New Metrics:
What assessing energy burden and bill impacts can and can't tell us

ILLUME helped a Midwest utility model the ways income eligible customers' energy burden varies and shifts under different conditions, such as residence type, heating fuel type and the type of energy efficiency offerings they receive. The result: a calculator that can generate estimated energy and bill savings at a per home and population level.

I L L U M E

The Challenge

Reorienting toward equity, utilities are seeking ways to remedy disparities through income eligible (IE) offerings. One way in which utilities are trying to remedy disparities in service is by identifying and tracking new metrics that might better enable our understanding of residents' *experienced benefits*—energy savings, bill reduction, increased comfort, or other beneficial impacts. Our work focused on deconstructing *energy burden*, the portion of gross household monthly income required to pay energy costs.

The idea that a household's energy expenses should not prove burdensome is as intuitive as it gets. But estimating energy burden is not as straight forward as one might think. The analysis of energy burden is complex and requires a lot of data and careful consideration of customer behavior, building system performance, and building conditions that may be obscured by energy consumption data alone. Tracking how energy burden changes over time further increases the complexity of this analysis.

Examining *how to reduce* energy burden is yet its own undertaking. To provide a jumping off point for this, we explored the following questions:

- What level of energy savings are necessary to reduce an income-eligible customer's energy burden?

- How does this differ for single family vs. multifamily customers?

- How does this differ for single vs. dual-fuel customers?

- Of the customers who may benefit from energy efficiency (EE) offerings, how many have already participated in such offerings? How many are eligible?

- What proportion of the population are being deferred from participating due to health and safety issues in the home?

The Results

The accessibility of energy bill data is enticing utilities to increasingly consider energy burden as a metric to assess the achieved benefits of utility offerings. But several factors make it difficult to draw direct conclusions from this metric alone. These include: 1) the unique challenges of single fuel providers, 2) variation in circumstances and home conditions across income-eligible sub-segments, 3) the interplay of behavior and baseline system operation, conditions and performance, and 4) a lack of accounting for the non-energy impacts (NEIs) created by common EE offerings, such as weatherization and heating system upgrades. When considering these factors in our analysis, we identified a number of important considerations for those looking to reduce the energy burden of income-qualified residents:

1. Consider sub-segments. Variability across income eligible subsegments means that the baseline energy burden within this population can straddle a large range. As an extension of this, the achievable impacts to energy burden also vary across the many sub-segments within this group. Utilities should consider differentiating within income eligible segments to identify where they may be able to create the most meaningful reductions in energy burden.

2. Embrace the complexity of behavior. Energy consumption is driven, in part, by customer behavior, and utilities will need to think through how to disentangle both the potential for and impacts created by (EE) offerings. For example, baseline energy consumption can appear low for customers who are sacrificing thermal comfort in order to reduce energy bills due to competing financial needs in the home and/or for customers with failing systems. Energy consumption may also appear low for a single fuel type where customers have augmented failing gas-fired HVAC systems with electric space heaters, for example. In some circumstances, EE upgrades may not generate energy savings in homes as customers are more prone to turn on and use heating systems, or to swap from electric space heaters to furnaces, and utilities should consider what other potential data or metrics to track to provide a more holistic view.

3. Explore intersections. Upgrades to weatherization and heating systems can provide additional benefits to customers beyond energy savings. For example, the growing interest in public health may provide utility and program administrators an increased opportunity to identify and track health-related non-energy impacts (NEIs), perhaps even integrating them directly into energy burden calculations. (see Sidebar).

4. Why go it alone? We discovered that creating cost-effective and meaningful shifts in energy burden for income eligible customers can be challenging for single-fuel providers. For an electricity provider, current weatherization and HVAC offerings may not create significant shifts in energy burden if the majority of IE customers have gas heated homes, for example. Such providers could consider strategic partnerships with gas utilities to increase the impacts created in customer homes.

Monetized Metrics:
How energy burden can be combined with other metrics to provide a more holistic view of benefits

In addition to the availability of energy data, using energy burden as a metric to assess benefits is an enticing framework because accounting for metrics monetarily is easy to understand and provides the opportunity to consolidate benefits. For example, utilities can monetize the health and safety impacts created via EE offerings to aggregate benefits into dollars—a single and easy-to-understand metric. But monetizing benefits can be complicated and must be done carefully. Here are some tips to get started exploring this particular benefit framework:

- Create common definitions of metrics to standardize understanding across offerings and departments

- Determine how to support the assessment of possible benefits, including performing research on metrics, and identifying methodologies for monetizing

- Establish a process and systems for tracking and reporting of benefits

- Identify how to avoid overlap in benefit accounting

Remember, there are many benefit frameworks to explore and any one framework may not be capable of encompassing the breadth of possible benefits.

How We Did It

As regulators demand that more benefits from clean energy investments go to disadvantaged and low-to-moderate income communities, utilities and program administrators will need to increasingly rely on different analyses and metrics to determine how to create and show real benefits. Here's how our team used data to model how energy burden changes in different scenarios to inform strategy and planning:

- **We utilized customer data and demographic research to identify and characterize the income-eligible population.** Our team harnessed utility customer data and supplemented it with data from the American Census Survey to characterize the size and demographics of this income eligible population, including the split of owners and renters and single vs. multifamily customers. We also identified and characterized the utility's very low-income population.

- **We harnessed the power of data to estimate impacts of select upgrades.** We used evaluation results from HVAC and weatherization program offerings to estimate the typical savings achieved in various home types. We utilized data to identify the portion of the population that had not yet participated in a utility funded energy efficiency (EE) program or a federally-funded EE program (e.g., weatherization assistance program). We then utilized secondary data to estimate the proportion of customers with housing stock issues (e.g., roof replacements, porch repairs, or anything that could create a deferral in EE work). Finally, we determined the financial cost to address health and safety issues in housing stock to estimate how energy burden would shift at the population level if all customer homes could be upgraded.

- **We put everything together to assess impacts to household energy burden.** We combined granular data, like the number of single family, multifamily, owners, renters, electric heat and gas heat customers, to model shifts in the energy burden at both the household (micro) level and the population (macro) level.