in energy consumption. Table 1 demonstrates that 87% of Massachusetts households use air conditioning in some form but that only 32% have central air conditioning. This indicates that 55% of homes in Massachusetts are using some form of window or room air conditioner that cools only part of the home. If 13% of homes have no air conditioning and 55% of homes are only partially cooled, two thirds (68%) of homes in Massachusetts have at least some uncooled rooms. A more recent Massachusetts report designed to inform ratemaking estimated that "46% of Massachusetts households have central AC, 33% have room AC, 3% use heat pumps, and about 18% of households have no AC at all" based on the National Renewable Energy Laboratory's ResStock tool (E3 2024, 38). This study also demonstrates the general assumptions that larger homes use more energy because they "have greater air volume and thus require more energy for space heating and space cooling," and single family homes are assumed to use more energy because they "tend to be larger in area than apartments in multi-family building complexes and have more surface area exposed to outside air, and subsequently have higher energy demands and energy expenses" (E3 2024, 18). Finally, the study found that low- and moderate-income households are associated with multi-family homes, smaller single-family homes, and older homes overall. Low-income homes were also more likely to have electric resistance heating and no air conditioning.

---

[2] Where annual averages were provided, monthly averages were calculated by dividing by 12. Where data was presented only in BTU, conversions to kWh were made using https://www.eia.gov/energyexplained/units-and-calculators/energy-conversion-calculators.php

Energy Burden and Affordability

The U.S. Department of Energy considers any household spending more than 6% of annual income on energy as a "high energy burden household" (DOE 2026). This threshold has become a widely used affordability heuristic. For example, the Massachusetts Department of Public Utilities uses 6% as the maximum target threshold in its affordability proceedings (E3 2024, 34). This same analysis found that "low-income households are observed to exhibit different energy demands in response to weather patterns and energy prices compared to moderate- or high-income households" (E3 2024, 48). The authors of this report also express concerns for the negative health effects caused by "low-income households restricting cooling or heating energy use" (E3 2024, 53).

In an effort to better understand our customers, Eversource worked with Oracle to calculate the energy burden of all households. Where customers were dual fuel electric and gas customers with Eversource and where income data was available, we were able to utility data to calculate energy burden. Where Eversource provided only one fuel (gas or electricity), and where income data was unavailable, data from open-source government data sets was used to provide estimates based on the Census area where the customer was located. This analysis did not consider transportation costs. This analysis found that 15% of all customers had a high energy burden. As would be expected, over half of low-income customers have high energy burdens and 30% of moderate-income customers have high energy burdens. What may be more surprising is that 10% of high-income customers also had high energy burdens (Figure 3, Lin et. al. 2019).

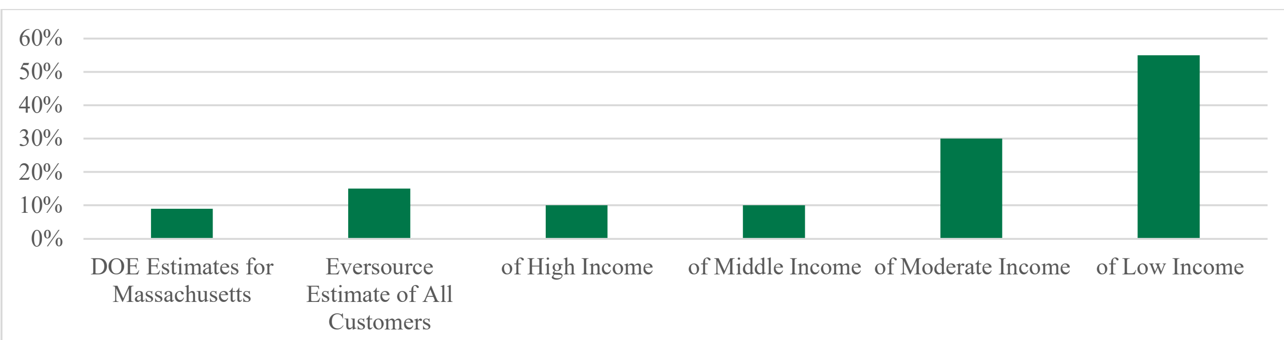


Figure 3. Percentage of Eversource Customers with High Energy Burden (Lin et. al. 2019)

High energy burden is frequently assumed in program design to prompt energy users to change energy behavior. Low- and moderate-income customers receive enhanced offers and support from energy efficiency programs in Massachusetts. Among other goals, the programs seek to reduce the need for customers to risk their health due to energy poverty.

Social Norms Background

Use of Social Norms in Energy Efficiency Programs

Energy efficiency program administrators seek to prompt changes in energy use through behavioral energy efficiency programs. The three-bar graph shared by the poster in Figure 1 appears to be from a Home Energy Report (HER) provided by Opower. It is worth exploring the history of these programs in order to understand how they work and what norms they promote.

Cialdini et al. (1990) laid the foundation for the application of norms to the promotion of pro-environmental behaviors by demonstrating that people respond to norms regarding littering. That is, they adapted their behavior to be consistent with the perceived norm – littering more in littered environments and littering less in clean environments. They defined the concepts of *descriptive norms* and *injunctive norms*. Descriptive norms demonstrate to people how everyone else *is* behaving around them while injunctive norms set the tone for how everyone *ought* to behave.

Schulz et al. (2007) applied the use of social norms to energy consumption by reading household electric meters directly and providing norm-based feedback to households. The researchers identified 290 homes in San Marcos, California with outdoor electric meters. They then read the meters to establish household average daily electric use and provided written feedback to the household indicating the household use and the average of each individual study participant to provide a descriptive norm directly to the household. For half the households they also provided an injunctive norm by writing a happy face on the note if the customer used less than average, and a sad face indicated if they used more than average. In the households that received only the descriptive norm feedback, higher than average consumers reduced consumption and lower than average consumers *increased* consumption. When the injunctive norm was added, lower than average consumers *maintained* their consumption rate.

In a follow up study, Nolan et al. (2008) surveyed Californians about what motivated them to conserve energy, then conducted a repeat messaging and meter reading experiment in San Marcos. This study found that while normative messages were perceived to be least likely to motivate energy conservation, the households that received norm-based messaging were the most likely to save energy.

Goldstein et. al. (2008) also applied normative messaging to promote pro-environmental behaviors, this time reuse of towels in hotel rooms in order to save water and energy. They found that not only were hotel guests more likely to reuse towels when told that most other guests also did so, the effect was even stronger when the norm was linked to the specific room in which they were staying. The distinguished this as a *provincial norm,* or "the norms of one's local settings and circumstances" (p.476).

National Grid began the HER program in Massachusetts as a pilot in 2009. An evaluation in 2011 found that overall, these reports were driving savings. Higher energy users saved more, but they were also more likely to express concerns about being compared to neighbors. Savings came from "conservation actions," installation of measures "outside of rebate programs," and through participation in "existing National Grid programs." This study also recommended adding more affirmations, more "household-specific" information, and self-comparisons to the program (ODC 2011).

Ashby et al. (2012) surveyed five early HER programs across the United States. They found that small homes and homes with pools saved more than average, but that large homes saved the most of any group. One of the utilities, Commonwealth Edison, looked at savings by income and found that customers with "intermediate" income saved the most. Another, Southern California Edison, found that a large portion of households with very low baseline consumption reduced the overall savings from the experiment, and they were excluded from the savings analysis.

Munson et al. (2022) compared evaluations from HER programs across the country for over a decade. They found on average electric customers saved 88 kWh annually or 1.16% of usage. Utilities typically only claim these savings for a year. However, Caputo et al. (2022) demonstrate that even behavioral energy efficiency programs with short measure lives can have big impacts on avoided carbon emitted to the atmosphere.

Eversource began testing a more personalized Delivered Energy Insights (DEI) program in 2020, partly motivated a desire to see if they could address the concerns expressed by high energy users in the 2011 evaluation about being compared to neighbors. These individualized reports compared a customer's monthly usage to the previous month and previous year (Romine and Findlay 2022). Evaluations of this study found that it did indeed result in higher satisfaction from customers, but it did not yield statistically significant savings (Young et al. 2024). This effectively provides another demonstration that descriptive norms are important. Eversource ended DEI as a standalone program intended to drive energy savings but continues to use targeted and customized outreach to drive participation in its energy efficiency programs through direct marketing to households.

Expectation for Comfort

Echoing Shulz et al. (2007), Moezzi & Lutzenhiser (2010) caution: "In communicating 'normal' levels of temperature in demand response, households may learn to consume more rather than less," and they recommend considering "the quality of information used to determine 'correct' choices" and taking "a sufficiently broad view of what 'correct' means" (p. 7-215). If there are people, such as the first poster on X from Figure 1, who are content to live without air conditioning and actively choose to do so, should energy efficiency program administrators still encourage the installation of an energy-efficient model, either through behavioral or rebate programs? As Moezzi & Lutzenhiser put it, "who decides what is good and for whom, and where to draw the line in producing normative pressure?" (p. 7-216).

Some of the assumptions about the norms being promoted are embedded within policy documents. For example: "Energy affordability can be defined as the ability of households to access reliable and sufficient energy services and maintain *comfortable living conditions* without compromising their financial well-being, influenced by energy costs, energy usage, efficiency, and *access to modern energy technologies*" (E3 2024 p. 18 emphasis added). This is a statement from a study exploring the impact of electrification on rates in Massachusetts. The state policy is to promote conversion of fossil fuel heating to electric heating through the use of heat pumps. However, not all existing homes in Massachusetts have air conditioning, and heat pumps provide both heating and cooling. The addition of cooling is seen as a "clear benefit" to policy makers especially when households install heat pumps as opposed to other air conditioning technologies, (E3 2024, 38). They acknowledge the potential that adding heat pumps could increase household electric costs for those households without air conditioning but could lead to savings for those with partial cooling using room or window air conditioners. E3's analysis showed that a household inhabiting an apartment in a multi-family building in Boston would save by installing a heat pump for the whole apartment when replacing a room AC that previously cooled 60% of the apartment. While they identify an instance where affordability and comfort are not in tension, they do not discuss in detail other cases where adding heat pumps could reduce affordability for individual households, such as in older, larger single-family homes.

Moezzi & Lutzenhiser (2010) raise concerns about this type of top-down policy assumption. They point out that energy efficiency has become positioned "as a premium add-on to ‘normal’ goods” (p 7-208) and that “higher efficiency does not necessarily translate to lower consumption or emissions, and houses (and ‘lifestyles’) with less efficient goods may use less energy than those with more efficient goods” (p 7-213). Finally, they point out “The problem is that assumptions about behavior are often based on unverified theories about behavior, broad averages, and overall optimism about the energy benefits of technological change” (p 7-214). The advantage of HERs in this respect is that while they offer tips, they are not narrowly prescriptive. The feedback and social comparison provide motivation, but it is up to the household to take action, and they can take the initiative to make choices that they feel are best for their specific household. The randomized control trial design is the mechanism for energy efficiency programs to claim savings. On the other hand, HER programs measure savings across hundreds of thousands or millions of customers, which homogenizes effects. Diversity of response by different types of customers may be missed.

In *Comfort, Cleanliness and Convenience: The Social Organization of Normality,* Elizabeth Shove (2003) explores the cultural forces that drive Western conceptions of energy use norms in the areas of home heating and cooling as well as bathing and laundry. She argues that market forces and policy makers have created a very narrow vision of comfort. Human physiology was used to establish the idea that comfort was the “natural condition” and generated precise definitions and specifications that led to the conclusion that air conditioning is necessary to human comfort and aided industry in specifying systems (p 31). One leading researcher in the field, Ole Fanger, worked through laboratory studies in controlled environments with measurement of skin temperature and surveys to record participants’ subjective experience in order to specify optimal thermal comfort. Fanger’s research was used to establish ASHRAE’s standard 55 as a single cultural standard of comfort, despite local variations in climate and the cultural adaptations to that climate. With this standard, expectation of air conditioning is designed into buildings, and ultimately this leads to the ability to achieve a year-round indoor temperature of 72 degrees Fahrenheit and the cultural expectation that this is normal, as expressed in the post in Figure 2. Shove argues that environmentalists “should do all that can be done to engender multiple meanings of comfort, diverse conventions of cleanliness and engender multiple meanings of comfort, diverse conventions of cleanliness and forms of social order less reliant on individual modes of co-ordination” (Shove 2003, 199). Behavioral interventions like HER could flatten the wide variety of human behavior into a single metric of monthly energy consumption that may miss the multiple meanings of comfort that Shove identifies.

Active Comfort Management

Behavioral interventions like HER provide tips that instruct households on how to manage energy use, and energy efficiency program administrators have leaned into promoting measures with larger savings potential (Ashby et al 2012), turning HERs into cost effective marketing for other rebates. However other program interventions may be possible.

For example, Heinemeier (2022) lays out a pathway through which highly engaged homeowners (whom she calls “tweakers”) in Davis, California may manage home comfort through opening windows, pre-cooling air conditioning in the morning, and allowing temperatures to rise during the afternoon. Savings can be measured and claimed through the use of coaching, thermostats, rates, and specialized low-capacity air conditioning. Heinemeier’s specific recommendations are tailored for the California climate, but there may be opportunities to encourage active comfort management in other climates. Van Moeske et al. (2024) describe a similar effort in Europe which sought to explore whether a reduction in energy used for heating could be achieved by providing “Personal Comfort Systems” (PCS) such as heated blankets to allow participants to explore alternatives that would heat the person instead of the space. They describe this as an “energy sufficiency” approach. Participants were encouraged to reduce the overall heat in their homes by using PCS in static situations and adapting clothing and physiology to cooler temperatures. The experiment measured temperatures in homes and conducted a bill study to measure energy savings. The authors conclude “the basic need for thermal wellbeing should not be equated with home heating, which is only one way of addressing it” (Van Moeske et al. 2024, 345).

Energy efficiency program administrators may shy away from promoting such active programs specifically in fear of reactions similar to that of the poster in Figure 2 above. The challenge is to identify the “tweakers” in advance and work with them to actively manage energy consumption.

Methodology

Data Sources

Eversource’s analysis of variation in household energy usage was conducted using monthly billing data from 2024. Eversource began rolling out Advanced Metering Infrastructure in 2025 and more granular interval data was not available at the time this analysis was conducted. Data from the customer information system used in this analysis were customer name, address, commodity consumption (kWh), dollars billed, and bill read date. Not all bills are read on the same day, and occasionally meters are read twice in one month and not at all in the other. For example, it is not uncommon for a customer to have two bill readings in March and none in February. While it is possible to infer seasonal usage from monthly billing data by normalizing usage across month, we focused on annual consumption for this analysis for simplicity.

Billing data was supplemented and enriched using demographic data purchased from Experian Marketing Services. Experian matches data to Eversource customer name and service address and then returns an enriched file containing modeled data on both the home and the customer demographics. Data elements relevant to the home used in this analysis were: year built, unit square footage, dwelling type (i.e., single or multifamily), and home ownership. Data elements relevant to customer demographics used in this analysis were: number of people in the household, State Median Income Index, and Green Aware Score. Experian estimates the household income for the individual and returns it as a number. A score of 100 indicates that Experian estimates the household makes exactly the state median income ($103,960 in 2024, Census 2026), a score of 60 indicates that the customer makes 60% of state median income (approximately $62,000), and a score of 200 indicates that the customer makes twice state median income (approximately $200,000). Experian also provides a GreenAware segmentation model. They use consumer attitudes, opinions, buying behavior, and media usage to assign scores to individual households. The values are defined in Table 2. While this segment is something of a black box given the proprietary nature of the Experian segmentation model, it does provide an interesting attitudinal element. Eversource routinely uses it to target energy efficiency program promotions and has found it a somewhat effective predictor of propensity to participate.

Table 2. Experian GreenAware Segmentation Model (Experian 2026)

GreenAware Segment Value	Segment Definition	% Eversource Population
Behavioral Greens	thinks and acts green, holds negative attitudes toward products that pollute, incorporate green practices on a regular basis	24.7%
Think Greens	thinks green but does not necessarily act green	28.8%
Potential Greens	neither behave nor think along particularly environmentally conscious lines, and remain on the fence about key green issues	30.9%
True Browns	not environmentally conscious and may in fact have negative attitudes about the green movement	15.3%
Unmatched	Eversource account holder was not matched to Experian database	0.03%

Data Cleaning and Segmentation

In 2024, there were 1.95 million active residential electric accounts in the Eversource Massachusetts service territory. We segmented these customers into quintiles based on annual energy consumption. First, we cleaned the data to focus on true residential household accounts, since there are many entities on residential rates that do not represent household consumption, such as condo common area meters, farms, and nonprofits, such as houses of worship. These were removed by eliminating customers with null first or last names in the billing system or accounts otherwise associated with previously identified commercial entities. We also excluded customers who were active for only part of the year, using only those with a minimum of 320 billing days or a maximum of 400 billing days and a minimum annual consumption of 300 kWh. This resulted in a data set of 903,179 billing accounts. These accounts were ranked based on consumption, then divided into 5 groups of equal consumption but not equal in number of customers referred to below as Quintiles 1-5 with Quintile 1 being the highest consumers.

Results

Quintiles

Quintile 1 represents the 57,856 customers who consumed 20% of the electricity in 2024. This is consistent with analysis conducted by Moezzi and Lutzenhiser (2010) which found that “the most consumptive quarter of households account for a full half of residential energy use” based on the 2005 RECS (p. 7-208). The mean annual consumption for members of Quintile 1 was 17,694 which is twice the annual median consumption of members of Quintile 3 and six times the annual median consumption of Quintile 5 (Figure 4). The average Massachusetts annual consumption from RECS of 7,237 kWh (Table 1) falls within Quintile 3. When the consumption for the “Average” and “Efficient” neighbors presented in Figure 1 are annualized, they fall within Quintiles 3 and 5 respectively. The alignment of these three sources increases our confidence that the Quintile analysis reveals differences in customer behaviors.

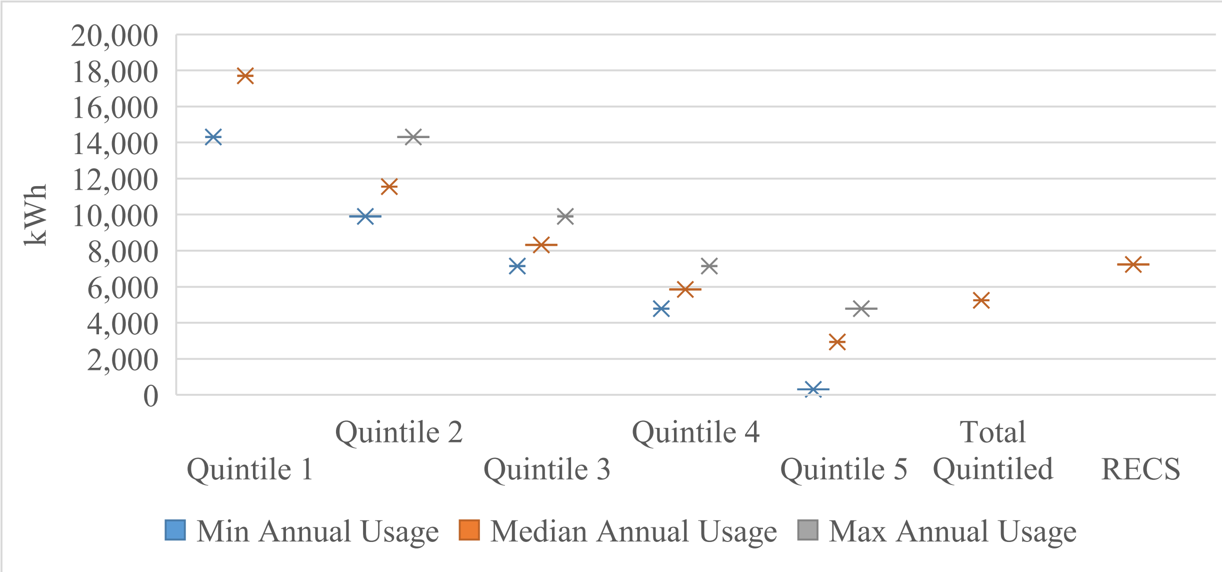


Figure 4. Minimum, Median and Maximum annual kWh usage by Eversource Electric customers in Massachusetts. Please note, Maximum annual usage for Quintile 1 was 627,600 kWh. This was omitted to enhance chart readability.

Demographics

Useful trends emerge when we examine the consumption patterns and add in third party demographic data. Table 3 provides median characteristics by quintile. This table indicates that customers in Quintiles 1 and 2, who consume more energy, are more likely to live in newer, larger homes, have higher incomes ($160,000-$200,000), and live in households with more people.

Table 3. Mean and Median housing and demographic characteristics by quintile

	Mean Year Built	Median Square Footage	State Median Income Index	Median Number of People
Quintile 1	1967	2500	198	4
Quintile 2	1965	2000	157	4
Quintile 3	1964	1800	151	3
Quintile 4	1963	1600	129	3
Quintile 5	1961	1300	103	2

Customers consuming the least, Quintile 5, were more likely to live in a multi-family home of five or more units and customers consuming the most were more likely to live in single family homes (Figure 5).

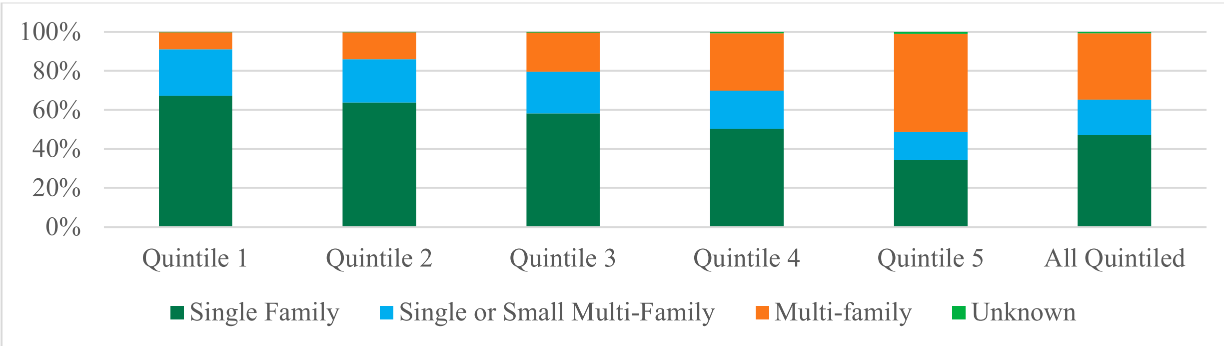


Figure 5. Distribution of housing type by Quintile

GreenAware segmentation also appears to be broadly aligned with energy consumption. Each segment is distributed across all quintiles, but "Behavioral Greens" make up a greater proportion of lower consuming Quintile 5 (29%) when compared to Quintile 1 (21%) and "True Browns" make up a greater proportion of Quintile 1 (24%) when compared to Quintile 5 (13%). (Figure 6).

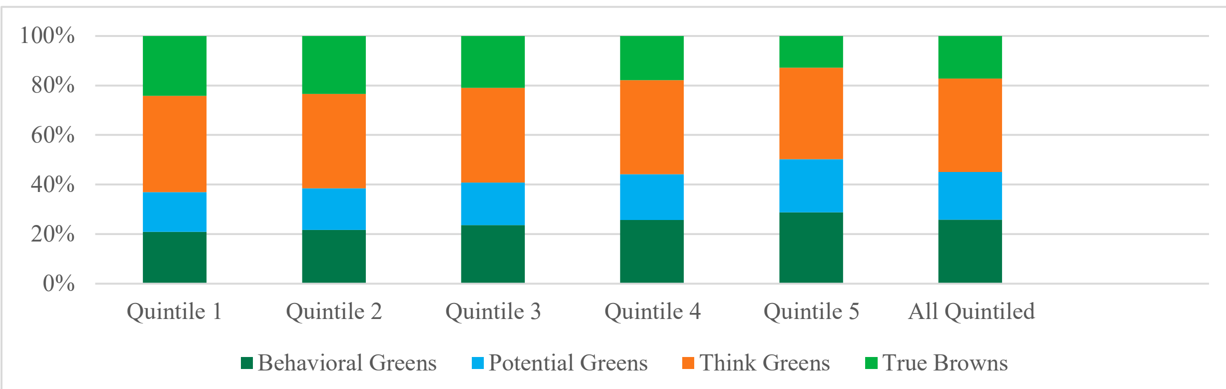


Figure 6. Distribution of pro-environmental attitudes by Quintile

Finally, members of Quintile 1 were more likely to own an electric vehicle (EV) (Figure 8). It is not surprising that EV ownership, which switches energy consumption associated with transportation from fossil fuels to electricity, drives higher electric bills. This also indicates that there may be more than one factor driving high energy consumption.

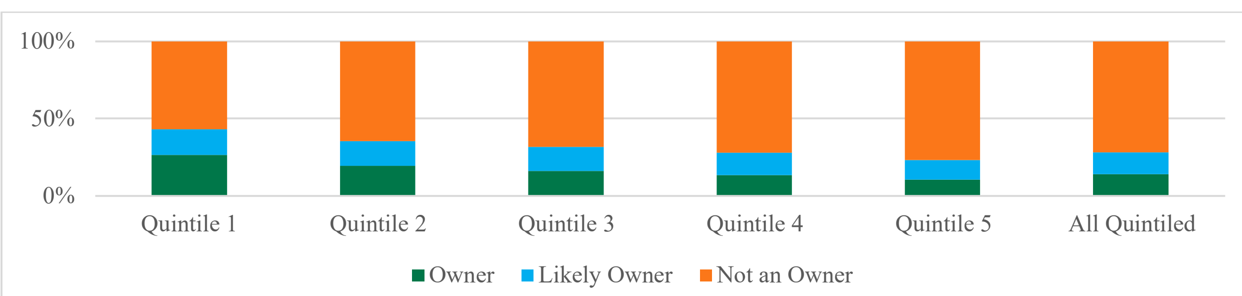


Figure 8. Likelihood of EV Ownership by Quintile

Eversource offers a low-income discount electric rate in Massachusetts, and customers enrolled in that rate are flagged in our databases as "income eligible" for marketing low-income energy efficiency programs. Income-eligible customers are relatively evenly distributed among the quintiles, representing 9% of Quintile 1 and 11% of Quintile 5 (Figure 9).

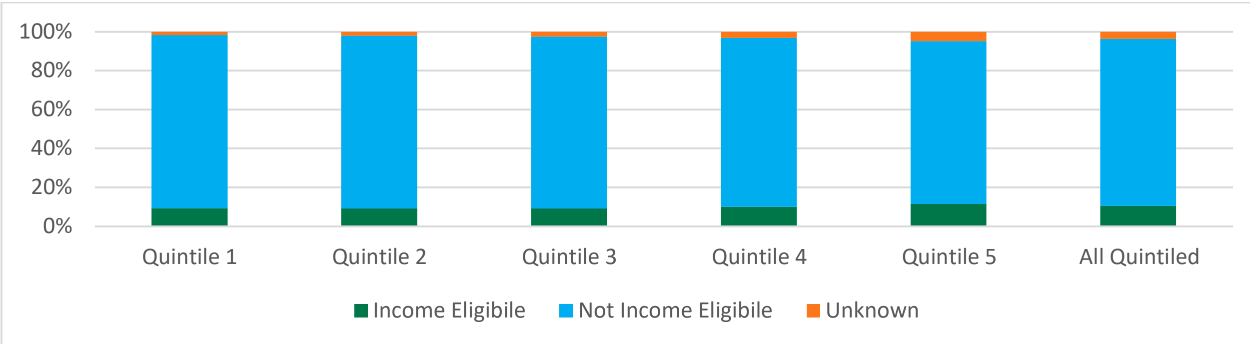


Figure 9. Distribution of qualifications for the low-income discount rate.

Conclusions

We May Be Leaving Savings on the Table

Schulz et al.'s original intervention in San Marcos, California, explicitly tested descriptive and injunctive norms, but implicitly it may have also taken advantage of provincial norms as well. The study worked with only 290 households, and the intervention required researchers to physically travel to homes, read the meter, and leave the note with feedback. This implies a very constrained geographic region. As HER type programs have scaled up to cover hundreds of thousands of homes within a program administrator's service territory such provincial norms may be lost. Anecdotally, the authors of this paper have had friends and neighbors question the accuracy of the reports and wonder whether their neighbors are the best comparison because they perceive their neighbors as having different homes and household characteristics. Better understanding what social group is most resonant to a household may be beneficial in improving savings and satisfaction from HER.

Beyond social identity, focusing on more specific communities or regions may enable other program interventions. Households within a tighter geographic area may share microclimate characteristics, housing characteristics, income, or ethnicity that make up both social identity, housing type, and energy use patterns. The characteristics of housing type may also be beneficial in understanding the constraints and opportunities faced by households in their efforts to manage energy and comfort. Older homes, designed before mechanical cooling was widespread, could be conducive to this sort of active management. This may require finely grained attitudinal research to identify the "tweakers" who may be willing to take on the active management.

The social media examples with which this paper began demonstrate that households are willing to adopt low-consumption lifestyles, but at the same time low consumption lifestyles can be extremely repellant to others. The challenge for energy efficiency program administrators tasked with delivering energy savings to every household is determining how to design programs that reflect this diversity of needs and motivations. How can program administrators reach more customers while measuring energy savings attributable to program actions? We have more work to do in this area

No, We're Likely Not Driving People to Consume More with HER

Behavioral programs like HER guard against driving low users to use more through the use of injunctive norms and by avoiding tips that specify specific set points for air conditioning.

More Refinement of Segmentation is Needed

Eversource's quintile analysis does not go far enough in helping us understand what is driving energy consumption in order to set the correct norms for households. The quintile analysis shows how hard it can be to untangle effects. While averages indicate that higher energy users are more likely to be higher income and live in larger homes, they are not exclusively so. Customers with similar monthly electric consumption may live in very different homes and have very different household characteristics. For example, there are low-income households across every quintile, even the largest energy users. More work is needed to understand who those households are and what's driving their consumption. Similarly, the fact that there are high income customers with high energy burdens also complicates program and policy interventions that may assume that high energy burden is faced only by low-income households.

As the mature energy efficiency programs in Massachusetts transform into decarbonization programs, it is becoming even more important to understand household variations in energy use. As we seek to personalize our outreach and help customers achieve deeper energy savings and decarbonization it will be beneficial to comprehend what's driving those variations. Moezzi & Lutzenhiser caution that, "Residential customers have tended to be seen as generic *consumers* who are either forced to adopt (standards and codes) or voluntarily adopt energy efficiency because of the engineering, economic, or psychological values doing so provides. (Moezzi & Lutzenhiser 2010, 7-210). Understanding residential energy customers as people with agency to control their energy use (or to understand what may interrupt that agency) may help energy efficiency program administrators meet the increasing pressures to deliver on a variety of policy goals.

References

Ashby, K., H. Forster, B. Ceniceros, B. Wilhelm, K. Friebel, R. Henschel, and S. Samiullah. 2012. "Green with Envy: Neighbor Comparisons and Social Norms in Five Home Energy Report Programs." In *Proceedings of the 2012 ACEEE Summer Study on Energy Efficiency in Buildings* 7:22-34. Washington, DC: ACEEE. https://www.aceee.org/files/proceedings/2012/data/papers/0193-000218.pdf#page=1

Castle Hill Mom (2025) Post on X.com https://x.com/castlehillmom/status/1958891514794270729?s=46

Caputo, S., D. Siddiqui, and C. Buck. 2022. "Busy BEE: Scaling Utility Action in Decarbonization. In *Proceedings of the 2022 ACEEE Summer Study on Energy Efficiency in Buildings* 8:70-83. Washington, DC: ACEEE. https://www.aceee.org/sites/default/files/summerstudy/2022/event-data/authors/--/1

Census (United States Census Bureau) 2026. "QuickFacts Massachusetts." https://www.census.gov/quickfacts/fact/table/MA

Ciandini, R., R. Reno, and C. Kallgren. 1990. "A Focus Theory of Normative Conduct: Recycling the Concept of Norms to Reduce Littering in Public Places." In *Journal of Personality and Social Psychology.* 6:1015-1026. CITY: American Psychological Association

DOE (Department of Energy) 2026. "Low-Income Energy Affordability Data (LEAD) Tool." https://www.energy.gov/scep/low-income-energy-affordability-data-lead-tool

E3 (Energy and Environmental Economics, Inc.). 2024. *Near-Term Rate Design to Align with the Commonwealth's Decarbonization Goals: Prepared for the Massachusetts Interagency Rates Working Group.* Cambridge, MA. https://www.mass.gov/doc/irwg-near-term-rate-strategy-report-e3/download.

EIA (Energy Information Administration). 2023. *Residential Energy Consumption Survey: 2020 RECS Survey Data.* Washington, DC: EIA. https://www.eia.gov/consumption/residential/data/2020/index.php?view=state#hc

Experian (Experian Marketing Services). 2026. https://www.experian.com/business/solutions/data-solutions

Goldstein, N.J., R.B. Cialdini, and V. Griskevicius. 2008. "A Room with a Viewpoint: Using Social Norms to Motivate Environmental Conservation in Hotels. In *Journal of Consume Research.* 35(3): 472-482.

Heinemeier, K. 2022 "Triumph of the Tweakers: Engaged Homeowners Optimizing Air Conditioning Energy Use." In *Proceedings of the 2022 ACEEE Summer Study on Energy Efficiency in Buildings* 8:319-334. Washington, DC: ACEEE. https://www.aceee.org/sites/default/files/summerstudy/2022/event-data/authors/--/1

Hickman, A.M. 2025. Post on X.com https://x.com/shagbark_hick/status/1958887274331914512?s=46

Kirchman, T., R. Nadolny, J. Siegel, and J. Strano. 2021. "Industry in Pandemic: Who's up? Who's down? Where to Focus. " In *Proceedings of the 2022 ACEEE Summer Study on Energy Efficiency in Industry* Washington, DC: ACEEE. https://www.aceee.org/sites/default/files/pdfs/ssi21/panel-4/Siegel.pdf

Lin, J., K. Rodgers, S. Kabaca, M. Frades, and D. Ware. 2020. "Energy affordability in practice: Oracle Utilities Opower's business Intelligence to meet low and moderate income need at Eversource" In *The Electricity Journal* 33 (2): 106687 https://www.sciencedirect.com/science/article/abs/pii/S1040619019302921?via%3Dihub.

Moezzi, M. and L. Lutzenheiser. 2010. "What's Missing in Theories of the Residential Energy User." In *Proceedings of the 2010 ACEEE Summer Study on Energy Efficiency in Industry* 7:207-221. Washington, DC: ACEEE. https://www.aceee.org/files/proceedings/2010/data/papers/2145.pdf#page=1

Munson, T., M. Galport, K. Quaye, and C. Sloan. 2022. "Behavioral Programs Come of Age: Analyzing Savings from Recent Home Energy Report Program Studies." In *Proceedings of the 2022 ACEEE Summer Study on Energy Efficiency in Industry* 7:207-221. Washington, DC: ACEEE. https://www.aceee.org/sites/default/files/summerstudy/2022/event-data/authors/--/1

Nolan, J. M., P.W. Schulz, R.B. Cialdini, N.J. Goldstein, and V. Griskevicius. 2008. "Normative Social Influence is Underdetected." In *Personality and Social Pyschology Bulletin.* 34(7): 913-923.

ODC (Opinion Dynamics Corporation). 2011. *Massachusetts Cross-Cutting Behavioral Program Evaluation: Volume I.* Waltham, MA: Massachusetts Energy Efficiency Advisory Council. https://ma-eeac.org/wp-content/uploads/Cross-Cutting-Behavioral-Program-Evaluation-Volume-1-Final-Report-June-2011.pdf

Rodgers, K. 2016. "Preaching to the Choir: Using Utility Data to Create Relevant Promotions for Energy Efficiency Programs." In *Proceedings of the 2016 ACEEE Summer Study on Energy Efficiency in Buildings* 7:1-12. Washington, DC: ACEEE. https://www.aceee.org/files/proceedings/2016/data/papers/7_841.pdf#page=1

Schulz, P., J. Nolan, R. Cialdini, N. Goldstein, and V. Griskevicius. 2007. "The Constructive, destructive, and reconstructive Power of Social Norms." In *Psychological Science.* 18 (5):429-434

Shove, E. 2003. *Comfort, Cleanliness and Convenience: The Social Organization of Normality*. Oxford, UK: Berg.

van Moeseke, G., de Grave, D., Anciaux, A., Sobczak, J., & Wallenborn, G. (2024). New insights into thermal comfort sufficiency in dwellings. In *Buildings and Cities* 5(1): 331–348. https://doi.org/10.5334/bc.444

Young, E., J. Lines, and D. Basak. 2024. *PY 2023 Delivered Energy Insights Impact Results.* Boston, MA: Guidehouse

AI-assisted tools used: Copilot.
Used for: Search for sources. Copy Editing. Formatting
Extent: [citation research / brainstorming/ light editing].
Human review: The authors reviewed and verified all content, calculations, and citations.