

Going the distance:

Sustained energy burden reduction through energy efficiency

Hassan Shaban, Empower Dataworks

Ryan Finesilver, Avista Utilities

Bing Tso, SBW Consulting

ABSTRACT

Energy burden is a useful indicator for quantifying energy affordability and insecurity. Using energy burden as a guiding metric allows utilities to set concrete energy equity targets for their energy assistance portfolio. For example, Washington's Clean Energy Transformation Act requires utilities to assess and report on the overall energy burden reduction from all of their customer programs. If energy burden and affordability are to be meaningfully addressed, we need to think holistically about our energy assistance program portfolios (which include energy efficiency, weatherization, direct assistance, rate designs, and arrearage management, among other strategies).

Energy efficiency is just one of the tools that are available for reducing energy burden, but it can be the most effective one at delivering sustained energy burden reductions (as opposed to temporary reductions through direct assistance and crisis programs).

This paper presents an energy burden framework for assessing the performance of utility programs. Using Avista's portfolio of customer programs in Washington state as a case study, we will discuss:

- How to use energy burden for setting targets for an energy assistance program portfolio
- How to balance an energy assistance portfolio using both direct energy assistance programs and energy efficiency, depending on customer characteristics.
- How Avista's energy efficiency programs have had great success serving high energy burden customers without explicit income verification requirements. We'll learn about Avista's overall customer energy burden and how it plans to use data to prioritize high energy burden customers.

Energy burden as a proxy for affordability

In general, a high level of energy equity means that customers across a utility service territory share the costs and benefits of the grid relative to their usage and have access to affordable energy. Energy affordability, specifically, is an indicator of whether energy costs are low enough to allow a household to pay for other basic needs (food, shelter, clothing and medical care) without being vulnerable to service disconnection. Two households in different parts of the

country can have identical incomes and energy costs, but one of them could consider their energy costs unaffordable if their cost of living is higher.

Energy burden is the ratio between annual energy expenses and gross annual income for a household. It is a percentage that typically ranges from close to zero to over 15%. As shown in Figure 1, the distribution of energy burden among customers in a given area is usually heavily weighted towards the left (low energy burden) and has a long tail, consisting of the lowest-income, highest burden households.

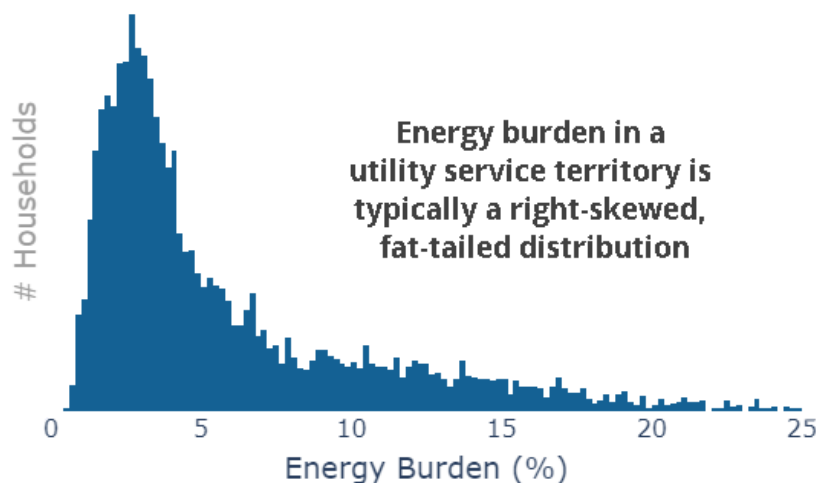


Figure 1. Illustrative distribution of customer-level energy burden.

A quantitative approach to capture energy affordability is by setting an energy burden threshold that is specific to a particular area. If the energy burden for a household exceeds this threshold, then their energy costs are considered unaffordable. This serves as a helpful proxy for energy affordability. For example, Fisher et al (2022) and the Washington Department of Commerce (2022) use an energy burden of 6% as the threshold between affordable and unaffordable energy burdens, as shown in Figure 2.

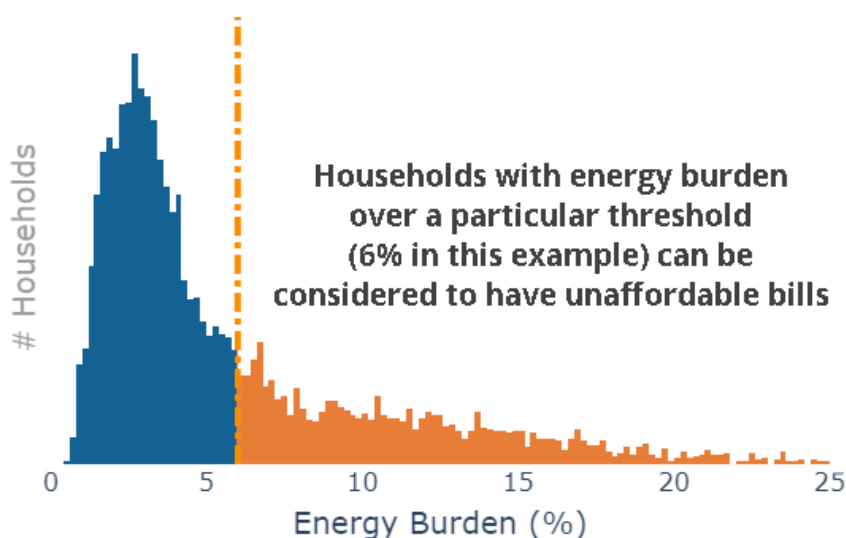


Figure 2. Application of an energy burden threshold to the distribution of customer-level energy burden.

Energy insecurity is a related but slightly different concept that indicates the vulnerability of a household to making delayed bill payments, and consequently having late payment fees and being disconnected from utility services.

In general, we can expect energy insecurity to be highly correlated with energy burden (Figure 3). But this correlation is not perfect; households with low energy burden can have high energy insecurity due to external factors (job loss, high medical bills etc.), while households with a high energy burden can have a low level of energy insecurity if they have access to energy assistance programs. Energy insecurity can be much more subjective than energy affordability and burden, so it is more difficult to quantify.

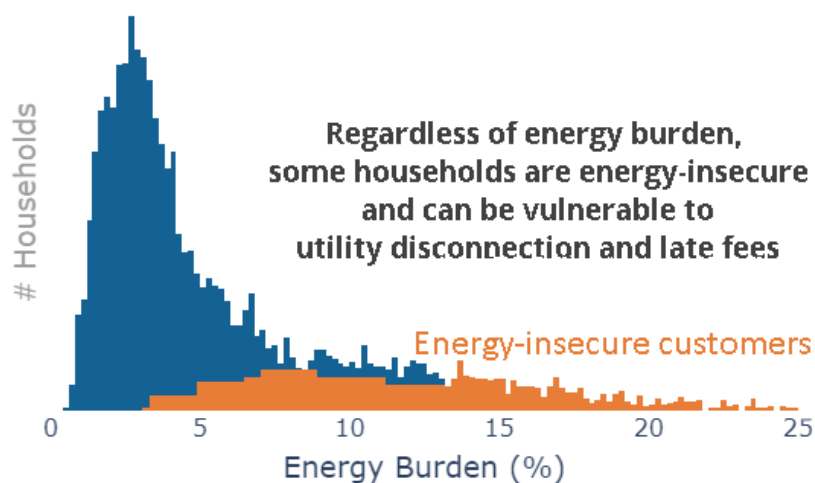


Figure 3. Correlation of energy insecurity with high energy burden.

One way that utilities, municipalities, and governments try to mitigate energy insecurity is through energy assistance programs. In this paper, we follow the Washington Department of Commerce’s definition of energy assistance as any initiative or program aimed at reducing energy insecurity and burden. These typically take the form of direct cash assistance (bill discounts, low-income rates, donation programs, crisis assistance), conservation (low income energy efficiency, weatherization), payment arrangements (payment plans, equalized bills or prepaid billing) or arrearage management (payment plans that assist customers with repayment of overdue energy bills).

Setting energy burden reduction targets

Using energy burden as a proxy for energy insecurity can help programs set concrete targets in terms of energy burden reduction. For example, one metric that is being used in Washington state as part of the Clean Energy Transformation Act (Washington Department of Commerce, 2022) is the **energy assistance need**. This is the sum of customer energy bills that exceed a specific energy burden threshold. In other words, if you could cut a check to reduce all customer energy bills to an affordable level (say, 6% energy burden) for all customers, how big would that check need to be?

In most areas, the total energy assistance funding that is available to customers is some fraction of the energy assistance need. But funding levels by themselves do not capture the success of a program. You could theoretically spend millions of dollars in a program and not reduce energy assistance need by a single dollar, because the funds fail at reducing energy burden for high-burden customers.

Avoided burden is the actual dollar reduction in customer energy bills resulting from energy assistance programs. This can be lower than the total energy assistance funding due to overhead expenses or the installation of non-cost-effective conservation measures. This value can be calculated through program impact evaluations.

Energy assistance programs that are trying to reduce high energy burden should focus their impact on payment-troubled, high-burden customers, rather than low-income customers writ large. The avoided burden specifically for high-burden customers is usually much smaller than avoided burden because many energy assistance programs do not target high-burden customers. This is the **avoided need**.

Using this energy burden framework (Figure 4), effective energy assistance programs would be avoiding a relatively high need and can demonstrate continuous progress by shrinking the gap between avoided need and total energy assistance need. So, there are three main levers to create a great energy assistance program: (1) funding, (2) efficiency of operations, and (3) effective targeting of high-burden customers through the program design or marketing/outreach.

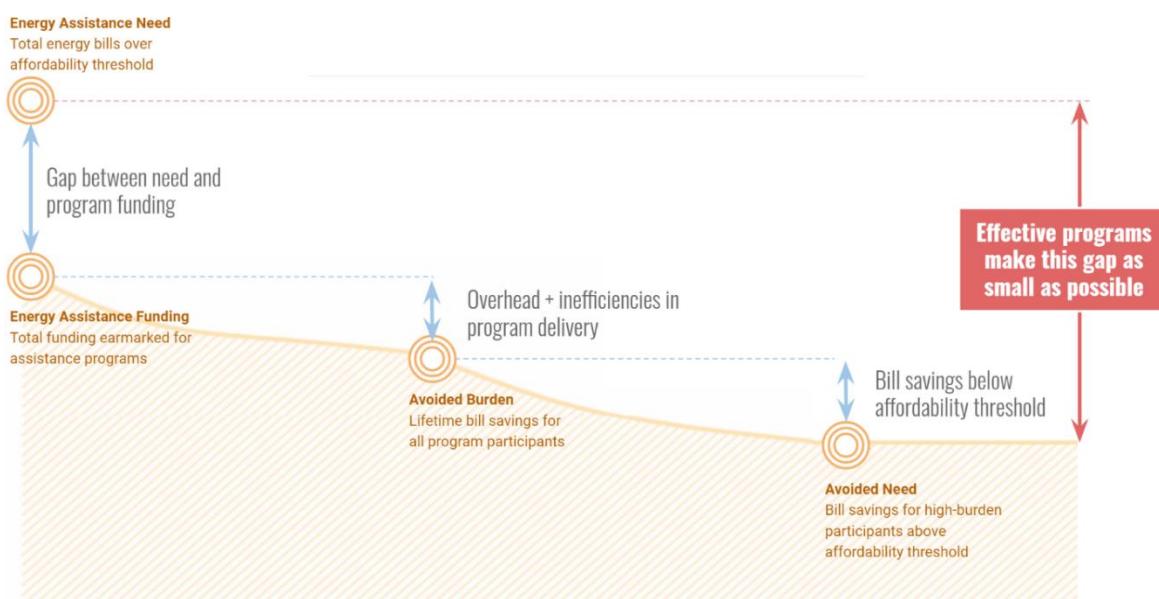


Figure 4. Quantitative metrics that describe energy assistance program performance.

Types of energy burden reduction programs

When planning energy assistance programs, program administrators (utilities or governments) have a choice between many program options (Figure 5). Do you target more immediate bill relief for customers or more persistent savings through energy efficiency? Should you focus on a few high-touch customers or should you build more mass-market programs?

Energy assistance programs can fall into one of two categories as shown in the following figure:

1. **Short-term Programs:** These programs directly reduce customer energy burden through bill discounts, separate rate classes for low-income customers, or mechanisms to directly offset customer bills. Some of them may be set up to offer one-time assistance to payment-troubled customers that demonstrate recent hardship (e.g. job loss or medical condition).

3. **Long-term Programs:** These programs aim to achieve sustained energy burden reductions through energy efficiency, energy education and/or workforce training. There is usually a high upfront cost borne by the program administrator with the customer energy burden reductions happening over many years.

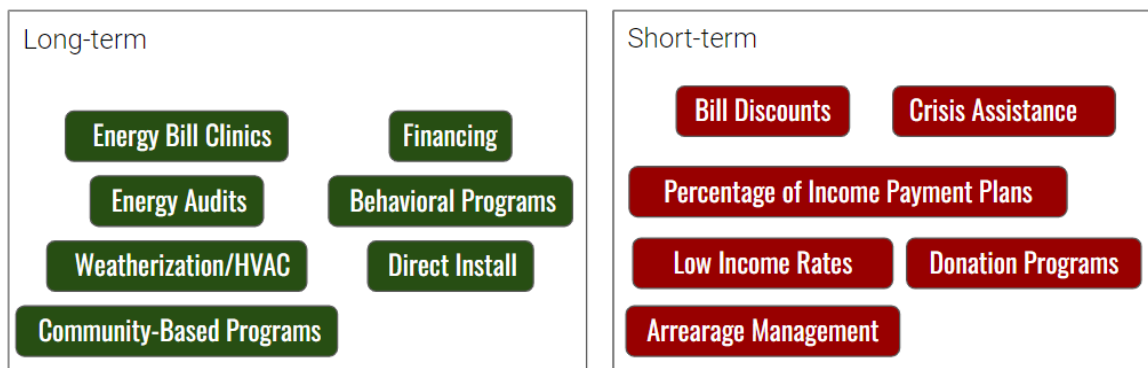


Figure 5. Categories of energy assistance programs.

A portfolio approach to energy burden reduction

For many high-burden customers, it is unlikely that participation in one isolated program at a time would eliminate their high energy burden. Instead, most customers would benefit from stacking the energy burden reduction from multiple relevant programs. Also, the reliance on direct assistance alone does not solve the root problems that result in a high energy burden and can be more expensive over the long run. Serving customers holistically will involve closer integration and coordination between the energy assistance and conservation teams, the community action agencies, and program implementation contractors so that customers receive the assistance that is most impactful and cost-effective.

A portfolio approach to energy assistance relies on a comprehensive suite of interconnected energy assistance offerings that are oriented to the customer journey, rather than to the organizational structure within a program administrator. This does not mean running every kind of program available, but instead focusing on building a continuous customer journey from light touch to more demanding interventions, while combining immediate relief through direct assistance with sustained burden reduction through energy efficiency.

The customer journey can be visualized as a funnel, as shown in Figure 6. At the top of the funnel, we find programs and initiatives that can be rolled out at scale to most low-income customers at a relatively low cost per customer. These include behavioral programs, targeted marketing, or rate designs. At a slightly higher level of investment, utilities can implement widget programs (e.g., smart thermostats) or offer free audits to identify low-cost conservation opportunities. They can also administer customer donation programs at a relatively low cost or offer critical bill assistance, which would apply only in certain situations.

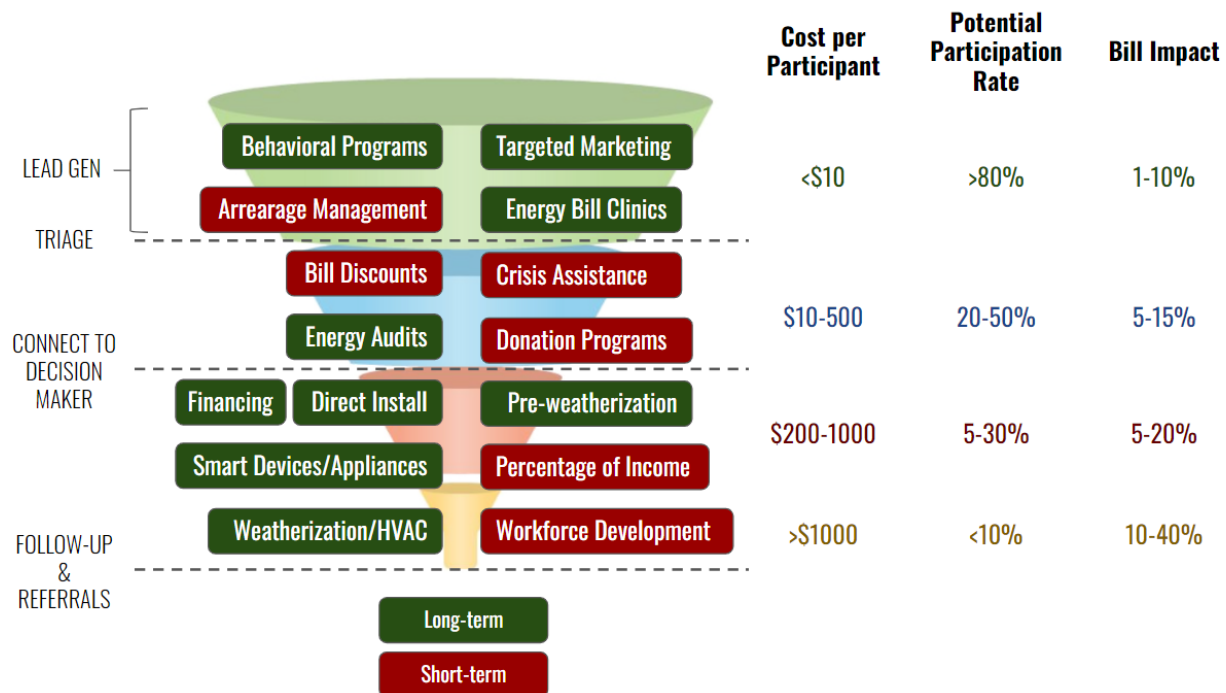


Figure 6. The funnel of an energy assistance portfolio.

Further down the funnel, we find strategies that require a larger investment and higher level of customer support, but are more personalized to specific customers, including efficient appliance programs, cash assistance, and arrearage management. Finally, at the bottom of the funnel are the heavy hitters: the weatherization and HVAC programs that deliver significant and sustained energy burden reduction, but potentially at a very high cost per participant to the program.

A portfolio approach to energy assistance has several benefits:

- **Economies of scale.** Building interconnected programs creates efficiencies in program delivery and technical infrastructure. Programs can share staff, application workflows, marketing assets and accounting systems to reduce overhead and administrative costs.
- **Single entry point to the energy assistance portfolio.** Customers appreciate having a one-stop shop for their energy assistance needs, rather than a collection of disparate programs and processes.
- **Customer engagement.** Maintaining strong ongoing relationships with low-income customers reduces barriers to participation in energy efficiency programs, which require a heavier investment of time (and sometimes money) from the customer.

Prioritizing which program(s) to offer customers and in what order should be guided by the customer's specific situation--in particular, their energy burden and their energy efficiency potential (expressed through the energy use intensity or other more sophisticated metrics). Figure 7 shows the distribution of energy burden (defined through an energy burden threshold) and

energy efficiency potential (defined through an energy use intensity threshold) across all low-income residential customers in an area. In a perfect world, the energy assistance portfolio would match these customer segments. For example:

- Conservation programs should primarily serve high burden, high savings potential households
- Direct assistance programs should primarily serve high burden, low savings potential households
- Crisis/emergency programs should primarily serve low burden, low savings potential households
- Traditional conservation programs with financing should serve low burden, high savings potential households

Aligning targeted customers with program strengths results in a very cost-effective pathway to energy burden reduction.

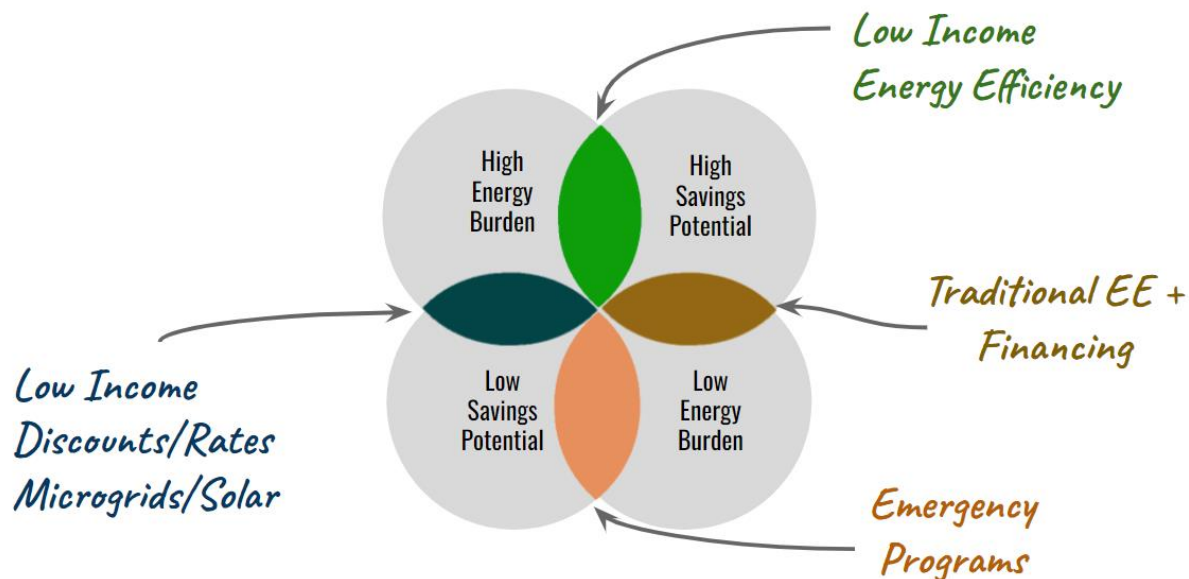


Figure 7. Low-income customer segmentation by energy burden and energy savings potential.

The Avista case study

Energy Burden Assessment

This section describes how the concepts described in the previous sections were applied in Avista's Washington state service territory to understand the energy burden on Avista's customers and develop recommendations for Avista's energy assistance programs moving forward. Empower Dataworks completed an energy burden assessment for Avista in 2021 (Empower Dataworks 2021). This involved collecting customer-level energy use, demographics, and building characteristics to build a complete picture of energy burden and programmatic gaps for all of Avista's customers.

Working with customer or meter-level data provides the ability to control the quality of data that goes into the energy assistance need estimates and yields a rich dataset of customer-level data for designing and targeting programs.

Main Findings

The energy burden assessment defined high-burden customers as those who spent more than 6% of their gross annual income on electricity, if they use electric heat, or more than 3% of their gross annual income on electricity if they use non-electric heat. Details of the analysis methodology are described in a technical report by Empower Dataworks (2021).

Of Avista's 225,000 residential customers in Washington state, approximately 42,000 were found to have a high energy burden with a total energy assistance need of approximately \$25M/year. As shown in the map below, most of these customers were clustered in the city of Spokane or in the northern rural counties in Avista's service territory.

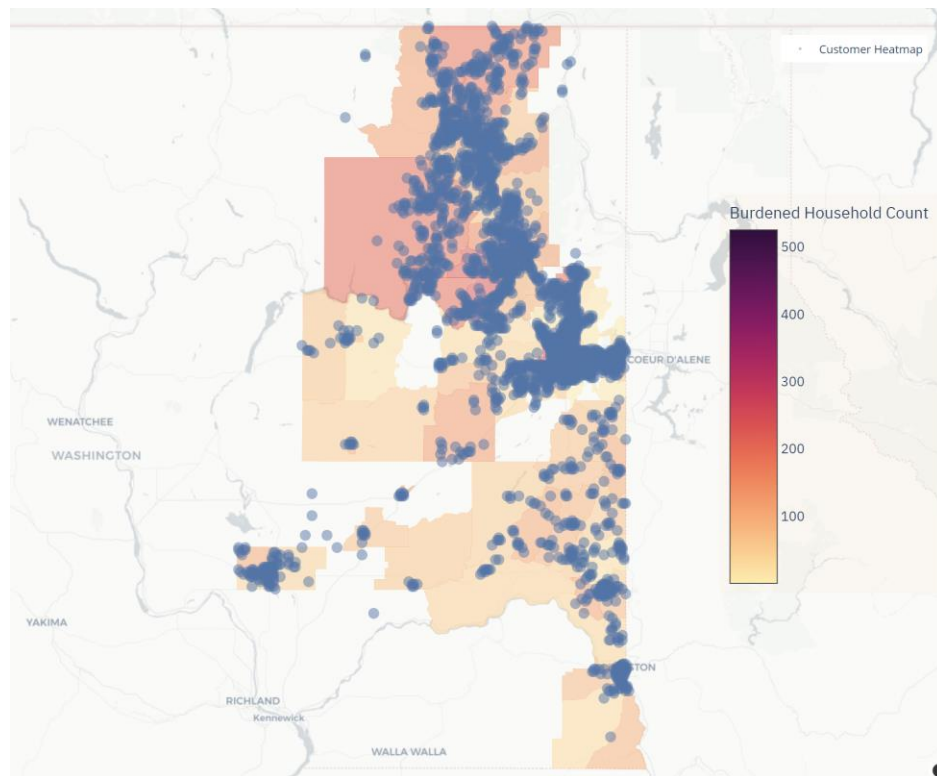


Figure 8. Map of high-energy-burden customers in Avista's service territory.

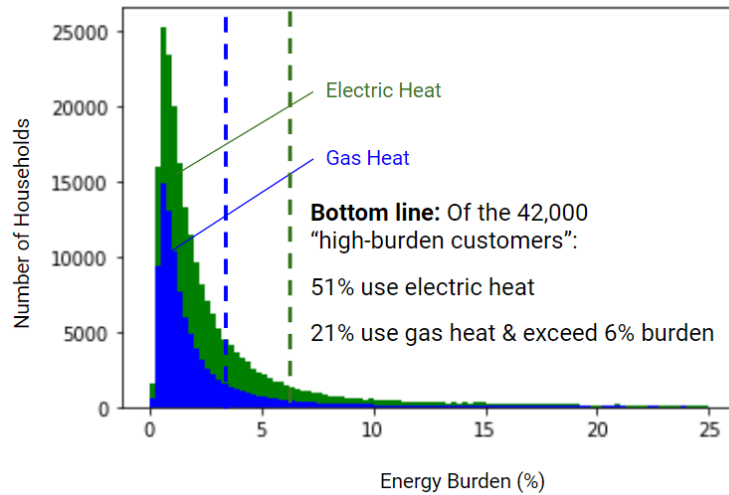


Figure 9. Distribution of customer-level energy burden among Avista's customers.

Approximately 40% of Avista's low-income customers have a high energy burden and 45% of those high burden customers also have a high efficiency potential. Since neither high or low potential customers completely dominate the high burden group, this indicates that the current program mix that combines conservation, direct assistance, and a variety of payment assistance options is a good fit for Avista's customers. As shown below, approximately 49% of low-income customers are low-burden and low-efficiency potential and they are best served by our crisis and arrearage management programs.

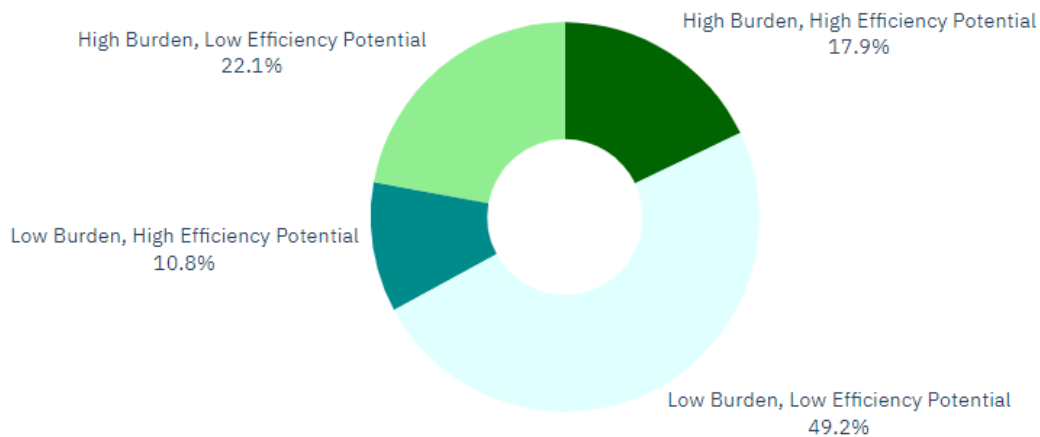


Figure 10. Breakdown of Avista's different low-income customer segments.

Contribution of non-income-qualified conservation programs

Table 1 shows statistics around program spending and participant characteristics for five of Avista's energy assistance programs in 2020. The first three are income-qualified programs, meaning that participants need to be considered low-income to participate.

The fourth program is a segmented program that serves a specific customer segment, namely residential customers in multifamily buildings. SBW Consulting has been delivering the Multifamily Direct Install (MFDI) program in Avista’s Washington service territory since 2018. This program recruits multifamily complexes throughout this territory and sends trained installers to visit participating tenant units. During these visits, the installers provide tenants with educational materials as well as install free LED lighting and other energy-saving devices. Some complexes also receive free common-area lighting retrofits. Importantly, approximately 77% of participating tenants were found to be low-income, even though this is not an explicitly “low-income” program. The MFDI program also serves many high-burden customers (26% of participating tenants). These findings support the best practice recommendation that market segmentation can be an effective way to reach high-burden customers (Drehobl et al. 2020).

Avista’s standard residential program (prescriptive measures and electric baseboard to heat pump system conversions) has an approximate annual budget of \$9M. Of all participants in this program, approximately 15% fall under 200% of the Federal Poverty Limit and half of those (approximately 8% of all participants) would be considered “high-burden.” Low-income and high-burden customers are under-represented in this program, but it is still contributing significantly to energy burden reduction as well. Avista has been testing various approaches to increasing access to this program through on-bill financing.

Table 1. High-level statistics for a selection of Avista’s energy assistance programs.

Program	Direct Customer Spend	Low-income % of Participants	High Burden % of Participants	Spend on High Burden
Low Income Rate Assistance Program (LIRAP)	~\$6.7M	100%	49%	\$3.3M
Low Income Home Energy Assistance Program (LIHEAP)	~\$3.7M	100%	46%	\$1.7M
Low Income Energy Efficiency	~\$1.1M	100%	41%	\$0.3M
Multifamily Direct Install	~\$2.3M	77%	26%	\$0.3M
Residential Energy Efficiency	~\$9M	15%	8%	\$0.7M

Potential Actions

Through the energy burden assessment and benchmarking with other energy assistance programs, Empower Dataworks found Avista’s energy assistance portfolio to be well-designed and well-funded. Avista has also piloted, implemented or plans to implement numerous initiatives that are considered best practices, such as income-based tiers for energy assistance,

income self-certification, community-based outreach and closely collaborating with community action agencies. The next step is for Avista to reorient some of the programs to be able to achieve better energy burden reductions for high-burden customers.

If Avista's programs are meant to prioritize high-burden customers, then they need to excel at reaching high-burden customers and identifying high-burden customers among existing program participants. This is not an insurmountable task, especially for programs where incomes are already collected as part of the intake process. But for some programs, Avista would need to develop data sharing and technical infrastructure with the community action agencies and reporting tools related to energy burden. Other programmatic actions that are under consideration include changes in program design to prioritize high-burden customers, targeted marketing efforts, and developing market-segmented programs. These actions are listed below in Figure 11 and detailed in Empower Dataworks (2021).

	POTENTIAL ACTION	READINESS LEVEL	BUDGET	AVISTA STAFF TIME	ENERGY BURDEN IMPACT
RESEARCH/ PLANNING	Adopt energy burden reduction as a metric for all conservation programs	 Intermediate	\$	 	Foundational Action (No direct impact)
	Implement an energy equity monitoring plan	 Intermediate	\$\$	 	Foundational Action (No direct impact)
	Use Energy Burden in Program Design	 Proven	\$		 
PROGRAMS	Implement a targeted marketing and outreach strategy	 Proven	\$\$	 	  
	Deploy a One Portfolio Model for energy assistance programs	 Intermediate	\$\$\$	  	  
	Community and small business energy efficiency in high-burden neighborhoods	 Proven	\$		
	Landlord-targeted energy efficiency	 Pilot	\$\$\$	 	  
	Energy Ambassador program	 Pilot	\$\$	  	  
	Democratizing the smart home	 Pilot	\$\$\$	 	 
	Income self-certification	 Intermediate	\$	 	
	Pre-weatherization incentives	 Proven	\$		
FUNDING	Review regional and program-level funding allocations	 Proven	\$		

Figure 11. Actions under consideration for improving the energy burden reduction of Avista's programs.

Conclusion

While energy burden may not be a perfect metric, it does a good job of quantifying energy insecurity and giving energy assistance programs concrete goals to strive for. If we do not set energy burden reduction targets and design our programs around energy burden, then we will never meaningfully address the problem of high energy burden among utility customers. This paper described a framework for using energy burden as a driving force within an energy assistance strategy and demonstrated how it can be used to assess the performance of an energy assistance portfolio.

The next priority for Avista is identifying means for tracking energy burden reductions over time and measuring progress of its different programs. Additionally, as all Washington state utilities have similar energy burden reporting requirements, we hope to find ways to share learnings, best practices, and energy burden benchmarking data with peer utilities in Washington state and beyond.

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