Reaching Rural Communities with Energy Efficiency Programs

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Executive Summary

Rural areas have unique energy needs that make it challenging for rural utilities, state energy offices, and other program implementers to deliver energy efficiency to customers. The infrastructure, energy use, and fuel mix in rural areas often differ from their metropolitan counterparts. Rural populations and housing stock are less dense, so utilities serve fewer customers per mile of line (NRECA 2017). Rural energy efficiency stakeholders often include smaller utilities, distinctive rural-based organizations, and agricultural customers. Furthermore, rural households in every region of the United States have a higher median energy burden than the median in their region.

This study examines rural energy efficiency programs. We use an inclusive definition of *rural* by considering programs delivered to communities with fewer than 50,000 inhabitants. We share lessons learned from a variety of program leaders across the country who have implemented energy efficiency programs across customer segments.

PROGRAM IMPLEMENTERS

Several types of entities provide energy efficiency services to rural communities, including municipal utilities (munis), electric cooperatives (co-ops), and investor-owned utilities (IOUs). The programs vary based on their business model, regulatory oversight, and governance. In some states, a single statewide program administrator delivers efficiency programs to customers across a state, sometimes with specific directives to serve those outside major metropolitan areas. Some state energy offices (SEOs) have identified rural communities as areas where energy efficiency needs are greatest and have developed programs explicitly to serve these customers. Universities—including cooperative extension services at land-grant universities and Industrial Assessment Centers (IACs)—are often a technical resource for implementing rural energy efficiency programs, especially for agricultural and manufacturing facilities. Private efficiency program implementers and energy service providers often work with state energy offices and utilities to implement efficiency programs. Some specialize in serving rural populations.

CHALLENGES

Low population density. Rural customers are located farther apart and in more remote locations, making it challenging to inform customers about programs, access communities to install energy efficiency measures, and keep program delivery costs low.

Lack of broadband access. Many rural Americans lack broadband access, limiting efficiency program marketing opportunities and broadband-enabled energy efficiency measures.

Customer reluctance. Some rural customers are unfamiliar with energy efficiency programs and are skeptical that their utility would want to help them reduce energy usage. Farmers in particular may have other priorities.

Shortage of qualified local energy efficiency workers. Program implementers may have difficulty finding local, well-trained workers for rural efficiency projects.

Financial constraints. Smaller utilities such as co-ops and small munis are often unable to allocate sufficient funding and capacity to meet the efficiency needs of their communities.

High costs. IOUs and co-ops may have high program delivery costs due to long driving distances for contractors to get to customers.

Insufficient outcome data. Most munis and co-ops have limited resources and are not regulated at the state level; therefore their efficiency program performance data are often less robust and accessible.

CASE STUDIES

This report highlights six energy efficiency programs serving rural areas across the country, including a summary of offerings, available performance metrics, notable elements, and delivery challenges. For example, Oncor, with delivery by Lime Energy, finances lighting and refrigeration upgrades for small businesses outside the Dallas–Fort Worth metro area. The Southern Minnesota Municipal Power Association offers its member utilities energy efficiency program design, development, and marketing services. The Florida Office of Energy has offered several energy efficiency and renewable energy programs for agricultural producers across the state. Pacific Gas and Electric helps local governments improve energy and water efficiency and develop energy and climate-related goals. Co-Mo Electric Co-operative, Inc. has expanded high-speed Internet infrastructure for its members and offered energy-efficient appliance rebates and energy management tools. Efficiency Vermont has incorporated energy efficiency measures into local economic revitalization projects.

PROMISING TRENDS

State policy. To drive energy efficiency investments for rural customers, some states include co-ops and munis in their energy efficiency resource standards (EERS), incentivize rural efficiency program delivery, establish rural-focused efficiency policy goals, and convene rural program implementers to share lessons learned.

Rural-targeted programs. Whereas most program implementers serving larger jurisdictions do not differentiate between programs for rural and nonrural customers, others like Oncor and the Florida Office of Energy do target customers in nonmetropolitan areas.

Program funding. Programs are drawing on a range of resources, including ratepayer, state, federal, private, and philanthropic funds.

Community engagement and partnerships. Engagement with rural community partners contributes to the success of rural energy efficiency programs. Key partners include local soil conservation districts, community-based nonprofits, chambers of commerce, and cooperative utility associations.

Program marketing. Contractors and retailers can help market programs to rural customers. Implementers use various marketing strategies depending on customers' access to broadband.

Increasing broadband access. Co-ops deploying broadband infrastructure can give their members better access to energy usage data and energy efficiency program opportunities.

Economic development. Implementers may design programs with rural economic development in mind and develop metrics to measure the programs' economic and workforce development benefits.

Energy efficiency workforce development. Program implementers are taking various steps to develop the local efficiency workforce, including working with and training a select pool of contractors and encouraging them to integrate efficiency into all the work they do.

Direct-install programs. Several rural efficiency program implementers preapprove a set of measures that contractors can install at the time of visit to the customer, potentially driving higher participation.

Customer education and assistance. Some program implementers provide energy efficiency–focused education to their customers and help them identify and apply for funding.

Combining energy efficiency with other measures. Packaging energy efficiency, renewable energy, and/or water efficiency measures can unlock additional value for customers.

RECOMMENDATIONS

- States should enact policies that drive rural energy efficiency investments.
- State energy offices and program implementers should use state, federal, and utility resources to fund programs.
- Implementers should engage local partners to help develop and carry out programs.
- Program marketers should use a variety of online and traditional channels depending on customers' access to broadband.
- Implementers should consider local economic development when designing programs and integrate efficiency into broader community development efforts.
- Implementers should develop a pool of contractors to carry out energy efficiency projects and join with state energy offices and utilities in training them.
- Co-ops should consider deploying broadband to their members and developing customer energy management platforms.
- Programs should offer water conservation and renewable energy measures alongside energy efficiency.
- Co-op and muni associations should consider hiring staff and combining resources to offer efficiency programs on behalf of their members.
- Implementers should bundle low-cost efficiency measures with ones that achieve deeper energy savings. Regulators should consider exempting rural programs from cost-effectiveness tests.
- Implementers and evaluators should quantitatively evaluate program performance even when state law does not require them to do so.

Introduction

Rural areas have unique energy needs that make it challenging for utilities, state energy offices, and other program implementers to deliver energy efficiency to rural customers. The infrastructure, energy use, and fuel mix in rural areas often differ from their metropolitan counterparts. Rural populations and housing stock are less dense, so utilities serve fewer customers per mile of line (NRECA 2017). Rural energy efficiency stakeholders often include smaller utilities, distinctive rural-based organizations, and agricultural customers.

Rural households in every region of the United States have a higher median energy burden than the median in their region.[1] Using data from the 2015 US Department of Housing and Urban Development (HUD) American Housing Survey (AHS)—a biennial Census Bureau survey of household income and utility bill data—American Council for an Energy-Efficient Economy (ACEEE) research shows that the median energy burden for rural areas in 2015 was 4.4%. This was 42% above the median metropolitan energy burden and one-third higher than the overall national rate of 3.3% (Ross, Drehobl, and Stickles 2018). Figure 1 shows the median energy burden for rural, metropolitan, and all households by census region.

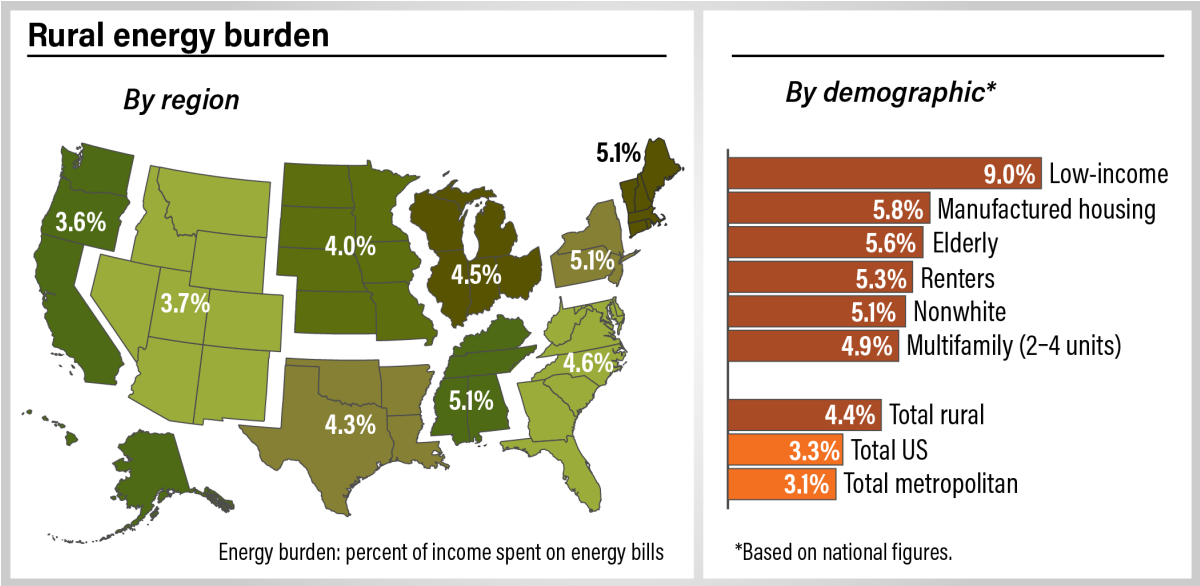

Figure 1. Median energy burdens for rural households by census region and by demographic group. Energy costs in this analysis do not include transportation costs or water bills, although those costs represent a large portion of household expenditures in rural areas. ***Source:*** **Ross, Drehobl, and Stickles 2018.**

This report fills a gap in the literature by identifying several successful rural energy efficiency programs. We draw on interviews with a range of program implementers across rural and small-town residential, commercial, industrial, agricultural, and public sectors. For each highlighted program, we summarize its offerings, identify challenges, and describe notable program elements. The target audience for this report includes investor-owned utilities, rural cooperatives, small-town municipal utilities, state agencies, and other program administrators involved in planning and implementing energy efficiency

[1] Energy burden is the percentage of household income that is spent on energy bills. See Drehobl and Ross 2016 for more detail.

programs in rural areas and small towns. Our goal is to help these entities design, implement, and refine their own successful energy efficiency programs for rural customers.

DEFINING RURAL COMMUNITIES

The federal government has 15 definitions of rural communities that give varying weight to population size and density, proximity to urban areas, and commuting flows (USDA 2018b). These definitions set the criteria for inclusion in rural data collection by agencies such as the US Census Bureau and determine eligibility for federal grants and loans. Various program implementers and funders contributed to the efficiency program case studies in this report, so the definition of *rural* may vary by case. For our own research, we have used the US Department of Agriculture's (USDA) Rural-Urban Commuting Area classification, which defines rural America as "nonmetro," i.e., outside a metropolitan statistical area (MSA).[2] By this definition, 14% of the US population and 72% of the national land area are rural, as seen in figure 2 (USDA 2016a; Ross, Drehobl, and Stickles 2018).

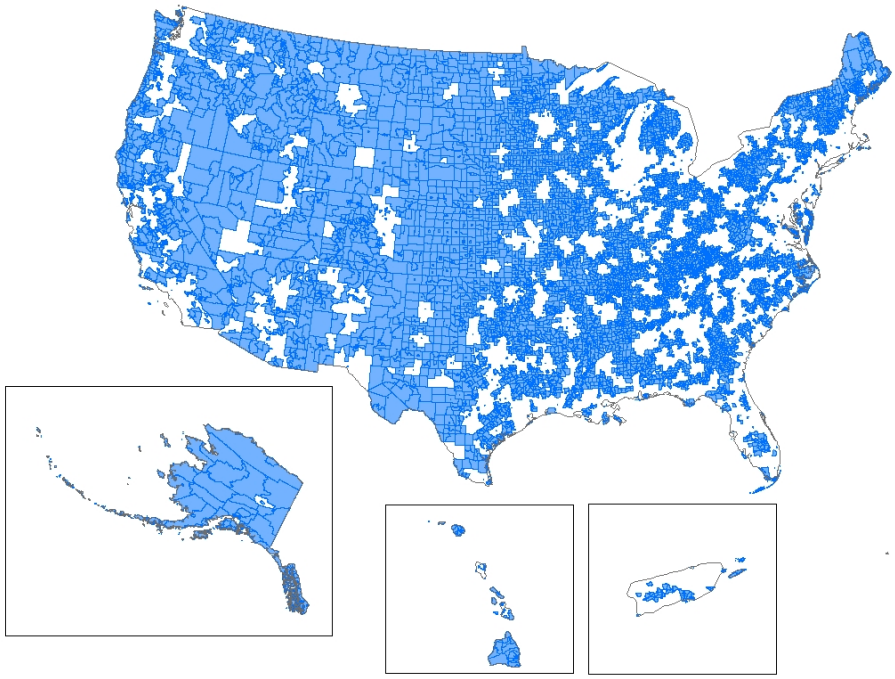

Figure 2. Nonmetropolitan or rural census tracts of the United States.
Source: Ross, Drehobl, and Stickles 2018.

CHARACTERISTICS OF RURAL AND SMALL-TOWN COMMUNITIES

Rural America comprises an array of energy end users, including small towns with older homes, energy-intensive manufacturing facilities, and family farms and ranches of varying size. The energy, economic, and societal needs of rural and small-town communities are unique to their geography. In delivering energy savings to these customers, utilities, state

[2] MSAs have a population of 50,000 or greater. See USDA 2016c for more information on metro and nonmetro designations.

agencies, and other efficiency program implementers should consider the following demographic and economic attributes.

Rural Customer and Energy Characteristics

Rural housing stock is geographically dispersed and primarily composed of larger, single-family homes as well as manufactured houses that predate 1980 building codes (Census Bureau 2018a). About 41% of households in rural communities have incomes below 200% of the federal poverty level (FPL) compared to 33% of households in urban areas (Census Bureau 2015; Ross, Drehobl, and Stickles 2018). Almost one-third of rural homes experience energy insecurity (EIA 2017).[3] For these reasons and others, rural customers stand to benefit disproportionately from the energy savings, bill reductions, and comfort improvements that efficiency programs can provide.[4]

The fuel use patterns of rural households are distinct from those in urban areas, and they vary by region (EIA 2011). While natural gas is the foremost heating fuel in much of the country, it is less common for rural households due to the high cost of extending distribution infrastructure to remote, sparsely populated regions. About 83% of households with propane heating are in rural areas, and mobile homes are twice as likely as traditional homes to use propane. Ninety percent of rural households in the Midwest use propane as their primary heating source (EIA 2011), whereas rural homes in the Northeast use more fuel oil for heating than do those in other regions.

Rural businesses, institutions, and farms also have distinct energy use characteristics. Many small and medium-sized businesses support the rural economy, consuming 44% of US commercial building energy (NREL 2018). Savings from energy efficiency could make a big difference to their bottom line. Rural facilities such as manufacturing plants and the agricultural industry represent an even more energy-intensive sector that could benefit from efficiency's cost reductions, improved productivity, and other nonenergy benefits (Russell et al. 2015). The US agriculture industry consumes more energy than 40 million homes combined, and the high cost of meeting peak irrigation load can lead rural utilities to increase energy prices (EIA 2014). Efficiency benefits all sectors by reducing electricity costs.

Economic Drivers

Rural economies tend to be less diversified than their metropolitan counterparts. According to the US Department of Agriculture (USDA), the national rural economy can be divided into seven industry groups: farming; mining, forestry, fishing, and related; construction; manufacturing; trade, transportation, and utilities; services; and federal/state government. As shown in figure 3, farming, mining, manufacturing, and government support rural economies more heavily than they do metropolitan ones. The services sector (finance, insurance, real estate, and other professional services) accounts for over 40% of the rural economy and is the largest of these groups (USDA 2017b).

[3] Household energy insecurity includes the loss of access to electricity and the inability to pay for heating or cooling required to maintain a healthy home temperature (Murkowski and Scott 2014).

[4] See Ross, Drehobl, and Stickles 2018 for a more detailed explanation of rural housing characteristics and differences across US Census regions.

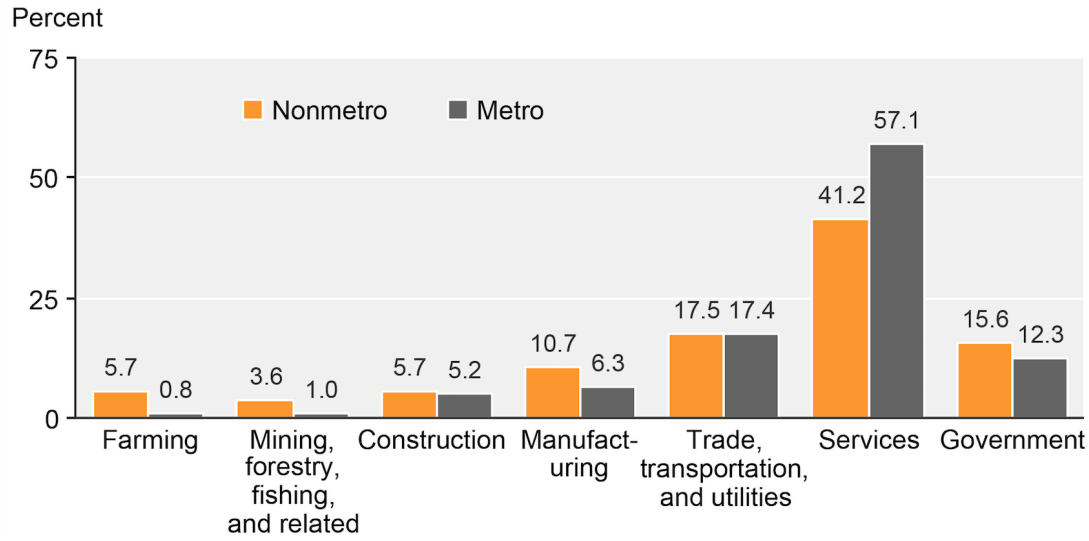

Figure 3. Distribution of nonmetro and metro employment by industry group, 2015. Includes full- and part-time jobs. *Source:* USDA 2017b.

Demographic Trends

A shift in the rural demographic landscape is under way. As shown in figure 4, rural counties experience slower population growth than more densely populated areas. Since 2000, rural counties have grown 3% while urban and suburban areas have grown 13% and 16%, respectively. Rural counties have a lower share of residents under 18 and a higher share of residents over 65 (Parker et al. 2018).

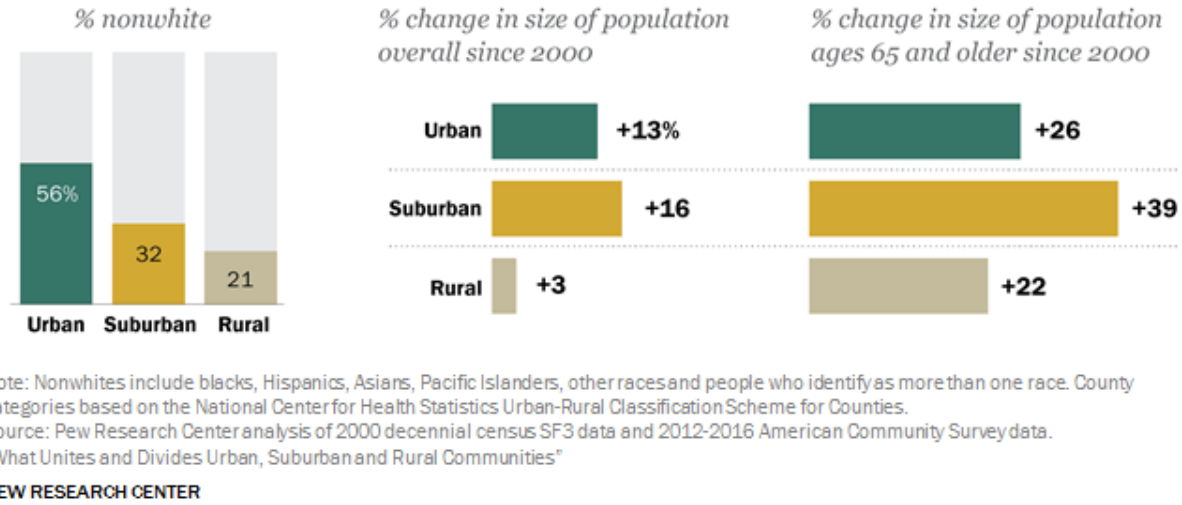

Figure 4. Demographic trends across urban, suburban, and rural counties. *Source:* Parker et al. 2018.

Report Method and Scope

This study examines rural and small-town energy efficiency programs. We use an inclusive definition of *rural* by considering programs delivered to communities with fewer than 50,000 inhabitants. We include efficiency programs delivered across customer segments by a variety of actors.

To collect information about rural programs, we conducted 29 interviews in two phases. We first interviewed a range of knowledgeable stakeholders (nonprofits, utilities, utility associations, federal officials, and third-party program implementers) on rural energy needs and efficiency program delivery strategies. We then reached out to experts with firsthand experience designing and delivering rural efficiency programs, including utilities (investor-owned, municipal, and cooperative), utility associations, state energy offices, statewide program implementers, and a community development financial institution. We based our selection of these program implementers on independent research and recommendations from our first round of interviews. We asked these experts about challenges, program design features, and metrics of success for rural efficiency program delivery.

We then identified several programs with key lessons learned to highlight as case studies. To provide diverse examples, we chose programs across the following criteria:

- Geographic diversity
- Program implementer diversity (e.g., investor-owned utilities, municipal utilities and electric cooperatives, state energy offices, statewide program implementers, and third-party implementers)
- Customer segments: residential; commercial and industrial; agricultural; and municipalities, universities, schools, hospitals (MUSH)
- Fuel type (electricity and nonelectricity)
- Funding source and/or financing model

In addition, we sought to highlight programs with performance data, robust efficiency measures (i.e., beyond lighting and education), a broader economic or workforce development mission, and/or a connection to policies that drive rural efficiency investments.

Several research topics fall outside the scope of this report, including rural-focused transportation efficiency programs, rural community adoption and enforcement of building energy codes, and energy savings performance contracting programs. We did not review demand-response programs, although we look forward to exploring program models that integrate energy efficiency, demand response, and distributed energy resources to benefit rural communities. At the end of the report we discuss specific questions on these topics and others that could guide future research.

Rural Program Implementers

Several types of entities provide energy efficiency services to rural communities. Program scope and funding can vary depending on the type of implementer.

UTILITIES

In 2016, utilities across the country spent approximately $7.6 billion on electric and gas efficiency programs (Berg at al. 2017). Most of this spending was reported by investor-owned utilities (IOUs), although municipal utilities (munis) and electric cooperatives (co-ops) across the country also fund and implement some efficiency programs. Table 1 summarizes some of the differences between munis, co-ops, and IOUs.

Table 1. Business model, regulatory oversight, and governance by electric utility type

Feature	Municipal utilities (munis)	Electric cooperatives (co-ops)	Investor-owned utilities (IOUs)
Electricity customers served*	15%	13%	68%
Customers per mile of line (density)	48	8	34
Business model	Not for profit, community owned	Not for profit, member owned	For profit, shareholder owned
Regulation by state public service commission	Very limited instances	Some	All
Governed by	Elected/appointed boards (mayors, city council members, citizens)	Member-elected boards	Private boards

* Power marketers serve the remaining 4% of customers, primarily in Texas (APPA 2018). *Source:* APPA 2018; National Rural Utilities CFC 2017; NRECA 2018a.

Several types of utilities provide energy efficiency programs to rural customers for a variety of reasons: to align with state policies such as energy savings goals, to provide a beneficial customer service, and to address issues of energy affordability.

Investor-Owned Utilities

Many IOUs offer the same programs to customers in rural and urban communities. However Wheeless, Grant, and Keegan (2016) note that although energy efficiency programs may theoretically be available in both rural and urban areas, IOUs and other utilities tend to serve urban customers more readily due to the high costs of provision in areas with low population density. Some IOUs, regulators, and other stakeholders have encouraged programs that specifically address barriers to rural participation, and some IOUs design and implement programs tailored to rural customers within their service territories. IOUs typically fund these programs using a charge collected from ratepayers, although some shareholder investments may also go to energy efficiency, weatherization, and bill assistance programs.

Munis and Co-Ops

In total, 836 member-owned electric distribution co-ops serve the majority of rural areas nationally (National Rural Utilities CFC 2017). While munis typically serve small towns, several large public power utilities serve more metropolitan areas.[5] Because state regulators do not usually oversee munis and co-ops, they are typically not subject to the same rules as IOUs, including energy savings goals and efficiency program evaluation requirements. Instead, munis and co-ops may invest in energy efficiency for a variety of other reasons. Distribution co-ops, for example, might offer programs to reduce the amount of power they

[5] Twenty-six large public power utilities serve metropolitan areas across the United States. Some of these utilities own generation, transmission, and distribution facilities and sell power directly to consumers, while others primarily sell wholesale power to municipal and cooperative utilities within their region (SPCC 2017).

purchase from generation-owning utilities or to lower energy costs for their members (NRECA 2018b).

A 2015 survey of 23 munis delivering energy efficiency services found that most did so because their customers liked the fact that they made these investments. Other high-ranking factors included the low cost of energy efficiency as a supply-side resource, efficiency's beneficial impact on local economic activity, and climate or energy goals set by local governing bodies (Kushler et al. 2015).

Resources and capacity can sometimes be more constrained for munis and co-ops than for IOUs. Limited staff and program dollars can make it difficult to develop and deploy efficiency programs to adequately serve residents and businesses. Moreover, many public and member-owned utilities face declining electricity sales due to shrinking customer bases, weather changes, unfavorable rate structures, and long-unchanged fixed costs. However many still want to offer energy efficiency programs to customers due to other benefits, such as increased customer satisfaction and energy affordability.[6]

Statewide associations can help public utilities fill training and resource gaps and more effectively deliver efficiency programs to their members and customers. For example, the Iowa Association of Municipal Utilities partnered with the Iowa Economic Development Authority in a pilot program to educate small communities and munis on energy efficiency investments and behaviors (B. Selinger, team leader, Iowa Economic Development Authority, pers. comm., May 2018). Similarly, 65 rural generation and transmission (G&T) co-ops provide electricity to local distribution co-ops and sometimes help their member cooperatives deliver energy efficiency programs (National Rural Utilities CFC 2017). The Arkansas Electric Co-operative Corporation (AECC), which delivers wholesale energy to 17 distribution co-ops, implements a statewide energy efficiency program on behalf of its member cooperatives. AECC handles all administrative aspects of the program, including managing trade allies, tracking and reporting, and quality control. AECC also splits the incentive costs of the residential efficiency program with its local distribution co-ops (M. Ross, energy efficiency manager, AECC, pers. comm., April 2018).

Touchstone Energy Co-operatives is an alliance of more than 750 member-owned cooperatives in 46 states. It offers it members three standardized energy efficiency programs that focus primarily on education and knowledge building: the Home Energy Adventure Tour (a web-based education tool for residential customers); the Home Energy Efficiency Analysis Tool (H.E.A.T.), which offers more details on options for making efficiency upgrades; and the Business Energy Advisor, which provides a series of calculators and articles to help business customers weigh efficiency options (Touchstone Energy Cooperatives 2018).

STATEWIDE PROGRAM ADMINISTRATORS

In some states, a single program administrator delivers efficiency programs to customers statewide, typically leveraging dollars from IOUs' ratepayer-funded energy efficiency

[6] The National Rural Electric Co-operative Association (NRECA) maintains a map of their distribution and generation and transmission co-op members promoting and/or offering efficiency and demand-side management programs: www.co-operative.com/content/public/maps/energyefficiency/index.html.

programs. Examples include the New York State Energy Research and Development Authority (NYSERDA), the Delaware Sustainable Energy Utility, Focus on Energy in Wisconsin, Energy Trust of Oregon, Efficiency Vermont, and Efficiency Maine Trust. Due to their larger service territory, they can have more resources to invest in programs specifically designed for customers in small towns and rural areas.

Several statewide program administrators have specific directives to serve customers outside major metropolitan areas. For example, Efficiency Vermont has a geographic equity requirement, which stipulates that a certain minimum of total resource benefits be delivered to each county across the state (Efficiency Vermont 2018).[7] NYSERDA, through its recently launched Community Energy Engagement Program, has a locally based community energy adviser for each of its 10 Economic Development Regions who connects community members with efficiency and renewable energy financing options and project support (NYSERDA 2017, 2018).

STATE ENERGY OFFICES

State energy offices (SEOs) also play a key role in providing energy efficiency programs to rural customers. Some SEOs have identified rural communities as areas where energy efficiency needs are greatest and have developed programs explicitly to serve these customers. For example, the Iowa Economic Development Authority (IEDA) released an energy plan in late 2016 that targeted support for rural and underserved communities. IEDA then developed a two-year pilot program to be delivered jointly with the Iowa Association of Municipal Utilities (IAMU). As part of this program, IEDA has funded a Regional Energy Services Specialist to coordinate IAMU's efficiency and distributed renewable programming, including several pilot programs and incentives in Summer 2018 (B. Selinger, Iowa Economic Development Authority, pers. comm., May 2018; J. Caron, regional energy services specialist, Iowa Association of Municipal Utilities, pers. comm., June 2018).

Some SEOs serve states where the majority of the population lives and works in rural areas or small towns, which account for most of the land area. In Nebraska, for example, the energy office does not develop specific rural programs, but since most of the state is rural, all its programs consider barriers to rural participation. The state's successful and long-running Dollar and Energy Savings Loan (DESL) program encourages small-lender participation through a requirement that lenders be chartered in Nebraska. Because most of the larger national banks in the state are not eligible to participate in the program, the DESL program is very popular among smaller banks (including those serving rural areas), which offer the low-interest loans as a value-added product (D. Bracht, director, Nebraska Energy Office, pers. comm., March 2018). The financing program serves customers across all sectors, including agriculture, business, multifamily, schools, and local governments, and even offers loans for energy-efficient home purchases (Nebraska Energy Office 2018).

[7] By our definition, the entire state of Vermont qualifies as rural, as the population of its largest city is under 50,000 (Census Bureau 2018b).

UNIVERSITIES

Universities are an important technical resource for implementing rural energy efficiency programs, especially for agricultural and manufacturing facilities. Land-grant universities often support cooperative extension services, which provide resources and tools focused on energy efficiency and renewable energy for agricultural operations.[8] Extension services may also provide resources for other rural energy users. For example, the University of Minnesota Extension includes a housing technology team that provides resources on efficient housing technologies. The University of Minnesota Extension also partners with regional institutions such as the Great Plains Institute and state agencies, including the Department of Energy Resources, to provide clean energy resources through the Clean Energy Resource Teams (CERTs) program. The University of Minnesota oversees five of the state's seven CERTs, organizing efficiency campaigns, identifying efficiency opportunities and offering tools for implementation, and providing financial assistance for clean energy project development (CERTs 2018).

The US Department of Energy (DOE) funds 28 Industrial Assessment Centers (IACs) at universities across the country. IACs provide no-cost energy assessments to small and medium-sized manufacturers within a 150-mile radius of the host university. IAC assessments typically identify about $150,000 in energy savings opportunities, with manufacturers on average implementing $50,000 worth over the following year (DOE 2018a). While IACs do not explicitly target rural areas, they serve small and medium-sized manufacturing facilities, which are particularly important to the health of rural economies (USDA 2017a; ACEEE 2018a). In early 2017, DOE announced an effort to extend funding of $4 million to IACs in underserved areas (DOE 2017).

PRIVATE-SECTOR IMPLEMENTERS AND ENERGY SERVICE PROVIDERS

Private companies also implement energy efficiency programs for rural and urban customers, working on behalf of a utility, state energy office, or other party, and acting as an agent for the program. Energy service providers work for the customer on a fee-for-service basis. For example, Lime Energy offers a small business direct-install program that many utilities leverage to reach their rural customers (A. Procell, president and CEO, Lime Energy, pers. comm., April 2018). EnSave, a private energy services company specializing in agricultural programs, has designed and implemented efficiency programs for IOUs, SEOs, and other state agencies. EnSave also regularly partners with nonprofit agencies to administer programs and is a service provider for the USDA Natural Resources Conservation Service (NRCS) (C. Metz, CEO, EnSave, pers. comm., February 2018).

Program Challenges

From our interviews with utilities, utility associations, state energy offices, and third-party efficiency program implementers, we identified several common barriers to delivering energy efficiency to rural communities. These challenges, and their corresponding solutions, vary by program implementer type and target customer segment. However these hurdles

[8] Cooperative extensions provide nonformal educational opportunities to agricultural producers, small business owners, consumers, families, and young people on a variety of topics, including energy services (USDA 2018a). Land-grant universities were originally established to teach agriculture, military tactics, mechanical skills, and classical studies

illustrate some of the important program design considerations in saving energy for rural residents, businesses, farmers, and industrial customers.

LOW POPULATION DENSITY

Rural customers are often widespread and in remote locations, making it challenging to inform them about programs and to access communities to install efficiency measures (S. Fletcher, senior communications and customer service manager, Energy Trust of Oregon, pers. comm., April 2018; E. Chu, supervisor, Pacific Gas and Electric, pers. comm., July 2018). Delivering and scaling energy efficiency programs is particularly challenging for utilities serving rural communities because low population density may mean higher program cost per capita. This problem is exacerbated for cooperative utilities, who serve fewer customers per mile of line than IOUs and munis, as shown in table 1. IOUs can spread administration and overhead costs across numerous job sites, while co-ops have higher overhead costs per job completed. Private implementers often work with IOUs to streamline efficiency program design and delivery. However they indicated that working with individual co-ops is not always economical because their programs target fewer customers and are less scalable (A. Procell, Lime Energy, pers. comm., April 2018).

LACK OF BROADBAND ACCESS

Americans living in rural areas have less access to broadband than those living in urban areas. The Federal Communications Commission (FCC) reported that in 2016, 69% of rural Americans had access to broadband, compared to 98% of Americans in urban areas. Telecommunication companies have been slow to move into the rural broadband market, finding it cost prohibitive to serve sparsely populated areas (Chambers 2016). The lack of rural broadband not only impedes efficiency program marketing but also hampers advanced energy management and other energy savings strategies across the residential, commercial, and industrial sectors.

CUSTOMERS WITH LIMITED EXPOSURE

Our interviews revealed that rural customers may be unfamiliar with energy efficiency programs and how they translate into energy and cost savings. When these customers think about energy, renewables may be the first thing that comes to mind. Small commercial customers may be skeptical that their utility would want to help them reduce energy usage (D. Ginn, sales manager, MainStreet Efficiency Program, Oncor, Lime Energy, pers. comm., April 2018).

Energy efficiency may also be a low priority for some rural customers. Farmers, for example, are often more preoccupied with soil quality and water availability (W. Holmes, director of strategy and development, Southeast Energy Efficiency Alliance, pers. comm., July 2018). While they stand to benefit from saving energy, farmers might not be able to participate in an energy efficiency program taking place in the middle of their growing season. Local government officials also might have full-time jobs outside of public service and will therefore only be accessible certain days of the week. These challenges are not necessarily distinct to rural communities, and they transcend customer classes and location.

SHORTAGE OF LOCAL ENERGY EFFICIENCY WORKERS AND LACK OF EXPERTISE

Programs may have difficulty hiring qualified local energy efficiency workers to serve rural areas (Ferguson 2018). This workforce challenge may be attributed in part to a broader population shift in rural America. The national rural population declined between 2010 and 2016 as younger inhabitants moved to urban areas, leaving an aging workforce (Cromartie 2017). In Nebraska, for example, new home construction in rural communities can be more expensive because the number of available contracting firms is limited, and they are generally smaller and focused on individual residential projects rather than larger housing development (D. Bracht, Nebraska Energy Office, pers. comm., March 2018). Pacific Gas and Electric (PG&E) and the Sierra Business Council found that after training efficiency program implementation staff, many would leverage their new skills and certifications and find jobs elsewhere. In Oregon, local contractors are sometimes unwilling to serve outside of a given driving radius, which can leave some customers without a contractor to install efficiency measures or equipment (S. Fletcher, Energy Trust of Oregon, pers. comm., April 2018).

Aside from the general shortage of workers, the rural workforce lacks specialized energy efficiency professionals. To take one example, there are over 31,000 certified energy managers (CEMs) across the country, but the entire state of Mississippi has only one (AEE 2018). In addition, rural facility operators may have too many responsibilities to be able to focus on energy efficiency (R. Sobin, senior program director, National Association of State Energy Officials, pers. comm., July 2018). For these reasons and more, implementers may sometimes need to source contractors from the nearest metropolitan center rather than supporting the local rural economy.

FINANCIAL CONSTRAINTS

Utilities serving rural areas also face barriers in accessing the technical and financial resources needed to design and implement tailored energy efficiency programs. Smaller utilities such as co-ops and small munis are often unable to allocate sufficient funding and capacity to meet the efficiency needs of their communities. As a result, these entities face difficulty affording third-party energy efficiency program operators or consultants, and staff members are left to design and implement programs on their own (J. Cross, on-bill financing project manager, Environmental and Energy Studies Institute, pers. comm., July 2018). Co-ops collect an average revenue of $16,000 per mile of line, compared to $75,500 for investor utilities and $113,000 for municipal utilities (NRECA 2017). Even when efficiency resources do exist, such as loans provided to rural utilities through USDA, CoBank, or the National Rural Utilities Cooperative Finance Corporation (NRUCFC), utilities may have difficulty navigating the loan application process (H. Vargason, business development and energy project manager, Natural Capital Investment Fund, pers. comm., May 2018; J. Lowery, member, board of directors, Southern Economic Development Council, pers. comm., May 2018; K. Pheil, technology development team, USDA Natural Resources Conservation Service, pers. comm., May 2018; F. Petok, energy program specialist, USDA Rural Development, pers. comm., May 2018 ; J. Cross, Environmental and Energy Studies Institute, pers. comm., July 2018).

HIGH COSTS

Another challenge faced by IOUs and their program implementers is designing rural efficiency programs that meet cost-effectiveness requirements. Labor costs for programs that

require contractors to visit rural customers' homes or facilities (e.g., direct install) can be high because of the driving distance. Lighting efficiency programs can be cheaper to administer because bulbs can be sold to customers through retailers, avoiding the need for a contractor visit. However, as states and cities begin to enforce more aggressive lighting and equipment standards and building energy codes, smaller utilities have expressed concerns about capturing additional cost-effective energy savings beyond those currently achieved from efficient lighting (SMMPA 2017).

Co-ops face other cost-related challenges. Program implementation may be more expensive because administrative and labor costs are spread over fewer customers and less energy savings (M. Milby, emerging technology program manager, ComEd, pers. comm., July 2018). Cost barriers may also keep them from hiring third-party program implementers.

INSUFFICIENT OUTCOME DATA

Public service commissions generally require IOUs to conduct and publish independent evaluation, measurement, and verification (EM&V) to demonstrate the diligent use of ratepayer dollars (Relf, Baatz, and Nowak 2017). While not common practice, some state commissions extend EM&V requirements beyond IOUs. Municipal utilities in Iowa, for example, must report energy efficiency program participation, demographics, training activity, energy efficiency projects achieved, and renewable energy projects achieved. Municipal utilities in Southern Minnesota voluntarily file an update on their efficiency program performance as part of the state Integrated Resource Planning process (SMMPA 2018a).

However, because most non-IOU utilities are not regulated at the state level, efficiency program performance data from non-IOUs are often less robust and less accessible. In states lacking EM&V guidance, program implementers have cited difficulty obtaining valuable energy usage or energy efficiency data. For example, the Mountain Association for Community Economic Development in Kentucky has had difficulty persuading their co-ops to share efficiency program outcome data publicly (C. Woolery, HowSmartKY program coordinator, Mountain Association for Community Economic Development, pers. comm., April 2018).

In addition, metrics by which IOUs measure program success can make rural efficiency programs less appealing to pursue. For example, some IOUs measure performance, in part, on the percentage of a neighborhood they enroll in a residential efficiency program. Because rural communities are less densely populated, meeting this type of participation criterion might be a challenge (V. Iamunno, southeast district manager, Honeywell, pers. comm., April 2018).

Rural Energy Efficiency Program Case Studies

In this section we provide in-depth descriptions of several energy efficiency programs serving rural areas, including a summary of offerings, available performance metrics, notable elements, and delivery challenges. Table 2 lists these case studies.

Table 2. Case studies included in this report

Implementer(s)	Program name(s)	Implementer type	State	Customer segment served
Oncor	MainStreet Efficiency	IOU	Texas	Small commercial
Southern Minnesota Municipal Power Agency	Be Bright Campaign; CERTS Commercial Energy Outreach Project	Municipal utility agency	Minnesota	Residential, commercial, and industrial
Florida Office of Energy	Farm Energy and Water Efficiency Realization Program; Florida Renewable Efficiency Demonstration	State energy office	Florida	Agriculture
Pacific Gas & Electric and Sierra Business Council	Sierra Nevada Energy Watch Local Government Partnership Program	IOU	California	Municipal, small commercial
Co-Mo Electric Co-operative, LLC	SmartHub; Take Control & Save	Rural electric Co-op	Missouri	Residential, commercial, and industrial
Efficiency Vermont	Downtown Revitalization Program	Statewide program administrator	Vermont	MUSH, small commercial

MAINSTREET EFFICIENCY

Key implementers: Oncor, with delivery by Lime Energy
Location: Oncor service territory, excluding the northern Texas urban counties of Dallas, Colling, Tarrant, Denton, and Rockwell
Sectors served: Small business
Program focus areas: Lighting and refrigeration
Funding source: Ratepayer funds

Overview

Oncor's MainStreet Efficiency is a direct-install program for small businesses with demand less than 200 kW. The program provides limited measures, including high-efficiency lighting and, more recently, refrigeration. MainStreet Efficiency is not available to customers inside the Dallas–Fort Worth metro area, so all small businesses that participate in the program are located in rural areas or small towns. Table 3 summarizes recent program results.

Table 3. MainStreet Efficiency Program impacts

	Demand savings (kW)	Energy savings (kWh)	Incentive costs ($)	Admin costs ($)
2015 verified	1,636	7,681,422	1,784,748	151,836
2016 verified	392	2,225,065	544,189	50,966

We were unable to confirm whether energy savings are annual, incremental, or cumulative, or whether they are net or gross. *Source:* Oncor 2017.

Challenges

Lack of customer knowledge about energy efficiency. Convincing customers that energy efficiency programs are legitimate has been a major challenge, as many of them are skeptical that Oncor would want to reduce their energy usage. This may be due to the fact that they receive fewer marketing materials and because efficiency projects are less common in small towns than in big cities. Limited exposure also means that customers are less familiar with efficient technologies (D. Ginn, MainStreet Efficiency Program, Oncor, Lime Energy, pers. comm., April 2018).

Difficulty attracting contractors. The eligible customer base for the MainStreet Efficiency Program is relatively dispersed, so driving time between jobs can average several hours. Because it takes more time to serve these customers, contractors complete fewer jobs and face lower profitability. As a result, Lime has difficulty attracting contractors willing to do project installation.

Limited customer information. Texas is a deregulated energy market, so customer information is more limited than it might otherwise be, preventing vendors from focusing on high-usage customers.

Notable Program Elements

Bundling measures to ensure cost effectiveness. In its initial program design, the MainStreet Efficiency Program included only lighting measures. Oncor and Lime expanded to include refrigeration by bundling measures to create a cost-effective program. Staff report that expanding to additional measures is one of the largest areas of opportunity for this program.

Packaging financing with direct-install rebates. Lime Energy, the program implementer, offers 12- and 24-month financing in-house (extended financing is also available through a third party). According to program staff, most customers choose to utilize a payment plan because many small businesses do not have the available capital to invest in efficiency measures, even with lowered upfront costs from rebates.

Effective marketing and customer engagement. Program staff report that many eligible customers do not have or use email, making Internet-based marketing strategies less effective. Therefore the MainStreet Efficiency program relies on mailers and then calls customers directly to follow up. Word of mouth has also been an effective marketing strategy.

Delivering high volume to a few key contractors. Oncor works with only a few contractors, giving them access to a large number of efficiency jobs. This ensures they are financially compensated for the long drives between customer sites. Due to the limited nature of measures offered in the MainStreet Efficiency program, these contractors typically specialize in lighting. Lime Energy, the program implementer, has developed more efficient working relationships with the smaller number of involved contractors than they would with a larger network.

SOUTHERN MINNESOTA MUNICIPAL POWER AGENCY

Key implementers: Southern Minnesota Municipal Power Agency (SMMPA) and collaborators, including Wisconsin Energy Conservation Corporation (WEC) and University of Minnesota Clean Energy Network Teams
Location: Service territories of 18 member munis[9]
Sectors served: Residential
Program focus areas: The Be Bright Campaign focuses on ENERGY STAR®–certified light-emitting diode (LED) light bulbs; the CERTs Commercial Outreach Project focuses on lighting equipment, cooling equipment, air conditioner/air source heat-pump tune-up, motors, efficient furnace fan motors, variable-speed drives, compressed-air equipment and leak correction, guest-room energy management systems, VendingMisers and SnackMisers, food service equipment, anti-sweat heater controls, and custom measures
Funding source: Ratepayer dollars

Overview

Valley Farm and Home of Spring Valley, Minnesota, participated in SMMPA and WECC's Be Bright Campaign. Annette Meyer, the shop owner, is pictured here with her employee Jeff Tart and her cat Furgie. *Source:* J. O'Neil, SMMPA.

SMMPA is a nonprofit joint-action agency that provides wholesale electricity and related services to its 18 municipal utility members throughout Minnesota. SMMPA has three energy services representatives (ESRs) that work closely with 15 of their member utilities that provide power to relatively small communities, offering the utilities energy efficiency program design, development, and marketing services. The 2016 populations of these communities ranged from about 1,300 to 10,400 residents. The other three of the 18 member utilities serve larger communities—Rochester, Austin, and Owatonna—and have in-house staff who implement energy efficiency programs. The populations of these larger communities range from about 25,100 to 113,300 residents (SMMPA 2018b). The US Environmental Protection Agency has awarded SMMPA and its member utilities multiple ENERGY STAR awards, including (most recently) 2016 Energy Efficiency Program Delivery Partner of the Year award.

SMMPA's ESRs build relationships with contractors, appliance retailers, and customers to deliver energy efficiency programs. SMMPA pays for these programs with ratepayer dollars. Their member utilities front costs for customer efficiency rebates, then SMMPA reimburses them for this expense.

SMMPA offers several core programs, including Be Bright and the CERTs Commercial Outreach Project, and ENERGY STAR Rebates.

[9] This includes Austin, Blooming Prairie, Fairmont, Grand Marais, Lake City, Litchfield, Mora, New Prague, North Branch, Owatonna, Preston, Princeton, Redwood Falls, Rochester, Saint Peter, Spring Valley, Waseca, and Wells. However the CERTs program excludes SMMPA's largest three communities: Austin, Rochester, and Owatonna.

Core Programs

BE BRIGHT LIGHTING CAMPAIGN

Starting every Public Power Week in October, SMMPA runs an annual fall lighting campaign. Through this program, SMMPA works with its program partner, the Wisconsin Energy Conservation Corporation (WECC), to provide discounted ENERGY STAR LED light bulbs for purchase from participating retailers. SMMPA provides an instant rebate, and WECC partners with manufacturers to further buy down the cost of the bulbs. This residential upstream strategy minimizes the barriers to program participation by reducing the cost and improving access to energy-efficient LED bulbs. WECC also delivers this program on behalf of several other utilities in Minnesota. Table 4 summarizes program impacts.

Table 4. Be Bright Campaign 2017 program impacts

Type	Impact
Energy savings	1,057,850 kWh
LEDs sold	41,674
Participating local retailers	38
Members with at least one participating local retailer	16

Energy savings are gross, and Minnesota does not have a net-to-gross savings adjustment. *Source:* SMMPA 2018a.

CERTS COMMERCIAL OUTREACH PROJECT AND ENERGY STAR REBATES

During 2014 and 2015, SMMPA worked with the University of Minnesota's Clean Energy Resources Teams to increase awareness of SMMPA's commercial and industrial rebate programs. CERTs staff met with all local businesses in the territories of target municipal utilities and provided an introductory letter and contact info for the SMMPA ESR, a list of current rebates, a utility-specific CERTs *Right Light Guide*, and a form through which participants could sign up for email updates from their local utility (CERTs 2016).[10] While the outreach effort with CERTs has ended, SMMPA continues to offer a variety of rebates for energy-efficient commercial and industrial ENERGY STAR equipment. Table 5 summarizes some of the impacts from the CERTs project.

Table 5. CERTs Commercial Outreach Project 2014–2015 impacts

Type	Impact
Energy savings	1,038,911 kWh
Customers visited	1,438

Energy savings are gross, and Minnesota does not have a net-to-gross savings adjustment. *Source:* SMMPA 2015.

Notable SMMPA Program Elements

Multiple program types. SMMPA's members serve a variety of customer types, including large industrial facilities that package and process food items and manufacture HVAC

[10] See CERTs *Right Light Guide*: www.cleanenergyresourceteams.org/lighting/guide.

systems, boats, and steel (SMMPA 2017). SMMPA offers a variety of programs to capture as many customers across market segments as possible. Initially it offered measures such as basic lighting, cooling, and motors that applied to many industrial types. More recently it has expanded into specialty customer segments such as food services.

Customized electronic marketing by member utility. To build the relationship between municipal utility members and customers, SMMPA markets its energy efficiency programs as if they were coming from the retail utilities themselves. Most customers are unfamiliar with SMMPA. SMMPA uses an in-house graphic designer to tailor their efficiency program marketing by customizing logos and sometimes messaging for each utility. They use an electronic newsletter to market programs, a cheaper alternative to printing and mailing paper materials. SMMPA noticed that most of their member utilities have a minimal web presence, so they created simple, custom-branded websites for each of their members within the SMMPA website.[11] Through these portals, customers can access their energy bills, obtain efficiency program rebate forms, and sign up for email updates.

Partnerships that enable SMMPA to leverage existing resources. SMMPA has forged several partnerships to make their efficiency program dollars go further. Over 15 years ago, SMMPA became an ENERGY STAR partner. This gave them access to ENERGY STAR marketing materials, tools, and resources; let them participate in nationwide promotions; and included them in the online ENERGY STAR database of utility incentives. Working with WECC enabled SMMPA to take advantage of an energy efficiency campaign with multiple larger utilities such as Xcel and Great River Energy. SMMPA's partnership with CERTs enabled an extensive outreach effort that did not require additional SMMPA staff resources.

Energy savings targets for retail munis. Since 2010, the Minnesota Conservation Improvement Program (CIP) requires municipal utilities and cooperative utilities to reduce electricity sales by 1.5% annually (Minnesota 2008). Between 2010 and 2017, SMMPA's members collectively exceeded the state savings and spending requirements each year, with an average annual energy savings of 1.77% of utility retail sales and efficiency spending of 2.71% of utility revenues (SMMPA 2017).

[11] The links to SMMPA's member portals can be found at smmpa.com.

FLORIDA OFFICE OF ENERGY'S FARM ENERGY AND WATER EFFICIENCY REALIZATION PROGRAM AND FLORIDA RENEWABLE EFFICIENCY DEMONSTRATION

Overview

Energy-efficient electric pumps irrigate a farm participating in FRED.
Source: FDACS OOE 2017

The Florida Office of Energy (OOE) is housed within the state's Department of Agriculture and Consumer Services. Due to its placement, the OOE staff report to the Agriculture Commissioner and communicate regularly with agricultural producers. The staff have developed several efficiency programs to directly address their energy needs. In 2015, the OOE launched the Farm Energy and Water Efficiency Realization (FEWER) program as a pilot in Suwannee County. Through the program, the Office of Energy provided agricultural producers with free energy and water audits, a grant to cover part of the cost of implementing recommended energy efficiency measures, and a preliminary analysis of renewable energy technologies, upon request. Due to the success of this pilot, the Office of Energy launched the statewide Florida Renewable Efficiency Demonstration (FRED) program in 2017 (K. Smith Burk, policy administrator, Florida Office of Energy, pers. comm., April 2018). According to the Florida OOE's 2017 Annual Report, the FRED program has received 134 applications, conducted 72 energy evaluations, and processed payments and produced audit reports from several applicants.

In early 2018, OOE announced the availability of funding for its Small Community Energy Efficient Lighting Grant program designed to help local governments upgrade indoor and outdoor lighting in community-oriented facilities such as libraries, museums, parks, and community centers (Florida Office of Energy 2017).

Table 6 summarizes FEWER and FRED.

Table 6. Florida OOE energy efficiency programs

	FEWER (2015–2017)	FRED (2017–2018)
Location	Suwannee County	Statewide
Key implementers	Florida Office of Energy and the Suwannee County Conservation District, with delivery by EnSave	Florida Office of Energy, Florida A&M University, University of Central Florida, and University of Florida
Sectors served	Agriculture	Agriculture
Program focus areas	Energy and water audits and upgrades	Energy audits (including renewable energy) and upgrades
Incentive amounts	75% cost share up to $25,000	Free energy evaluations up to $4,500; 80% cost share up to $25,000

	FEWER (2015–2017)	FRED (2017–2018)
Funding source	State funding and USDA Rural Business Enterprise Grant (RBEG) funds	State funding and USDA Natural Resources Conservation Service (NRCS) funds

Sources: FDACS OOE 2017; EnSave 2017.

Table 7 presents FEWER program impacts. Data for FRED are not yet available.

Table 7. FEWER 2015–2017 program impacts

Type	Impact
Audits	192
Projects completed	132
Identified energy savings (MMBtus)	116,473
Realized energy savings (MMBTus)	45,310
Annual electric savings	$1.5 million

Energy savings are cumulative. We were unable to determine whether they are net or gross. *Source:* FDACS OOE 2017.

Challenges

Aligning program implementation with farming seasons. Both FEWER and FRED have had significant interest from agricultural producers. However growing seasons impact when farmers can complete recommended upgrades. This leads to fluctuating program uptake that aligns with the agricultural production cycle, making it difficult to provide year-round steady work for contractors. To address this issue, the Office of Energy worked with producers to establish a schedule. OOE then extended its contracts with implementers to ensure all participants received work and contractors had a more predictable workflow.

Aligning program implementation with federal requirements for financing. For larger projects, program implementers steered participants toward USDA RBEG and NRCS financial assistance, which require an energy audit. Program staff structured FEWER and FRED audits to match those needed for USDA loan applications as well as Environmental Quality Incentives Program (EQIP) funding, so program participants would not need to complete a second audit to apply for USDA financing. OOE gave priority to producers who were eligible or would become eligible for the Natural Resources Conservation Service EQIP cost share to help fund the practices and projects as a result of the on-site evaluation.

Notable Program Elements

Packaging renewable energy and energy efficiency. While the FEWER pilot focused solely on energy and water efficiency, the FRED program also includes eligible renewable technologies. Many farmers are interested in renewable energy, and the program helps educate them on efficiency opportunities that would reduce the payback period of renewable energy investments. When combining these technologies, auditors evaluate the efficiency of buildings before considering recommendations for renewable energy integration.

Comprehensive audits leading to a range of savings opportunities. Because both FEWER and FRED require complete audits, the programs can incorporate a variety of measures. The Office of Energy offered incentives for lighting, HVAC, motors and motor controls, insulation for poultry houses, milk-harvesting equipment, irrigation pumps, variable-speed drives, and sprinklers and water regulators. The programs also allowed for fuel switching—usually from diesel to electricity.

SIERRA NEVADA ENERGY WATCH LOCAL GOVERNMENT PARTNERSHIP PROGRAM

Key implementers: Sierra Business Council and Pacific Gas and Electric
Location: California counties of Alpine, Amador, Calaveras, El Dorado, Lassen, Mariposa, Nevada, Placer, Sierra, and Tuolumne
Sectors served: Municipal, small commercial
Program focus areas: Lead-by-example efforts, including benchmarking government buildings and wastewater facilities, assisting development of community-level energy action plans, facilitating local government meetings focused on energy and climate, education on water-leak detection, small business direct-install measures
Funding source: Ratepayer funds

Overview

Pacific Gas and Electric (PG&E) and other California IOUs deliver over 50 unique Local Government Partnership (LGP) programs across the state. The Sierra Nevada Energy Watch (SNEW) LGP is a partnership between the Sierra Business Council (SBC) and PG&E. The SNEW LGP began in 2010 and serves municipal and nonresidential customers across 11 counties. The program also serves special districts in 11 counties, which operate separately from local governments. As the lead local partner, SBC oversees efficiency projects and conducts outreach to local government agencies and small businesses. PG&E primarily offers technical assistance and identifies energy efficiency measures for program participants.

A grocery store that participated in the SNEW LGP program. *Source:* Sierra Business Council 2015.

In addition to offering small business direct-install measures, the program benchmarks government buildings and wastewater facilities, helps communities develop energy action plans, facilitates local government meetings on energy and climate, and provides education on water-leak detection. The program has three core areas, summarized in table 8.

Table 8. LGP program summary and impacts

	PG&E activities	SBC activities	Impacts (2016)
Municipal building retrofits	Provide technical assistance, education, and training for implementation of energy	Coordinate local governments. Oversee energy assessments and benchmarking. Develop	29 projects completed

	assessments. Once energy efficiency (EE) opportunities are identified, link to rebates and financing. Train contractors.	budgets for retrofits and submit projects to decision makers.	
California Energy Efficiency Strategic Plan support	Provide technical assistance. Help identify innovative measures. Provide financial support for SNEW activities.	Benchmark local government buildings. Showcase energy-efficient products and programs, including water–energy nexus programs. Develop guiding documents for local communities to leverage for energy planning.	Not available
Core programs coordination (small business direct install)	Manage direct install program. Provide technical assistance and funding. Coordinate with other PG&E Core Programs.	Host community events. Market and advertise programs. Implement direct-install program.	1,209,245 kWh savings*

*** Includes net energy savings delivered through direct-install program for all local government, small business, and special district efforts. *Source:* Evergreen Economics 2017.**

Challenges

Staff availability and retention. Developing the workforce needed to deliver SNEW programs required significant training. Once staff had developed energy efficiency skills, they often left for new jobs. Staffing was also an issue for SNEW's work with local governments, which often employed only a few individuals with multiple responsibilities. This made identifying the most appropriate local partners challenging.

Large territory and customer skepticism. As with many rural energy efficiency programs, delivery requires significant travel across a large area. In addition, contractors working on behalf of PG&E and other California IOUs delivering this program have faced difficulty gaining the trust of rural customers, who were skeptical that the utility wanted to provide free efficiency upgrades.

Notable Program Elements

Regional direct-install implementer model. PG&E's Energy Watch programs use a regional direct-install implementer to conduct audits and identify energy savings opportunities. The utility then arranges the delivery of measures to participating customers. PG&E targets this program to areas that align with its LGP territories rather than across its entire service territory.

Working group to address rural issues. California program implementers formed a Rural Hard to Reach (RHTR) working group to address issues common to those working in rural areas. California IOUs, efficiency program administrators, nonprofits, housing authorities, and others coordinate monthly about practices for serving customers in less-densely populated parts of the state. Implementers have increased the program participation rate by using trusted community-based agencies and organizations to deliver efficiency services (C. Kalashian, executive director, San Joaquin Clean Energy Organization, June 2018; J. Griesser, supervisor, energy and climate programs, County of San Luis Obispo Planning and Building Department, June 2018). Finding that contracting firms could not afford to send their workers to existing IOU-run training centers, the RHTR encourages utilities to

offer trainings in more rural areas. It coordinates with contracting firms in those communities to create demand for and interest in these trainings.

Division of labor among partners. The close coordination between PG&E and SBC as part of the SNEW local government partnership allows for division of labor in ways that leverage the strengths of each entity. SBC focuses on identifying and engaging decision makers to work with on local government retrofits, for example, while PG&E focuses on providing technical assistance.

Dual focus on saving energy and building capacity for local governments. The SNEW LGP achieves energy savings due to several design elements. PG&E counts energy savings from SNEW LGP toward its portfolio energy efficiency savings goals. PG&E is also permitted to direct spending toward nonresource measures for LGPs. This allows these partnership programs to build capacity among local program staff through trainings and work with communities to develop longer-term action plans.

SMARTHUB AND TAKE CONTROL & SAVE

Key implementers: Co-Mo Electric and subsidiary Co-Mo Connect, Calix
Location: Tipton, Missouri
Sectors served: Residential, commercial, and industrial
Broadband program focus areas: Smart grid, gigabit Internet, TV, phone
Energy efficiency program focus areas: Energy savings calculator, energy audits, appliance rebates
Funding sources: Ratepayer and debt capital from CoBank and NRUCFC

A lineman at Co-Mo Electric's subsidiary Co-Mo Connect installs fiber along the right-of-way (above) to deliver gigabit broadband-enabled energy efficiency to its members. *Source:* Co-Mo 2018b.

Overview

In 2011, Co-Mo Electric Co-operative, Inc. was one of the first electric co-ops to integrate high-speed Internet into their portfolio of energy services (CoBank 2017). Co-Mo leveraged ratepayer funding and resources from local banks to pilot a small-scale fiber-to-the-home (FTTH) network program for their members in Tipton, Missouri (Zager 2013). Co-Mo Electric created the subsidiary Co-Mo Connect, which expanded FTTH service to every member (Co-Mo 2015b, 2018). Before this project began in 2011, only 15% of the population in Co-Mo's service territory had broadband access. By 2016, Co-Mo had become the first electric cooperative to offer fiber service to 100% of its members without the use of government subsidies or grants (CoBank 2017).

Co-Mo deployed the FTTH infrastructure alongside their overhead and underground electric lines, also using existing poles that had been abandoned by cable companies. To receive the service, residents provided a $100 deposit to cover the installation of equipment in their home. Once the fiber infrastructure was in place, Co-Mo launched SmartHub, an online platform through which members can monitor their energy use, pay bills, report

outages, and access energy efficiency tips (Co-Mo 2015a). This combination of broadband and smart grid infrastructure also enabled Co-Mo to start its Take Control & Save Program, an online energy savings tool where members can calculate their energy savings potential, find discounted energy audits, and identify available rebates for energy-efficient appliances (Take Control & Save 2018a).

Take Control & Save participants have shared personal success stories detailing residential energy savings amounting to as much as 7,200 kWh ($430) during one heating season. Their commercial and industrial customers report savings up to 15,552 kWh ($1,244) annually (Take Control & Save 2018b). After implementing SmartHub and Take Control & Save, Co-Mo was better able to manage the growth of energy use, postponing the need to invest in further generation (Take Control & Save 2018a).

Co-Mo has served as a model to other cooperatives interested in scaling broadband-enabled energy efficiency programs of their own. For example, a member of the Co-Mo team founded the company Conexon to help other cooperatives replicate and improve upon Co-Mo's success (CoBank 2017). Their subsidiary, Co-Mo Connect, has expanded its FTTH services to customers outside of Co-Mo's service territory, including the Missouri cities of California, Tipton, and Versailles (Co-Mo 2015b). While Co-Mo does not report program-wide energy savings data, table 9 includes other program impacts for SmartHub and Take Control & Save.

Table 9. Smarthub and Take Control & Save 2015 program impacts

Type	Impact
Jobs created	25 full-time, 8 part-time
Membership eligible for fiber-optic services	100%
Customers served	15,000
Average residential bill savings	$45 per month, $540 per year

Source: **Rural Electric Magazine 2015.**

Challenges

Exposure to financial risk. Steep capital investment combined with the uncertain return on investment can expose electric co-ops to financial risk that may result in acquisition (T. Heidel, deputy chief scientist, NRECA, pers. comm., April 2018). Co-Mo's board ultimately determined that the multiple member and community benefits outweighed this short-term financial risk.

Geography. Co-Mo Electric's service territory includes 2,300 square miles of rural communities (USDA 2007). Remote areas often require optical network terminals and fiber drops, increasing the cost of service; in small towns, contractors can more easily connect the fiber network to a smart meter (Zager 2013).

Contractor retention and management. At peak performance, Co-Mo simultaneously managed 200 contractors over a period of three years. To overcome the challenge of retaining

contractors during temporary workload ebbs between project phases, Co-Mo learned to maintain a steady flow of work by increasing outreach to enroll more subscribers.

Notable Program Elements

Empowering members by increasing customer control. Co-Mo's advanced metering infrastructure is a robust two-way communications interface that increases customer awareness and control of energy usage. These smart grid technologies give members access to lighting, phantom load, and energy savings potential calculators. They also enable Co-Mo to provide tailored and seasonal energy savings advice to customers (Co-Mo 2015a). This online energy-monitoring app shows customers their hourly and daily usage, thus allowing the cooperative to offer prepay electricity accounts (CoBank 2017).[12]

Concurrent rebate programs. The SmartHub and Take Control & Save platform connects both commercial and residential members with energy efficiency incentives. Co-Mo offers rebates to their commercial members ranging from $150 to $850 for air source, dual fuel, or geothermal heat pumps. Co-Mo also offers residential members $300 toward the cost of an energy audit and $500 to follow through with the installation of recommended improvements. Co-Mo applies all heat pump, appliance, and audit rebates to customers' energy bills (DOE 2018d). These concurrent rebate offers are especially important to boost member participation since Co-Mo has only a 40% take-up rate in some areas (CoBank 2017).

Phased approach. Co-Mo attributes its success to its four-phase approach, which allowed the cooperative board to manage risk at each phase. The first phase targeted the most densely populated areas within their rural service territory to minimize risk and maximize the return on investment. Each successive phase expanded the fiber and connected the Internet service to more members within the service territory. This multi-phase approach meant that the co-op board was exposed to the risk of only one phase at a time, rather than multiple phases simultaneously. This was the key to staying on track with their projected 11-year payback period (CoBank 2017).

[12] Prepay payment plans allow utilities—often co-ops and munis—to charge their customers in advance for utility services, provide regular feedback on their remaining credit, and, if they run out of prepaid credit, disconnect customers until they have paid for additional services (within certain rules about disconnection). If utilities pursue prepayment plans, ACEEE believes they should also administer energy efficiency programs to reduce customer bills. However additional research is necessary to determine the impact of prepay plans on energy consumption. See ACEEE's blog post for specific research questions: aceee.org/blog/2017/02/should-utility-prepay-plans-be.

EFFICIENCY VERMONT'S TARGETED COMMUNITIES

Key implementers: Efficiency Vermont
Location: Communities rotate
Sectors served: Municipal and small business
Program focus areas: Lighting, HVAC, refrigeration, industrial processes
Funding source: Ratepayer funds

Overview

Efficiency Vermont is an energy efficiency utility that works to provide all state residents with technical energy efficiency services and financial support. In 2016, Efficiency Vermont launched the Targeted Communities program for several towns and surrounding farms engaged in economic revitalization efforts (Efficiency Vermont 2016).[13] The program integrates energy efficiency technologies and practices into downtown revitalization. It gives local businesses access to capital for building renovations into which they can easily incorporate efficiency upgrades such as replacing equipment or adding insulation (Corliss 2016). As part of this initiative, Efficiency Vermont offers on-site energy consultations, workshops, and energy efficiency guidance to businesses, households, and municipal buildings in participating towns (Efficiency Vermont 2018).

Efficiency Vermont helped Orleans County in Newport cut $8,000 off their energy bills in 2017 by upgrading lighting, insulation, and heating systems in the county courthouse (above) and sheriff's department. *Source:* Efficiency Vermont 2018.

Efficiency Vermont works with the Vermont Department of Housing and Community Development (DHCD), which preserves and revitalizes the historic centers of state-designated downtowns. The program also partners with local municipalities, schools, businesses, and community development corporations to deliver efficiency measures (Efficiency Vermont 2018). Table 10 summarizes program impacts.

Table 10. Targeted Communities 2015 program impacts

Type	Impact
Energy savings	5,224 MWh
Net total resource benefits delivered	$8,798,820

Source: Efficiency Vermont 2018

[13] This program was originally called Designated Downtowns, but Efficiency Vermont changed the title to Targeted Communities to expand the focus beyond town centers. Their latest selection process was based on energy-burdened community members, so they sometimes refer to the program as Energy-Burdened Communities.

Challenges

Lack of access to traditional marketing channels. Efficiency Vermont notes that community members do not always have access to traditional marketing channels. To engage community members in this program, Efficiency Vermont emphasizes relationship building.

Notable Program Elements

Rotating geographic focus. Efficiency Vermont focuses on a few towns at a time to deliver the deepest benefit possible. This has enabled testing of program delivery strategies such as in-person home energy visits that it would not have been able to offer statewide (D. Corliss, manager, Account Management, Efficiency Vermont, pers. comm., June 2018).

Promising Trends

In this section we discuss some of the trends and notable program elements found among the rural energy efficiency programs we reviewed.

STATE POLICY

State policymakers can use numerous mechanisms to drive energy efficiency investments in rural areas.

Energy Efficiency Targets for Munis and Co-ops

One of the most effective state-level tools for driving utility-sector energy savings is energy efficiency resource standards (EERS)—a long-term (3+ years), binding energy savings target for utilities or third-party program administrators. Savings are achieved through energy efficiency programs for customers. To drive additional rural efficiency investments, public service commissions can include munis and co-ops in their EERS policies or encourage them to participate on a voluntary basis. Currently 26 states have an EERS in place; however these requirements often do not address targeted energy efficiency programs for rural customers (ACEEE 2017). As seen in SMMPA's successful participation in the Minnesota Conservation Improvement Program, including smaller utilities in energy savings targets—when appropriate—can drive energy savings. Out of concern for regulatory encroachment, munis and co-ops have sometimes resisted expanded state oversight from public service commissions. In these cases, policymakers can encourage the utilities to commit to voluntary targets.

Tables 11 and 12 provide a snapshot of states that include co-ops and munis in their electric and natural gas EERS requirements and/or other efficiency policies. ACEEE plans to address these topics in greater detail in future research projects.

Table 11. Examples of EERS requirements that include co-ops and munis

	Electric		Natural gas	
	Co-ops	Munis	Co-ops	Munis
Arizona	x		x	
Connecticut		x		
Hawaii	x			
Massachusetts	x	x	x	x
Michigan[a]	x	x	x	x
Minnesota[b]	x	x		
North Carolina	x	x		
Rhode Island		x		x
Washington	x	x		
Wisconsin	x	x		

[a] Michigan includes co-ops and munis in its electric and natural gas EERS through 2021, after which requirements apply only to utilities regulated by the Michigan Public Service Commission. [b] 2017 Minnesota legislation exempts co-ops and munis under a specific size threshold. *Source:* ACEEE 2017; ACEEE 2018b.

Table 12. Examples of state energy efficiency policies for co-ops and munis

State	Policy
Arkansas	The Arkansas Public Service Commission exempts co-ops from energy efficiency requirements but requires them to annually report on energy efficiency activities.
Indiana	The Indiana Utility Regulatory Commission invited co-ops and munis to participate in the statewide electric EERS, but most chose not to participate.
Iowa	The Iowa Utilities Board requires munis and co-ops to set energy savings targets, but it does not review or approve these plans.
New Mexico	The New Mexico Public Regulation Commission requires distribution co-ops to annually consider self-imposed electricity reduction targets, design energy efficiency or peak demand reduction programs to meet those targets, and annually report on these efforts.

Source: ACEEE 2017; ACEEE 2018b.

Energy Efficiency Guidelines for Hard-to-Reach Customers

State energy efficiency spending or savings guidelines can require or incentivize utilities to deliver energy efficiency in rural areas. Several states have adopted legislation, regulation, or commission orders establishing energy savings goals or efficiency spending requirements

for low-income or hard-to-reach customers (Berg et al. 2017).[14] States can include rural customers in their definition of *hard to reach* and offer incentives to encourage program implementers to serve these customers. The California Public Utilities Commission (CPUC), for example, allows utilities to claim a higher net-to-gross ratio for serving hard-to-reach customers, including rural businesses and residents.[15] According to the CPUC, customers qualify as hard to reach if they lack access to efficiency program information or do not generally participate in efficiency programs due to geographic, language, income, housing type, or home ownership barriers. Customers who are located outside the San Francisco Bay Area, Greater Los Angeles Area, Greater Sacramento Area, and metropolitan statistical areas of San Diego County and meet one of the other criteria qualify as hard to reach (CPUC Resolution 2014).[16]

State Energy Plans, Incentives, and Convenings

State policymakers have numerous other options to encourage efficiency investments in rural areas. Through state energy planning processes, governors determine long-term energy policy priorities and programmatic milestones. Governors and state energy offices can include rural-focused programs in their state energy plans. For example, Michigan recently launched the process to develop an Agriculture and Rural Communities Energy Roadmap (Michigan Agency for Energy 2018). The 2018 Utah Energy Action Plan proposed several rural-focused initiatives and metrics, including a goal to target rural business development (Utah Governor's OED 2018). The 2016 Iowa Energy Plan focused on expanding support for small cities in rural and underserved areas and vulnerable populations through greater access to energy efficiency programs and workforce support (Iowa 2016).

State legislatures also play a key role in enabling localities, private program administrators, and utilities to offer various financing mechanisms. Specifically, state legislation is required to enable Property Assessed Clean Energy (PACE).[17] Some states also pass legislation to authorize or guide the use of public benefits funds for on-bill financing programs (NCSL 2015).

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[14] For a compilation of state policies to encourage low-income energy efficiency investments, see: database.aceee.org/state/guidelines-low-income-programs.

[15] Efficiency program implementers can report either net or gross savings. Gross savings include all savings expected from an energy efficiency program. Net savings calculations exclude savings from free riders—program participants who would have implemented or installed the measures without or with a lesser incentive—and free drivers—utility customers who install efficiency measures as a result of a program but are not themselves participants in the program. Program evaluators apply a net-to-gross ratio to convert gross savings to net savings (Berg et al. 2017).

[16] The CPUC is in the process of refining their definitions of *disadvantaged communities* and *hard-to-reach customers*: docs.cpuc.ca.gov/PublishedDocs/Efile/G000/M212/K763/212763072.PDF.

[17] Property Assessed Clean Energy (PACE) is a financing instrument for implementing energy efficiency or renewable energy projects. It enables property owners to finance up to 100% of the upfront cost of clean energy projects and is paid through a voluntary assessment on customers' property tax bill. PACE funds can come from a third-party financier or the local government that enables the PACE program. PACE financing is tied to the property and not the individual property owner or borrower. To learn more, see ACEEE's PACE toolkit: aceee.org/sector/state-policy/toolkit/pace.

State legislatures, regulatory bodies, and utilities can also play a role in convening rural efficiency program implementers to discuss common issues and opportunities. In California, for example, the Rural Hard to Reach LGP Working Group convenes quarterly to discuss practices for serving less-densely populated parts of the state (C. Kalashian, San Joaquin Clean Energy Organization, June 2018; J. Griesser, County of San Luis Obispo Planning and Building Department, June 2018). To build relationships with rural economic development agencies and organizations, the Florida Office of Energy regularly participates in a rural economic development conference (K. Smith Burk, Florida Office of Energy, pers. comm., April 2018).

RURAL-TARGETED PROGRAMS

Some energy offices in predominantly rural states, such as Iowa, Maine, and Nebraska, offer efficiency programs statewide and therefore do not distinguish rural versus nonrural programs. Other programs, such as Oncor's MainStreet program, explicitly target customers in nonmetropolitan areas.

PROGRAM FUNDING

Efficiency program implementers can use a variety of public, private, and philanthropic resources to fund energy efficiency projects for rural communities.

Ratepayer Funding

Funding for rural energy efficiency programs often depends on the implementer. Programs delivered by investor-owned utilities, for example, are typically funded by ratepayers, often through an efficiency charge or rider on their monthly energy bill. Because they are funded by ratepayers, these programs are subject to regular evaluation and must meet strict cost-effectiveness standards. Rural co-ops that implement efficiency programs also use member dollars to fund them. With smaller service territories and more-limited member bases, co-ops sometimes face challenges choosing how to allocate funds toward efficiency programs. Some co-ops have addressed this by pooling funds to offer programs at the association level rather than through individual co-ops. Not only does this increase the available funding for programs, scaling up programs can also minimize administrative costs per customer served and increase available funding for efficiency incentives and education.

State Budget Allocations

State energy offices (SEOs) often run energy efficiency programs using state budget allocations, federal funds, and—occasionally—ratepayer dollars. SEOs can use these resources to pay for energy office staff time, some or all of which may be dedicated to energy efficiency program implementation. These moneys can also be used for project cost sharing (i.e., the model used for Florida's Farm Energy and Water Efficiency Realization program), to develop educational materials, or to fund staff dedicated to energy efficiency education across the state. For example, through 2017 the Washington Department of Enterprise Services used its Resource Conservation Management Team to identify efficiency improvements and funding sources to implement those improvements for school districts, higher education institutions, and state agencies (Washington State Department of Enterprise Services 2018).

Federal Funding

Federal funding sources are particularly important for rural cooperatives and state energy offices. In the most recent program year, for example, USDA allocated $45 million to utilities and other service providers in rural areas (Coates 2018). The agency offers several funding sources for energy efficiency programs, including the Energy Efficiency and Conservation Loan Program (EECLP), the Rural Energy for America Program (REAP), and the Rural Energy Savings Program (RESP). These include both loans and grants, typically offered to rural utilities to seed financing programs for members or to make direct investments in the utility system. Energy efficiency providers can leverage these funds to limit upfront costs or provide additional financing options to customers. REAP, for example, makes direct loans and grants to agricultural producers and small businesses. The Florida Energy Office has designed its program offerings for agricultural producers to ensure that they can more easily take advantage of USDA programs such as REAP. Table 13 summarizes these USDA programs.

Table 13. USDA rural energy efficiency funding mechanisms

Feature	EECLP	RESP	REAP
Eligibility	Utilities serving rural areas	Utilities and other service providers serving rural areas	Agriculture and small business in rural areas*
Focus	Helping utilities manage system load growth or load profile	Reducing energy costs and consumption for rural households and small businesses	Energy efficiency improvements and renewable energy systems
Loan/grant size	Not specified	Not specified	Loans up to $25 million; Grants up to $250,000 for energy efficiency and $500,000 for renewable energy
Funding intermediary	Utilities serving rural customers	Utilities serving rural customers	Agricultural producers and small businesses
Financial structure	On-bill financing or tariff-based structures or direct investments in the utility system	Relending in a tariff charge, PACE, or through traditional loan structures like on-bill financing	Grants up to 25% of eligible project costs, loan guarantee may not exceed $25 million, and the combination of grants and loan guarantees cannot exceed 75% of the project's cost

* Agricultural producers may also access REAP funding for projects that have an outlet in an urban area (F. Petok, USDA RD, pers. comm., April 12, 2018). *Source:* Coates 2018.

USDA also has economic development–focused programs for which energy efficiency projects can qualify. The Rural Economic Development Loan and Grant Program (REDLG) offers loans to local utilities, which they pass on to local businesses for projects that will create or retain rural jobs. The Energy Resource Conservation (ERC) program defers payment of principal or interest for current USDA Rural Utilities Service (RUS) borrowers so they can make funds available to their consumers for renewable energy and energy

efficiency projects. The Electric Infrastructure Loan Program finances the improvement of electric facilities in rural areas (USDA 2016b).

Implementers can structure their programs to steer participants (i.e., customers themselves or co-ops) toward USDA loans, either by publicizing these funding opportunities or by structuring energy audits to qualify them to take part in these federal programs (K. Smith Burk, Florida Office of Energy, pers. comm., April 2018). The Natural Capital Investment Fund (NCIF), for example, helps small businesses, nonprofits, and local governments in West Virginia and North Carolina apply for USDA REAP funding (H. Vargason, Natural Capital Investment Fund, pers. comm., May 2018).

The US Department of Energy (DOE) also has several programs that fund rural energy efficiency projects. The State Energy Program (SEP) provides both formula and competitive grants for state energy offices' clean energy incentives and stipulates a few target areas for competitive grants each year. In 2017, DOE made about $50 million available to states through SEP (DOE 2018b). Some states have leveraged these dollars for engagement in rural communities. For example, Nebraska's Dollar and Energy Savings Loan Program has received SEP funding. Through the Weatherization Assistance Program (WAP), DOE weatherizes households across the country, sometimes in partnership with utilities.

States can also allocate up to 15% (or 25% with approval) of their funding from the US Department of Health and Human Services (HHS) Low-Income Home Energy Assistance Program (LIHEAP), most of which is used for bill assistance (LIHEAP Clearinghouse, 2018).

Private and Quasi-Public Funding

Implementers of all types may leverage private funding for financing programs. State energy offices may also leverage private dollars as sources for their financing programs. For example, they can establish a loan loss reserve or buy down interest rates for financing products.[18] IOUs, co-ops, and some munis may offer on-bill financing programs that rely on third-party funds for making loans to residents and businesses for efficiency upgrades.

Community Development Financial Institutions (CDFIs) are particularly good partners for leveraging private dollars for efficiency. CDFIs are mission-driven lenders dedicated to serving market niches that may be overlooked or underserved by traditional lenders. Located in all 50 states, these institutions include banks, credit unions, loan funds, and venture capital funds (CDFI Fund 2016). Because of their mission-driven approach, CDFIs often engage in energy efficiency lending. For example, How$mart Kentucky—a residential energy efficiency program run by six rural cooperatives in Kentucky—combines several sources of financing, including CDFI funds, to provide low-income loans (DOE 2015). The Natural Capital Investment Fund (NCIF) partners with banks and community development lenders to finance renewable energy and energy efficiency projects for small businesses, nonprofits, and local governments in central Appalachia and across the Southeast, with a focus on West Virginia and North Carolina (NCIF 2018a).

[18] See ACEEE's Energy Efficiency Financing Toolkit for an overview of existing financing mechanisms, their benefits and drawbacks, and related resources. The toolkit includes information on on-bill financing, loan loss reserves, and other financing options: aceee.org/sector/state-policy/toolkit/financing-energy-efficiency.

Member rural co-ops can also obtain loans for efficiency programs from the National Rural Utilities Co-operative Finance Corporation (CFC), a CDFI that aggregates member dollars and issues bonds to generate funding. Of the loans that CFC issues, 99% are to rural co-ops. Co-ops typically leverage this financing for investments in distribution or supply, but they sometimes use it for energy efficiency (National Rural Utilities CFC 2018). Similarly, CoBank provides loans, leases, and other financial services to cooperatives, agribusinesses, and rural public utilities. CoBank's customer-owners include rural electric generation, transmission, and distribution cooperatives as well as independent power producers (CoBank 2018).

Philanthropic organizations sometimes provide grants to nonprofits to enact change in rural areas. However such investments have declined (Cohen 2015). Foundations with a rural focus often engage in conservation, anti-extraction, and Just Transition movements, which do not necessarily include energy efficiency measures. Rural areas, which are home to 14% of the US population, receive only 6.3% of philanthropic investments (Pender 2015). This disproportionally low trend underlines the importance of leveraging rural development and energy efficiency program funding from a variety of sources.

The Role of Energy Efficiency in a Just Transition

The Just Transition movement is based on the concept that the transition to a greener economy will come with unavoidable employment loss, which should be coupled with efforts to secure workers' livelihoods (Cunniah et al. 2010). Energy efficiency can be an effective tool for empowering rural areas because it spurs economic development, creates jobs, and lowers bills for those most in need while supporting environmental stewardship.

COMMUNITY ENGAGEMENT AND PARTNERSHIPS

Community engagement contributes to the success of rural energy efficiency programs. For IOUs in particular, working with a local partner enables program implementers to better understand the needs of the customer segment they are trying to serve. IOUs sometimes have district managers who act as key liaisons to local leaders and community members (V. Iamunno, Honeywell, pers. comm., April 2018). Local soil conservation districts and farmers bureaus work closely with farmers around land management practices and can help communicate the needs of their members to agricultural energy efficiency program implementers. Agriculture cooperatives could be another partner for engaging farmers and promoting efficiency programs (R. Sobin, National Association of State Energy Officials, pers. comm., July 2018). Local governments, local nonprofits, chambers of commerce, local business councils, and community action agencies act as liaisons to customer segments within specific communities (E. Chu, Pacific Gas and Electric, pers. comm., July 2018; M. Milby, ComEd, pers. comm., July 2018; V. Iamunno, Honeywell, pers. comm., April 2018). Associations representing state and local governmental agencies can also be helpful for connecting with local partners and pooling resources. For example, the nonprofit National Rural Water Association teaches state rural water associations how to conduct energy audits, evaluate energy and cost savings from efficiency improvements, and support utility-delivered efficiency programming (NRWA 2018).

PROGRAM MARKETING

Barriers to customer access such as lack of broadband can make it challenging to market efficiency programs in rural areas. Many program implementers rely on contractors to market efficiency programs. If utility customers have Internet access and are engaged, implementers may use low-cost email marketing strategies to reach prospective program

participants. SMMPA, for example, uses an email marketing campaign tool to notify members about efficiency program opportunities—an approach they have found cheaper than marketing in print. SMMPA also found that most of their member munis did not have a web presence, so they created and hosted websites for them that include descriptions of efficiency program offerings and muni contact information.

Target customers and members who lack computer access must be reached through other channels. For example, many munis and co-ops already have newsletters in which they include community announcements. These can serve as effective vehicles for publicizing efficiency programs. Oncor found that many of its commercial customers do not use email, making Internet-based marketing less effective. To ensure a robust outreach effort, Oncor uses a multitouch approach to marketing, engaging current and prospective program participants via mail, by phone, and on their website (D. Ginn, MainStreet Efficiency Program, Oncor, Lime Energy, pers. comm., April 2018). Oncor also uses word-of-mouth program marketing strategies to reach rural customers.

Similarly, Efficiency Maine serves many small retailers that do not have a digital sales platform. As part of its long-running retail lighting program, Efficiency Maine prints instant rebate coupons and distributes them to many rural stores along with in-store signs. Customers can tear off these coupons and present them to the cashier to receive a reduced-price ENERGY STAR LED bulb (A. Meyer, residential program manager, Efficiency Maine, pers. comm., April 2018).

INCREASING BROADBAND ACCESS

Access to broadband contributes to efficiency programs by giving customers more control over their energy usage. Co-Mo Electric's build-out of broadband infrastructure, for example, gives members better access to energy usage data and energy efficiency opportunities, thereby reducing energy bills for residential customers and small businesses alike. Broadband-enabled smart grid and management capabilities can also improve grid reliability and security (DOE 2018c). While the expansion of broadband can increase uptake of new electronic devices (e.g., routers and modems), pairing broadband expansion with energy efficiency can help mitigate this increased usage.

Co-ops are uniquely poised to enter the broadband market by delivering a suite of modern connectivity and communication services to their members. As of 2017, an estimated 60 electric co-ops had deployed FFTH, 87 co-ops offered residential gigabit service, and about 100 were conducting feasibility studies or securing funding (Trostle 2017; Zager 2013).

ECONOMIC DEVELOPMENT

Energy efficiency programs traditionally focus on energy and/or cost savings as their main goal or outcome. However both program implementers and customers are expanding the definition of a successful energy efficiency program to include economic development impacts, specifically, how the program enables economic growth and spurs workforce development. Although some implementers may feel they lack the experience and resources to measure economic development benefits, at least two of the programs highlighted in this report—those of Co-Mo and Oncor—have been designed with economic development in mind.

ENERGY EFFICIENCY WORKFORCE DEVELOPMENT

A number of rural programs are involved in developing the local energy efficiency workforce. Some work with a selected pool of contractors to ensure that each firm gets enough business. Others ask contractors to help promote energy-efficient products and publicize current program opportunities, thus increasing demand for their services (H. Vargason, Natural Capital Investment Fund, pers. comm., May 2018; J. O'Neil, manager of energy efficiency and customer support, SMMPA, pers. comm., May 2018). Energy Trust of Oregon works with community-based nonprofits to engage local contractors and encourages them to integrate energy efficiency into all of the work they do.

Implementers also connect with advocates, officials, companies, and other stakeholders involved in workforce and economic development (Ferguson 2018). The Florida Office of Energy, for example, participates in rural community and economic development conferences to connect with economic development stakeholders. The Lehigh University IAC trains hundreds of students who help local businesses save millions of dollars on energy costs. Some of those students enter the energy field upon graduation (IAC 2014).

DIRECT-INSTALL PROGRAMS

Several of the highlighted programs use a direct-install approach. They typically contain a preapproved set of measures that contractors can install when visiting the customer, usually at a modest cost to the customer or accompanied by a rebate (Hoffman et al. 2013). PG&E's Energy Watch Programs, for example, leverage a regional direct-install approach that allows them to offer small business customers measures that provide deeper energy savings. Lime Energy also offers small business direct-install on behalf of IOUs across the country, with program design variation based on incentive levels, measures, and definitions of small businesses. Because small businesses can be less likely than their larger counterparts to follow up from an audit, this approach can sometimes drive higher program participation (A. Procell, Lime Energy, pers. comm., April 2018).

CUSTOMER EDUCATION AND ASSISTANCE

Some munis, co-ops, and other program implementers provide energy-efficiency-focused education to their customers. In partnership with Energy Trust of Oregon, the nonprofit Sustainable Northwest hosted a series of workshops on renewable energy and energy efficiency called Making Energy Work for Rural Oregon. These workshops were available to community members, municipalities, and local electric cooperatives (Sustainable Northwest 2018). With partial support from Energy Trust and other collaborating partners, several communities have brought on Resource Assistance for Rural Environments (RARE) interns to sustain workshop learning and momentum. RARE is an AmeriCorps program administered by the University of Oregon.

Several rural programs help current or prospective participants access financial resources. As part of its Small Community Energy Efficient Lighting Grant Program, the Florida OOE helps communities complete reimbursement forms. NCIF helps businesses apply for funding for energy efficiency improvements from USDA and other lenders. NCIF works one on one with businesses to identify funding opportunities, conduct an energy assessment and audit, recommend incentive programs based on the appropriate energy-saving improvements, and facilitate project implementation (NCIF 2018b).

COMBINING ENERGY EFFICIENCY WITH OTHER MEASURES

Rural customers may not think about energy efficiency, renewable energy, or water efficiency discretely. Rather, they may think about utility bills as a whole. While this tendency is not necessarily unique to rural customers, it emphasizes the value of offering programs that encompass a variety of technologies, when appropriate. Several of the programs we reviewed included other eligible measures beside energy efficiency technologies. The Florida OOE provides agricultural producers with water conservation measures as part of the FEWER program and renewable energy technologies as part of its FRED program. However EnSave found with FEWER that farmers needed to focus on efficiency upgrades before looking to renewable energy incentives (A. Gulkis, chief operating officer, EnSave, pers. comm., July 2018). Other examples are PG&E's SNEW program and Nebraska's rural wastewater program. SNEW includes wastewater facility benchmarking services and municipal government training on water-leak loss detection. Nebraska's rural wastewater program combines benchmarking services for rural wastewater systems and makes available $5 million for loans from the DESL program to finance energy efficiency improvements (D. Bracht, Nebraska Energy Office, pers. comm., March 2018). Several USDA rural funding sources such as REAP and ERC include both renewable energy and energy efficiency technologies.

Recommendations

Delivering efficiency services to rural customers in a cost-effective, impactful manner requires careful program planning. Program delivery should be tailored to the needs of rural households, public institutions, businesses, manufacturing facilities, and farms. The programs we reviewed as part of this research reveal insights about some of the tools available to implementers to effectively serve rural customers and overcome the challenges described. We propose the following considerations for program implementers.

STATE POLICY

States should require or incentivize utilities to deliver energy efficiency in rural areas. Public service commissions should include munis and co-ops in state energy savings targets and efficiency requirements, perhaps with somewhat lower targets because rural customers can be hard to reach. Alternatively, regulators can encourage munis and co-ops to participate on a voluntary basis. State policymakers can include IOUs, co-ops, munis, and appropriate nonutility entities (e.g., state energy offices) in legislation enabling energy efficiency financing and the use of public funds for financing. Governors, legislatures, and state energy offices should include rural-focused programs in their state energy plans. These plans should define short- and long-term energy efficiency policy priorities for rural communities, including efficiency workforce development programs, business development activities, funding for rural efficiency incentives, and opportunities to incorporate efficiency into broader infrastructure improvement projects. Finally, legislatures and regulatory bodies can work with utilities to convene rural efficiency program implementers to discuss issues and opportunities in serving their customers.

PROGRAM FUNDING

State energy offices should use state budget allocations and federal funds to support rural programs through energy office staff time, project cost sharing, and educational materials.

They can leverage DOE SEP and HHS LIHEAP funds for rural efficiency projects. State energy offices and utilities can design program offerings to help farmers take advantage of USDA programs such as REAP. They can also leverage private dollars for rural efficiency financing programs.

Statewide co-op associations can obtain financing from the NRUCFC, and IOUs, co-ops, and munis can offer on-bill financing programs that rely on third-party funds. Program implementers can design programs (e.g., their energy audit requirements) in such a way that participants can also apply for federal efficiency dollars. Local utilities can apply for USDA REDLG loans and pass them on to local businesses for projects that will create or retain rural jobs. They can also take advantage of ERC deferrals and make the funds available to their customers for efficiency projects. Finally, they can work with community action agencies to leverage WAP funding for rural residential energy efficiency projects.

LOCAL PARTNERSHIPS

Program implementers should work with partners who are familiar with the needs of community members. IOUs should consider using district managers as liaisons with local leaders and community members. Agricultural programs can benefit from partnerships with local farm conservation districts, farmers bureaus, and agriculture cooperatives. Other efficiency program partners could include local governments, nonprofits, community action agencies, chambers of commerce, business association chapters, and universities. These local organizations are well positioned to provide feedback on the types of energy efficiency improvements that might be most valuable and generate awareness of efficiency offerings among their constituencies. By working with these partners, program implementers will also be able to more effectively understand the types of technical, financial, and administrative support most important to program success.

MARKETING

Programs should work closely with local contracting firms and leverage their relationships with customers to market program offerings. Given varying customer communication preferences and access to broadband, implementers should consider both online and more traditional marketing channels. For rural customers with Internet access, implementers should consider low-cost online marketing tools such as email newsletters, social media posts, and simple websites with program information. Programs serving customers with little computer access should use muni and co-op newsletters, phone, snail mail, and word of mouth. For programs delivered in partnership with local retailers, implementers can use in-store signage and distribute instant rebate coupons to store managers.

ECONOMIC DEVELOPMENT

Implementers should keep community-wide economic development impacts in mind as they design efficiency programs. They should work with local and state officials to identify opportunities for energy efficiency measures and services in broader economic development efforts, e.g., as part of state-led downtown revitalization efforts in small communities. Evaluators should measure the economic impact of efficiency programs using metrics driven by the needs and priorities of the community.

ENERGY EFFICIENCY WORKFORCE DEVELOPMENT

Implementers should scope efficiency programs that simultaneously save energy for rural communities and support their local workforce. They should develop pools of rural contractors to carry out and help market efficiency measures. Community-based nonprofits can engage local contractors in efficiency projects and encourage them to integrate efficiency into all the work they do. IOUs and state energy offices should work with energy efficiency training centers to develop the skills of rural workers. Utilities should offer classes to contractors alongside current customer-facing energy efficiency programs and support local governments and community organizations doing the same (Shoemaker and Ribeiro 2018). Statewide program implementers can generate interest in these training programs among their contractor networks. Workforce training efforts should also extend beyond contractors, installers, and auditors to include facility operators, business managers, and local officials.

BROADBAND

Co-ops might wish to enter the broadband market in order to deliver connectivity and communication services to their members. Once broadband is available, program implementers should use it to offer tools such as energy management platforms and other technologies that provide real-time, automated, and remote energy monitoring and control. Programs should use granular customer energy data to help identify energy savings opportunities and offer incentives or financing to customers for efficiency measures.

COMBINED PROGRAMS

Program developers and funders should consider designing and support programs that include other eligible measures beside energy efficiency, e.g., water conservation and renewables.

POOLED RESOURCES

G&T co-ops, co-op associations, and muni associations should consider hiring staff to deliver efficiency programs on behalf of their members, many of whom lack the resources to deliver programs themselves. These professionals can identify priority measures, develop marketing materials, and cultivate relationships with partners like universities. They can also work with third-party implementers to scale up the offerings. In turn, co-ops and munis should consider partnering with their G&T co-op or their statewide associations to spread efficiency program costs over a wider customer base (Ross, Drehobl, and Stickles 2018).

COST EFFECTIVENESS

Program developers should bundle deeper energy efficiency measures like refrigeration with lower-cost measures such as lighting to balance cost and energy savings (D. Ginn, MainStreet Efficiency Program, Oncor, Lime Energy, pers. comm., April 2018; C. Woolery, Mountain Association for Community Economic Development, pers. comm., April 2018). Contractors will be able to make multiple energy-saving improvements at remote customer sites if a variety of measures are bundled together. As another cost-saving strategy, implementers can roll out programs to a few communities at a time instead of all at once. Co-Mo, the Florida Office of Energy, and Efficiency Vermont have all taken this approach. In addition, program implementers should line up multiple program participants who are near one another and then schedule contractors to make energy efficiency improvements

during one trip. Implementers can offer customers financing to make multiple measures more affordable.

Regulators can exempt rural programs from cost-effectiveness tests, just as several states currently do for low-income programs. If tests are applied, they should account for the many nonenergy benefits (NEBs) that rural efficiency programs deliver and should apply at the program or portfolio level rather than the measure level.

EVALUATION

Munis, co-ops, state energy offices, and other non-IOU efficiency program implementers should quantitatively evaluate their programs to determine their effectiveness, even when not required by state law. By not conducting thorough EM&V, they are missing out on opportunities to make their programs more cost effective, deepen energy savings and other customer benefits, and identify challenges unique to customers in rural areas. Because co-ops and munis are mandated to serve their members, their evaluators should also make customer service a primary metric. Finally, evaluators should work with non-IOUs to obtain efficiency program performance data that are as robust as possible, and individual co-ops should consider making these data public.

Conclusion

Rural communities are distinct in their energy use, economic drivers, and demographics. These characteristics feed into the program delivery challenges faced by utilities, state agencies, and program implementers. Low rural population density can make it difficult to scale efficiency programs and keep them cost effective. Utilities and implementers may lack the technical, financial, or staff resources to deliver high-quality efficiency programs to rural customers. However the programs highlighted in this report show that these challenges are surmountable and demonstrate the value of energy efficiency to rural economies.

As we conducted our interviews and literature review, we identified several questions that fell beyond the scope of this study but would be useful topics for future research:

- How can we electrify energy uses currently fueled by heating oil, propane, and natural gas in ways that benefit rural communities? How can energy efficiency, demand response, and distributed energy resources be integrated to generate the most value for rural customers?
- How can states most effectively support rural public-sector energy efficiency upgrades? How can public agencies (e.g., school districts, educational support agencies, wastewater facilities) pool staff resources to maximize efficiency program benefits? For example, could they share energy managers?
- To what extent do small municipal governments work with energy service companies to implement energy efficiency improvements? What are the barriers to expanding their participation? How can towns engage these companies in energy service performance contracting programs?
- What challenges do rural communities and small towns face in adopting and enforcing building energy codes? Are officials in these communities sufficiently

familiar with the latest building energy codes? If not, what training opportunities could close this knowledge gap?

- What types of transportation efficiency programs are most effective in reducing transportation expenses for rural communities?
- What is the role of green banks in serving rural communities? How can they design their programs and financial products to most effectively serve rural customers?

We hope these recommendations and questions point rural energy efficiency program implementers in the right direction. As they continue to innovate efficiency program design, utilities, state and local officials, and advocates will deepen energy savings and expand community-wide benefits to rural residents, businesses, and communities at large.

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