Using Data to Help Achieve Decarbonization and Equity Goals

As state and federal policies that aim to decarbonize our grid and recognize past institutional injustices are enacted, energy efficiency programs should also begin to focus on climate and equity goals. For climate, instead of looking to reduce a set amount of energy per year, programs should be designed with an understanding of where and how energy is used to help create a flexible, clean grid. For equity, the industry can take an important step forward by proactively approaching previously overlooked customers. These are often customers who could benefit significantly from program participation.

In this brief, NEEP will identify two new data trends that can help achieve equity and climate policy objectives. These tools use granular data to enhance energy efficiency portfolio performance and unlock new ways to save energy and foster equitable program delivery.

Section 1: Decarbonization and End-use Load Profiles (Loadshapes)

States are setting ambitious carbon reduction goals as a climate strategy, but it's important to acknowledge that carbon reduction occurs in many spheres. For energy efficiency, a paradigm shift in program planning away from energy savings and towards carbon savings is required. Energy efficiency programs must lower energy use at the right times to have the greatest impact on carbon emissions. Instead of emphasizing yearly energy savings as the primary program performance metric, programs will need to incorporate data that show when energy is needed and how it is generated into program planning and goal setting.

One source of this data is end-use load profiles (EULPs or loadshapes), which quantify how and when energy is used on a granular level. Loadshapes can provide a better understanding of the value of energy efficiency, demand response, and other distributed resources, and help with planning and forecasting efforts.

Incorporating end-use load profiles into energy efficiency program planning and EM&V is beneficial because they allow for: 1) proper accounting of program impacts in the cost-benefit test, and 2) more comprehensive program evaluation through more granular data. By outlining the timing of energy usage and accounting for seasonal variation, loadshapes are a critical tool for designing programs that deter usage during peak periods. Lowering demand on the grid during peak periods is key to reducing emissions because it facilitates incorporation of renewable energy sources. EULPs will be increasingly important as energy efficiency programs continue to incorporate additional demand response technologies.

Historically, end-use load profile data has been limited, but the following new EULP research and resources have recently become available.

The National Renewable Energy Laboratory (NREL), Lawrence Berkeley National Laboratory (LBNL), and Argonne National Laboratory have just finished a three-year United States Department of Energy (U.S. DOE)-funded study, End-Use Load Profiles for the U.S. Building Stock. This national study provides EULPs for the residential

and commercial building stock in multiple regions of the United States. The project results, which are now publicly available, include:

- Pre-aggregated load profiles in downloadable spreadsheets that reflect the sum or average of all buildings of a given type in a given geographic area;
- Web data view that allow users to quickly filter, slice, combine, visualize, and download the results in custom ways;
- The full dataset of individual building/dwelling unit load profiles, which includes several hundred thousand files, each containing the outputs of an individual building energy model; and
- Downloadable building energy models used by ResStock and ComStock to represent the building stock.

In 2020-21, NEEP conducted a Regional End Use Load Profile Project in coordination with the national EULP study and with support from the Massachusetts Clean Energy Center (MassCEC) and the New York State Energy Research and Development Authority (NYSERDA). This project resulted in three reports:

- Sharing Load Profile Data: Best Practices and Examples (May 2020): This report provides guidance to facilitate effective data sharing among energy data users.
- Regional End Use Load Profile Data Inventory and Needs Assessment (April 2021): This report provides a summary assessment of EULP data currently available in Massachusetts, New York, and the Northeast region and identifies regional needs for EULP data in order to guide recommendations for future priority EULP research.
- Regional End Use Load Profile Priority Research and Data Sharing Recommendations (June 2021): This report condenses the high-level recommended research areas identified in the Regional EULP Data Inventory and Needs Assessment report and explores two priority areas for future EULP research.

Section 2: Equity and Data Sets

Energy efficiency plans have begun to more deeply address equity issues as the energy industry and policymakers better understand the importance of centering equity and undoing past injustices. In the past, spending and savings targets have determined whether low- and moderate-income (LMI) programs are successful. Yet, these data points focus only on the final product. Barriers to successful LMI programs arise not only in spending and achieved savings, but also in engaging and enrolling customers in the programs.

To overcome these barriers, energy efficiency program administrators can use data on the front-end to design programs that identify and reach previously overlooked customers. This approach is similar to the one used in environmental justice laws recently passed in New Jersey and Massachusetts. Both pieces of legislation seek to identify underserved communities by defining them through data.

- In Massachusetts, S9 - An Act Creating a Next Generation Roadmap for Massachusetts (Climate Act), defines environmental justice populations using three different sets of standards: 1) Minorities comprise 40 percent or more of the population; 2) 25 percent or more of the population lacks English language proficiency; or 3) Minorities comprise 25 percent or more of the population and the annual median

household income of the municipality does not exceed 150 percent of the statewide annual median household income.

- In New Jersey, the New Jersey Environmental Justice Act defines "burdened community" as any census tract from the most recent federal decennial census that is ranked in the bottom 33 percent of census tracts for the state.

The same approach – defining characteristics of underserved communities and identifying them – can be used in energy efficiency programs. Using data, program implementers can identify the most vulnerable customers and design a program portfolio suited to meet their needs. Using this data can result in proactive customer engagement and a more comprehensive program portfolio that streamlines offerings and tackles unique challenges in underserved communities.

Here are two approaches to using data to change the design and delivery of LMI programs: Oracle Utilities Opower Limited Income products predictive analytic tool and Efficiency Vermont's Program Re-Design with the U.S. DOE Lead Tool.

Predictive Analytics and Customer Engagement

Currently, energy efficiency program administrators rely on out of date or incomplete data sets to identify customers for LMI programs. This creates program administration issues since it is difficult to identify customers, and customers must find and apply for the appropriate programs. The Oracle Utilities Opower Limited Income products predictive analytics tool changes this dynamic by using utility, third-party, and customer-provided data to identify financially vulnerable customers and predict program eligibility.

To identify customers and understand the energy vulnerability of a service territory, Opower's Limited Income Solutions gathers data to create an understanding of how energy burden impacts customers in a certain territory. The tool uses three layers of data:

- Individual consumption data, including energy burden (share of a household's income that is spent on energy bills) and the ability to pay (an index of available budget determined by subtracting housing costs from income);
- Additional data that can help complete an assessment of energy burden, including all energy bills, the predominant fuel type of the home, and the area median income level to better understand income levels relative to energy costs in the area; and
- Geographic surroundings (urban, suburban, or rural), household characteristics (type, age, and size), and customer demographics.

So far, this process of predictive analytics has helped at least one utility in the Northeast identity 78 percent more customers that were energy burdened. Additionally, once customers are identified, this data can be used to streamline enrollment processes and engage customers in programs. Using predicative analytics to learn more about the energy use and energy burden for LMI customers allows programs to more effectively and equitably identify and enroll customers.

Energy Burden and Portfolio Design

An additional data-based tool that can help address barriers around engagement and enrollment of customers is the Department of Energy's Low-Income Energy Affordability Data (LEAD) Tool. The LEAD tool is a free online resource that can be used to improve understanding of low- and moderate- income characteristics in a service territory. These characteristics can be used to change program enrollment and design and to inform other planning and outreach efforts. Similar to the Opower Tool, the LEAD Tool uses predictive analytics to provide estimates of residential energy use including electricity, gas and other fuels. The map provides information to stakeholders so that they can make data-driven planning decisions.

At Efficiency Vermont, this data has been used to transform the design and delivery of its low-income programs. Using an energy burden map generated from the LEAD tool, Efficiency Vermont revamped its programs to increase participation and create a better program portfolio for energy-burdened customers.

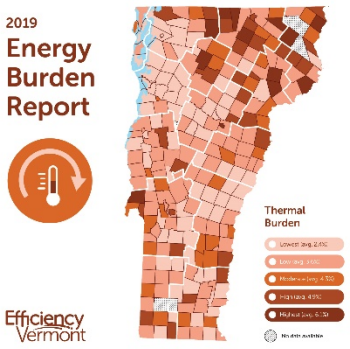

Figure 1: Image source: https://www.efficiencyvermont.com/news-blog/whitepapers/vermont-energy-burden

Efficiency Vermont used data on how energy burden impacts customers across the state to improve its low-income portfolio by increasing offerings and creating a more streamlined application process. Instead of offering one low-income program (a whole home program targeting high energy users), Efficiency Vermont now offers four energy-burden programs that engage with customers experiencing various levels of energy burden across sectors of the state: an energy savings kit program, free appliance replacement, and two versions of a whole home program that targets low energy use and high energy use homes.

Using this data also helped Efficiency Vermont streamline its program qualification process in two ways. First, it changed the qualification process for the appliance program that provides free appliances to low-income Vermonters. Instead of using high electric bills to qualify, customers can now qualify based on energy burden. Already, Efficiency Vermont has seen an increase in interest and program participation. Second, Efficiency Vermont has a new qualification process that is fast and consistent with an online low-income program application process and screening tool.

Conclusion

As states strive to accelerate decarbonization and center equity in their policies, it is important that energy efficiency programs also adopt strategies that can help achieve these goals. Through using more granular data that consider the timing and locational aspects of energy use, such as EULP data, energy efficiency program administrators can better align programs with decarbonization plans. Further, program administrators can begin to use additional data to better interact with customers who are energy burdened, thereby designing equitable programs with broader customer participation.