Issue Brief: Using Data to Set Priorities and Track Success of Low-Income Energy Programs

States, localities, and utilities interested in lowering the energy bills of low-income households through energy efficiency and renewable energy have come to recognize how critical it is to understand the barriers such households face to accessing these technologies. Partners in the U.S. Department of Energy's Clean Energy for Low Income Communities Accelerator (CELICA) used metrics to help set a baseline from which they can track progress and impact, prioritize energy-saving services for low-income households according to need, determine program needs, and track performance across a multitude of energy programs focused on the low-income residential housing sector. After providing an overview of how community barriers have been used to help determine goals for low-income energy programs, this issue brief outlines specific ways to measure progress used by CELICA partners in Connecticut, California, and Minnesota.

Using Low-Income Household Participation Barriers to Help Set Goals and Measure Program Success

Low-income households generally face greater barriers to accessing energy efficiency and renewable energy than non-low-income households. Program administrators can set goals and establish indicators to measure low-income program performance. This can help with understanding whether low-income households are accessing and benefitting from cost-saving energy efficiency and renewable energy technologies. CELICA partners developed the following list of barriers they faced when delivering energy programs to low-income households.

Housing Instability: A person's mobility and housing instability can create barriers to participation (and retention) in low-income energy programs. Collecting information on enrollment in other social service programs (for example, programs offering food, housing, or medical assistance) can help the energy program stay in communication with people in each participating household. Tracking enrollment in other programs is a good substitute for directly tracking people as they move often or become homeless. By tracking enrollment in other programs, energy program administrators can track the number of participating low-income households. One pitfall of this approach, is when people move, the low-income energy program administrator or affiliated agency will often need more than just an address to keep a person enrolled to receive benefits. Adequate tracking can make it possible to follow-up on energy services at a new location and keep households engaged when they move. For example, when a participant moves, they may be able to stay enrolled in a community solar program. Programs measure the number of people reached, enrolled, and retained to track the effectiveness of enrollment efforts.

Bill Payment Challenges: Some low-income households have difficulty paying bills because they do not use checking accounts or credit cards and may struggle with getting to bill payment centers. To better recruit potential participants, low-income energy programs can measure the number of people making alternative payments, receiving assistance program benefits such as U.S. Department of Health and Human Service's Low Income Home Energy Assistance Program, or having trouble with overdue payments. Measuring people using various bill payment alternatives can help with finding additional customers and determining the amount and type of need in communities.

Geographic Dispersion: The need to travel greater distances to serve low-income households in rural places can be a barrier for both low-income program households and implementers. For rural low-income residents, the degree to which geographic distance impacts access to programs can be tracked by measuring the number of households served in rural areas and the average amount of energy saved per household or personnel time. For implementers, it typically is more challenging to deliver benefits to rural low-income customers because of the low population density and the associated higher cost per capita to deliver EE services, lack of broadband access, shortage of energy efficiency workers with expertise, and long distances required to reach households in sparsely populated areas. Measuring the number of rural

households participating in a low-income program and comparing that to participation of other populations on a per capita basis can help with measuring the success of efforts to increase access for these households. In addition, measuring the density of trained contractors per eligible household can help identify where workforce shortages may need to be addressed to ensure adequate access to services.

Jobs and Career Development: Some programs target small business access to contracting opportunities in disadvantaged communities as an indicator of success. The motivation is to train local people to work in low-income programs and be effective at serving those communities. This in turn affects access to high quality energy jobs, training, and career development for those same communities. To ensure local business engagement, job creation, and career pathways for local residents, programs can measure who accessed contracting, employment and workforce development opportunities in low-income communities.

Access to Capital: Insufficient access to capital to pay for energy upgrades can be a significant barrier to low-income energy efficiency and renewable energy projects. Measuring specific factors can help program administrators understand when programs have achieved sufficient access to financial capital for programs serving low-income households. For example, the number and quality of financing options and available funding for low-income building owners and households can help determine if incentivizing private investment capital or directly providing public financing is needed to provide affordable financing options. Evaluating the energy cost savings relative to the cost of financing may lead to determining that loan terms need to change to help ensure monthly savings exceed costs to reduce energy burden. Analyzing the degree to which credit scores are limiting access to programs for low-income households with the ability to pay for improvements can be identified and addressed through alternative underwriting criteria, such as the use of utility bill payment history. Loan interest rates for low-income housing retrofit projects and borrowers may be prohibitively high and impacting participation, so a program may decide to seek alternate financing with better terms or implement a credit enhancement to mitigate any financial risk for lenders. Acquiring lending data can be helpful to gauge success or impact of the program over time.

Program and Policy Limitations: Program design and implementation can unintentionally limit low-income household access to energy efficiency and renewable energy. For example, CELICA partners found missed opportunities to streamline available services for participating households when there are variances across different low-income programs in terms of administrative procedures, contractors, jurisdiction, funding and eligibility requirements. In response, ease of collaboration among government, utilities, community organizers, tribes, nonprofits, and the private sector may provide opportunities to broaden participation and maximize benefits to low-income participants. Also, without accurate information on low-income households such as income, housing type, housing tenure (i.e., owner occupied or renter occupied), and energy expenditures by census tracts, a program may not be targeting the real needs of households in those communities and outreach efforts may not be as effective. In addition, when non-energy benefits are not factored into the cost-benefit analysis for low-income energy efficiency programs, programs may be underreporting outcomes and missing opportunities to optimize outcomes across programs for low-income households. Finally, tracking what data is available on existing low-income programs can help to shape and improve program design. Making customer data available from one low-income program to other low-income programs can improve service delivery.

Setting Low-Income Energy Program Targets and Measuring Progress

Whereas the previous section focused on using barriers to low-income household participation to set goals, the following section describes ways that CELICA partners are measuring program progress. To understand the performance of their low-income energy programs, a group of partners in CELICA developed program indicators and metrics, using them to set targets and track progress related to their goals.

Use Low-Income Housing and Energy Characteristics to Determine Participant Outcomes

CELICA partners used the tools listed below to cross-reference data on energy use, income, housing type, and age with data on asthma, mortality, and disaster incidence, among others. Utilizing different sets of data can help with better targeting and engaging potential participants for a particular program.

Some states are creating custom tools, like the New York State Low-to-Moderate-Income Census Population Analysis Tool, and increasingly they have utilized publicly available tools developed by the U.S. Department of Energy such as the Low-Income Energy Affordability Data (LEAD) Tool and the Solar for All Map. The LEAD Tool provides state-, county-, and city-level charts and graphs, providing a breakdown of household income levels by fuel type, building type, construction year, tenure, and energy cost, including average monthly energy expenditures and energy burden. It offers the ability to compare low-income energy characteristics across multiple states or local areas. The Solar for All Map can be used to determine where vulnerable communities reside and how best to target spending of scarce resources. It provides geospatial information (i.e. maps), including data from the LEAD Tool, and data on low-income households' ability to pay for services, mortality rates, asthma frequency, home energy efficiency and solar potential, fuel prices, and susceptibility to extreme weather.

Determining Measures of Program Success

Efforts to measure success by CELICA partners focused on the following questions related to program targets, success indicators, and metrics:

Target	A particular aspect of achieving a goal, e.g., a target audience, a target amount of sales
Indicator	A variable typically used to measure program performance
Metric	A standard of measurement to record progress over time

- How should indicators be revised to improve measurement of energy efficiency and renewable energy access, investment, and resilience for low-income communities and other disadvantaged communities?
- How can the indicators best leverage existing equity indicators and data?
- Which agency, organization, or program administrator(s) should take the lead for each indicator?
- How can local priorities be most effectively integrated into the indicators?

Figure 1 represents success indicators and related metrics that CELICA partners considered valuable for measuring program progress and assisting in data-driven decision making.

FIGURE 1: Indicators CELICA Partners Found Most Valuable

Indicator	Metrics
Energy Efficiency Savings	Energy (MWh, MCF, MMBtu) and cost savings ($) for customers in aggregate or by low-income household served
Low-Income Parity	Savings across low-income and market rate programs (% of total savings)
	Market penetration rate by income band (% AMI, % FPL) statewide and in each census tract
Participation	Number of households served (#) or percent of eligible households served (%)
	Percent of participants at various income levels (% AMI, % FPL)
Housing Type	Percent participation by housing type (# by single family, mobile, and multifamily housing of different sizes and types, e.g., restricted, naturally affordable, and market-rate multifamily)
Program Resources	Total funding leveraged for energy efficiency, health and safety, and solar ($ by source and purpose)
	Amount of investment financed — housing tax credit projects, on-bill programs, etc. ($)
Energy Burden	Amount that energy burden decreased (% reduction in % of income paid for energy bills) for participating low-income households
Health and Safety	Number of homes not served due to health and safety issues and percentage that receive referrals and ultimately return for service (% homes and % frequency of health and safety issues cited)
	Health and safety issues abated (# of homes with % frequency issues abated)
Workforce Development	Contracts or jobs to locally-owned, minority-owned, women-owned, and small businesses (# and/or %)
	Number of jobs created (# by job type)
	Participation of low-income residents in the energy efficiency and renewable energy workforce (# of local workers trained and # placed into energy efficiency and renewable energy jobs)

Assess which Metrics Align with Program Goals and are Practical to Implement

In addition to identifying specific metrics like those noted in Figure 1, it is important to assess how well the metrics align with program goals and targets and to determine the availability of the data and the ability to collect it. Each organization has different reasons to consider a particular set of indicators. Sometimes an organization's decision is limited by how difficult it is to get data for a particular indicator and associated metrics. The state of California, as shown in Figure 2, chose success indicators tied to serving low-income communities and established recommendations related to making progress on each indicator.

The following section describes how CELICA partners in Connecticut, California, and Minnesota have used indicators and metrics for low-income program planning.

CELICA Partner Profile: Connecticut

The Opportunity to Scale Investment in Low-Income Communities: Connecticut's Department of Energy and Environmental Protection (DEEP) and Connecticut Green Bank, who were joint partners in CELICA, used their goal of weatherizing 80% of homes by 2030 as an opportunity to scale up their low-income energy efficiency efforts and ensure equitable access to solar across all income levels. In order to weatherize 80% of all homes by 2030, they would have to do more work on low-income households. They

focused on attracting private investment in their low-income programs including participation in the Solar for All program, which bundles energy efficiency savings agreements with rooftop solar photovoltaics (solar PV) leasing.

Goals: DEEP and Connecticut Green Bank's mission is to increase accessibility and uptake of energy efficiency and renewable energy generation source installations in both low-income and moderate-income (LI&MI) communities in the state. Connecticut's state-directed and utility-administered energy efficiency programs serve approximately 20,000 residential units per year and have averaged a minimum of 4.5 megawatts (MW) of solar installed on those same units. To ensure as many LI&MI households as possible can benefit, they sought to quantify health benefits and leverage additional funding for home health and safety improvements that would otherwise prevent homes from accessing energy efficiency and onsite renewables.

Challenges: Connecticut realized that energy inefficient and unhealthy housing places a substantial burden on LI&MI families, their communities, and the state. As such, Connecticut sought to shrink the gap in energy affordability for LI&MI communities and quantified the decrease in energy costs needed across LI&MI households to achieve an affordable level for all households, finding an "energy affordability gap" of $1,250 to $2,500 a year per low-income household.[1] This helped the Green Bank to scope the substantial size of public and private investment they would need to reduce the energy affordability gap between low-income and higher income households.

Connecticut analyzed how low-income households that would benefit the most from energy efficiency measures and health and safety interventions are the least likely to be able to afford such home improvements. In addition to subsidizing energy efficiency and renewable energy projects for low-income households, Connecticut worked to quantify the healthcare savings associated with energy efficiency and healthy homes interventions. They aimed to leverage other state program funding to address health and safety issues in low-income homes. As part of this effort, the Connecticut Green Bank completed a Green and Healthy Homes Pre-Feasibility Analysis Report and established a memorandum of understanding with multiple agencies, including the state Medicaid office, to partner on the Connecticut Green and Healthy Homes Project.

Metrics Strategy: Connecticut used data from a variety of sources to define their low-income residential sector and the marketplace for energy efficiency and solar deployment in LI&MI communities, tracking progress as part of a statewide energy data dashboard. Connecticut used the LEAD Tool to target their programs to single-family owner-occupied homes and large multifamily buildings, which, when combined, account for nearly two-thirds of the low-income housing in Connecticut. They also used information on housing vintage to target homes that had the greatest potential for savings from energy efficiency and renewable energy projects. For energy efficiency programs, the Green Bank conducted analysis at the census tract level on households that may be eligible for utility-administered programs, which provide the vast majority of funding for low-income home energy efficiency retrofits in the state. This allowed them to see if utility customers across the state were equitably participating in the program and where potential additional targeting of outreach was needed. For solar PV deployment, they visualized the data at the census tract level for the number of projects and the kW installed. This allowed them to calculate the kW installed per capita at different income levels.

Using a Nielson customer market segmentation analysis, Connecticut Green Bank gained insight into customer behavior and bias that program implementers would likely encounter. This type of analysis links consumer behaviors for shopping, financial decisions, and receptiveness to media based on neuroscience studies. This tool helped Connecticut Green Bank tailor its communications and messaging to engage

[1] Colton, R. Home Energy Affordability in Connecticut: The Affordability Gap (2016). Prepared for: Operation Fuel: Retrieved from http://www.operationfuel.org/wp-content/uploads/2016/12/2016-ConnecticutHEAG-Final.pdf

various types of customers, including low-income households. They also use maps at the census tract level to target new low-income customers for solar PV and energy efficiency projects. Using household credit score data they purchased, Connecticut Green Bank found that LI&MI households in the state generally had credit scores similar to higher income households. This supported the state's case to launch the Solar for All program, which offers bundled energy efficiency agreements and solar PV leasing with guaranteed savings.

For more information, please see the Connecticut Case Study.

CELICA Partner Profile: California

The Opportunity to Coordinate Comprehensive Low-Income Energy Solutions: As part of the implementation of state law AB350, the California Energy Commission (CEC) was tasked with leading the development of a state strategy for low-income energy equity issues. After conducting a stakeholder engagement process as part of meeting mandates for California Senate Bill 350's Low-Income Barriers Study, CEC commissioners adopted a report in late 2016, Part A: Overcoming Barriers to Energy Efficiency and Renewables for Low-Income Customers and Small Business Contracting Opportunities in Disadvantaged Communities. In this report, they specifically examined access, investment, and resiliency of low-income and otherwise disadvantaged communities.

Goals: CEC aims to continue economic growth and to strengthen the resiliency of California's low-income communities by implementing recommendations and policies included in CEC's barriers study. To that end, they developed an energy equity framework to measure access to energy efficiency and renewable energy. Indicators of program success included access, investment, and resiliency metrics. Access metrics included product selection, financing, location, and small-business contracting opportunities in California's low-income and otherwise disadvantaged communities.

Challenges: The CEC requested feedback from stakeholders on the indicators that had been selected as well as available data sources. They sought assistance with designing a community engagement approach around data gathering and communications, collaborating on data sharing with a local utility, and identifying trusted contractors to track metrics and report on the indicators for the state.

Metrics Strategy: The CEC used energy equity indicators to create recommendations (as shown in Figure 2), establish a baseline, and track progress on the performance of energy efficiency and renewable energy programs in low-income and disadvantaged communities. This approach requires collection and synthesis of data across a wide variety of sources to develop a solid foundation for tracking progress over time. CEC used information and resources provided by DOE's LEAD Tool to quantify the energy burden faced by residents of each county and municipality in the state and to identify where interventions were needed to reduce the use of non-renewable heating fuels and associated health impacts. To track progress on legislated low-income energy programs, CEC chose to measure success in low-income and disadvantaged communities by quantifying progress in three areas: 1) access, 2) investment, and 3) resiliency. To measure access to energy efficiency and renewable energy, they track product selection options, job creation, expansion of small business contracting opportunities, and non-debt finance offerings. To calculate investment, CEC measures the increase of energy efficiency and renewable energy investment in low-income and disadvantaged communities, including technology development and demonstration funding, infrastructure investments, and funding for emergency preparedness, technical assistance, and local capacity building. Capacity building takes into account workforce and small business development, outreach, and education for energy efficiency and renewable energy. Resiliency is measured by assessing energy reliability, energy affordability, and health and safety, and is defined as energy services supporting the ability of local communities to recover from grid outages and enjoy affordable energy in a changing climate.

FIGURE 2: How California Uses Progress Indicators to Help Develop a Low-income Strategy

Objective	Indicator	Recommendation
Access	Number Served	a) Establish regional outreach and technical assistance one-stop shop pilots; and b) Investigate consumer protection issues for low-income customers and small businesses in disadvantaged communities
	Small Business Contracts	Conduct a follow-up study for increasing contracting opportunities for small businesses located in disadvantaged communities
	Energy Efficiency and Renewable Energy Jobs	Formulate a statewide energy efficiency, renewable energy, and workforce development strategy
Investment	Amount Invested	a) Fund research and development to enable targeted benefits for low-income customers and disadvantaged communities; and b) Enhance housing tax credits for projects to include energy upgrades during rehabilitation
	Energy Efficiency Savings	Develop a new financing pilot program to encourage investment for low-income customers
	Rooftop Solar PV	Expand funding for solar PV and solar thermal offerings for low-income customers
Resilience	High Energy Bills	Encourage collaboration with community-based organizations in new and existing programs
	Health and Safety Abated	Organize a multiagency task force to facilitate coordination across state-administered programs
	Community Energy Resilience	Enable community solar offerings for low-income customers

CELICA Partner Profile: Minnesota

The Opportunity to Reduce Energy Burden for More Households: Out of over 400,000 income-eligible Minnesota households, approximately 115,000 receive federal HHS's Low Income Home Energy Assistance Program assistance annually in Minnesota; a little under 2,000 typically receive weatherization assistance services in the state.

Goals: The goal of the Minnesota Department of Commerce (MNDOC) was to develop a comprehensive approach to weatherization and add solar PV to significantly reduce low-income residential energy burden. In some parts of the state, the state reported that the average energy burden of low-income households was over 40% as compared to the national average of about 8.2%.[2]

MNDOC wanted a system of metrics to evaluate a new initiative, "Connecting Low-Income Communities through Efficiency and Renewable Sources" (CLICERS). CLICERS's three technical assistance goals for low-income communities were: 1) develop a deeper understanding of stakeholders and best practices; 2) develop models for integrating solar initiatives with existing energy programs while ensuring the same or greater number/depth of service is maintained; and 3) determine the impact of integrating solar PV generation with energy efficiency in income-eligible communities.

Challenges: MNDOC decided to develop a tool to analyze how to maximize impact for each household served by state-supervised programs. The tool could be used by the state to prioritize use of limited funding to administer energy efficiency and renewable energy programs for low-income households and to develop funding proposals around specific target audiences. Specifically, the goal was to understand what

[2] US Department of Energy State and Local Solution Center. https://www.energy.gov/eere/slsc/low-income-community-energy-solutions

combination of measures have the greatest impact on low-income household budgets and how often there was a cost savings for these households associated with switching from oil or gas to electric heat.

Metrics Strategy:
Through the CLICERS project, MNDOC determined that 11 characteristics and related sub-characteristics were important to consider related to household energy burden (as shown in the box at right). MNDOC plans to track these metrics in a comprehensive tool.

Metrics for Household Burden Impacts:

- Geography (urban rural and suburban)
- Percent energy burden (for various income bins)
- Billing structure (taking into consideration direct residential rates, rent, subsidized rates, time of use, demand side management, and community solar gardens)
- Fuel type (including fuel switching instances)
- Energy measures (energy efficiency, conservation, solar integration, health and safety measures, and behavioral change)
- Barriers to access (availability of resources, language, transportation, transiency, and knowledge of resources)
- Income type (fixed, variable, variable with potential to increase)
- Dwelling type (single-family, multifamily, and manufactured)
- Income level (low income, 200% FPL, 150% FPL, 100% FPL)
- Age of housing (pre-1940, 40-59, 60-79, 80-95, and 96+)
- Ownership structure (owner-occupied, renter utility customer, and renter non-utility customer)

References and Resources

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