

A Systems Approach:

Defining Energy Burden and Determining How to Treat It



A single-fuel view is an incomplete picture: Understanding how a program, product, or service can impact energy burden is misleading in dual fuel homes if assessed via only one fuel type. Reorienting toward equity, program administrators must think holistically.



Ask a botanist to describe a plant leaf and you are likely to hear about a leaf's upper dermis, or its spongy mesophyll cells, or the role of the Xylem and Phloem in transporting water, food, and minerals. Inside each small leaf lies a complex biological system. The same could be said about understanding the complexities of energy burden.

Energy burden estimates are complex and require a lot of data and careful consideration. They include an ecosystem of considerations of customer behavior, building system performance, and building conditions that may be obscured by energy consumption data alone. Analysis becomes even more complex when tracking changes in energy burden over time.

If we can better identify and track metrics that capture the benefits residents experience from energy efficiency (EE) interventions (such as reduced energy consumption, increased health and comfort, decreased shut offs, etc.), we are better positioned to lessen or alleviate energy burden.

The Limitations of Cost & Consumption

When looking to understand energy burden, it is tempting for program administrators and researchers alike to use the readily available energy use data gathered by utilities. But there are several limitations that make it difficult to draw direct conclusions from energy use data alone. These include:

Asingle-fuel view is an incomplete picture: Understanding how a program, product, or service can impact energy burden is misleading in dual fuel homes if assessed via only one fuel type. Consider, for example, a resident using electric space heaters to supplement a failing gas furnace. The beneficial impact of HVAC or weatherization upgrades viewed in electric bills alone will not reflect changes in consumption on the gas side, essentially mischaracterizing the efficacy of the intervention and failing to reflect how the customer experiences energy burden after the intervention.

Income-eligible customers' circumstances and home conditions vary: It is a mistake to read the income eligible population as a monolith, including in terms of their energy burden. In one analysis, we saw the baseline energy burden vary dramatically based on poverty level. In a single-family electrically heated home, energy burden was twice as large for customers below 150% of the Federal Poverty Line (FPL) compared to those between 150% and 250% FPL. Tracking only shifts in energy burden may misconstrue the absolute financial impact achieved for some customers.

There is a complex interplay of behavior and baseline system operation, conditions, and performance: Where there are competing financial needs in homes, some customers may choose to sacrifice comfort to keep energy bills low. Assessing energy burden without assessing shifts in thermal comfort may distort the customer experience. In effect, "burden" may be underreported for those who have already taken measures to address the financial hardship caused by their energy bills, even if it degrades their quality of life.

Energy burden does not reflect the entirety of financial distress: As a metric, energy burden does not account for customers who cannot make payments, who are in arrears, who have shut offs, or who have requested assistance. These additional metrics are critical to understanding financial health and distress and should also be considered when creating a holistic view of interventions' challenges and impacts.

Non-energy impacts (NEIs) are largely ignored: NEIs are created by many common EE offerings, such as weatherization and heating system upgrades. These can improve indoor air quality and reduce drafts resulting in reduced doctor visits, hospital admissions, and sick days. Counting only the impact to energy burden can exclude these important NEI's and their impact on customers' overall financial health.

Our Expanded Approach

As regulators demand that more benefits from clean energy investments go to disadvantaged and low-to-moderate income communities, 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 energy burden changes in different scenarios to support our clients in strategy and planning:

We utilized customer data and demographic research to identify and characterize the income-eligible population.

Our team combined utility customer data with data from the American Census Survey to characterize the size and demographics of the income eligible population, including the split of owners and renters and single versus multifamily customers. We also identified and characterized the utility's very-low-income population.

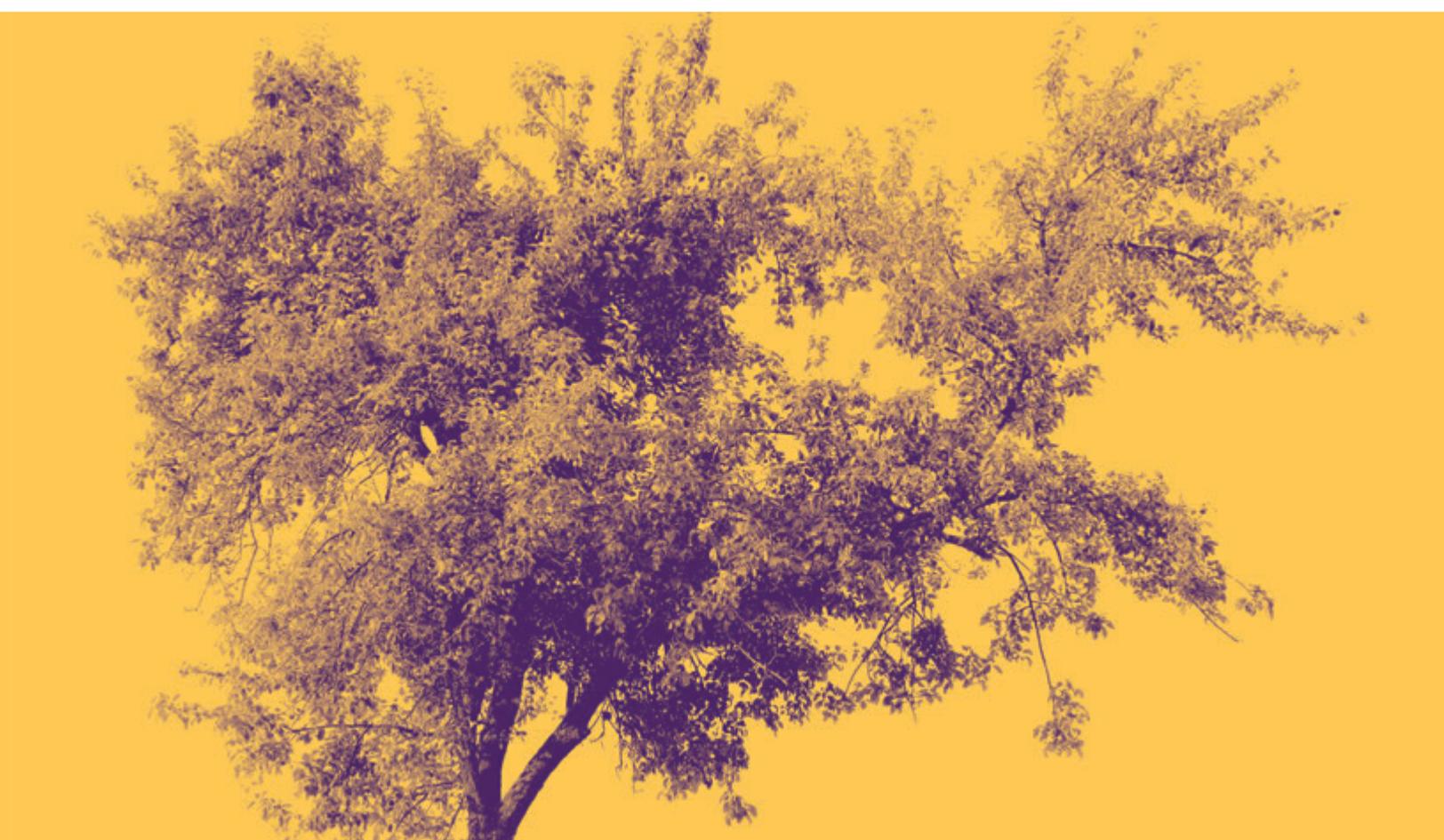
We harnessed the power of data to estimate impacts of select upgrades.

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 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.



The Takeaway:

Our analysis identified several important considerations for those looking to reduce the energy burden of income-qualified residents:

Consider sub-segments. Variability across income eligible sub-segments means that the baseline energy burden within this population can straddle a large range. As an extension of this, the achievable impact to energy burden can 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.

Embrace the complexity of behavior. Energy consumption is driven, in part, by customer behaviors. Program administrators will need to think through how to disentangle both the potential for, and impacts created because of, their offerings. As we discussed above, baseline energy burden can appear low for customers who are sacrificing thermal comfort to reduce energy bills due to competing financial needs. Pairing consumption data with other information (such as heating and cooling system status, operation and schedules, household size, etc.) will be critical to determining how to identify those whose need is obscured by the data.

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. Such partnerships may also create opportunities to braid funds and outreach. (See Sidebar).

Why go it alone? 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 most 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, it can be enticing to use energy burden as a metric to assess benefits because accounting for metrics (monetarily) is easy to understand and provides the opportunity to consolidate benefits. For example, program administrators 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 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.