Transitioning to a Lower-Carbon Energy Future: Challenges and Opportunities for Municipal Utilities and Electric Cooperatives

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On March 24, 2017, the Florida State University College of Law's Environmental, Energy & Land Use Program and the University of North Carolina School of Law's Center for Climate, Energy, Environment & Economics (CE³) co-hosted a day-long conference that addressed the challenges and opportunities that municipal utilities ("munis") and electric cooperatives ("co-ops") face as they transition to a lower-carbon future.[5] The goal of the conference was to focus on these electricity providers, in particular, because they operate under unique conditions that can allow them to be nimbler than traditional investor-owned utilities ("IOUs"), but they also face different constraints as they move toward a lower-carbon future. Regardless of the near-term status of federal carbon regulation, this transition is underway as a result of changes in market conditions, technologies, consumer demand, and state and local policies. Many utilities also operate under the assumption that there will eventually be some type of federal regulation of greenhouse gas emissions. We hope that the initial lessons gleaned from this conference will spark a broader conversation on this transition, particularly as it plays out in the muni and co-op context.[6]

Introduction

The electricity industry is somewhat uniquely structured in that it includes three distinct types of business entities. In some cases, vertically-integrated investor-owned utilities (IOUs) provide electricity, whereas in other cases local governments form municipal utilities ("munis") to provide this service, or electricity consumers form their own electric cooperative ("co-op"), particularly in rural areas. Munis and co-ops share many characteristics with IOUs. All of these entities face the central challenge of maintaining electric reliability under an ever-changing set of conditions, for example. Some munis and co-ops build and operate their own generation similar to IOUs, while others are primarily transmission and distribution utilities. Munis and co-ops also have meaningful differences from IOUs; they vary significantly in terms of size, state oversight, governance and management forms, and relationships with their customers and owners.[7] These characteristics give them certain advantages in the transition to a lower-carbon future but also pose challenges. As an example of an advantage, if the members or voters served by one of these utilities demand lower-carbon generation that is more expensive than conventional generation sources, munis and co-ops that face light regulation of rates, or no regulation, can more easily and quickly respond to this demand, albeit with the ever-present challenges of maintaining reliability, addressing the risk of stranded assets, and other concerns. Munis and co-ops can also more easily implement community solar projects, in which many customers share the costs of building a local solar farm, with customers choosing to participate and the utility simply adding a fee to their monthly electric bill.[8] With respect to challenges, munis and co-ops that serve both rural and urban populations must respond to the changing demands of both of these populations. For example, the Pedernales Electric Cooperative in Texas, which serves customers in the Austin metropolitan area and more rural portions of Texas, has rural customers who tend to support certain rooftop solar projects but not electric cars with limited range, whereas urban customers are purchasing and demanding infrastructure for electric cars.[9]

The goal of our 2017 conference was to bring together representatives from many different types of munis and co-ops around the country in order to better understand these opportunities and challenges, and to develop broadly-applicable lessons learned. Due to the many variations in these types of utilities, there are no cookie cutter solutions for a lower-carbon transition. Indeed, munis and co-ops are also quite distinct from each other, just as they differ from traditional IOUs. This paper explores three case studies based on our day of productive discussions; these studies address large municipal utilities, municipal public power associations, and a co-op serving both urban and rural customers. Together, they identify lessons that may inform upcoming decisions by munis and co-ops that are large and small, urban and rural, and governed by local governments or an independent board, among other differences.

The History of Munis and Co-ops

The U.S. electricity sector consists of many different types of public and private entities. IOUs—which serve about 75 percent of U.S. customers[10]—traditionally own and operate generation, transmission, and distribution lines and act as regulated monopolies that serve all customers within a certain territory. Merchant generators are similarly investor-owned but are competitive entities that build generation and sell the electricity wholesale to IOUs and other entities. Still other types of entities are primarily in the business of owning and operating transmission lines. Approximately two-thirds of U.S. electricity customers are served by regional transmission organizations (RTOs), which take over the operation of IOUs' and other entities' transmission lines and are responsible for determining when and how much electricity flows through the transmission grid at any given time.

Munis and co-ops have their own distinctive status within this realm of electricity providers. Many of them act similarly to IOUs in that they also own and operate generation, transmission, and distribution infrastructure, although some primarily or solely purchase electricity and distribute it to customers.[11] But they are distinctive in terms of their ownership and governance and other functions, as we briefly discuss below.

Munis and co-ops have long played a central role in the U.S. energy sector. There are now 2,006 active munis operating in 49 U.S. states.[12] They serve approximately 49 million customers, providing 14.5% of all electricity generated and sold. However, many are small; more than 1,350 munis have fewer than 4,000 customers, and only 30 have more than 100,000 customers.[13] By comparison, there are more than 900 U.S. co-ops in 47 states that provide 11.3% of the electricity sold in the United States.[14] In the 1930s, nine out of ten rural homes did not have access to electricity. In 1937, the Rural Electrification Administration drafted the Electric Cooperative Corporation Act, model legislation that states could use to enable the formation of electric co-ops, since many had come to realize that IOUs were uninterested in serving sparsely populated areas. Due to the development of co-ops, by 1953, more than 90% of U.S. farms had electricity.[15] Because co-ops often serve rural, dispersed populations, they own and operate a significant percentage—42%—of the distribution lines that distribute electricity to customers and serve around 56% of the U.S. land mass.[16]

Governance Structures of Munis and Co-ops

Munis, which may operate independently or as members of public power agencies, are labeled as such because they are governed by a public entity—either the legislative government of the town, city, or other local government that they serve, or a board that acts separately from the general legislative local governing body. Small and large munis typically differ in their respective governance structures. Governance of large munis is generally less subject to political fluctuations at the local government level, as opposed to their smaller counterparts. A 2015 survey of 534 munis showed that those with greater than 50,000 customers were governed by an independent utility board 77% of the time, whereas utilities with fewer than 5,000 customers were governed by a city council or similar local legislative body 68% of the time.[17]

Co-ops are governed by the electric customers that they serve, all of whom are members who elect a co-op governing board to represent them. Unlike IOUs, neither co-ops nor munis are run by shareholders who demand a return on their investments in the utility.

Differences Within Munis and Co-ops

Although munis and co-ops share the important distinctions from IOUs discussed above, members of each sector differ in terms of their size, their independent or association-based operation, the number of members or ratepayers they serve, the urban or rural settings in which they operate, and whether or not they own generation and other infrastructure or primarily purchase electricity and distribute it to customers. The case studies discussed in this project explore lessons learned for transitions to lower carbon from three different types of entities—large munis, such as the Sacramento Municipal Utility District and the City of Austin (Austin Energy); munis and co-ops that operate as part of an association that owns generation or other infrastructure or purchases electricity; and co-ops that serve both urban and rural populations, such as the Pedernales Electric Cooperative.

Changes and Challenges Facing the Electricity Sector Generally

Munis and co-ops of all types face several changes and associated challenges that are common to the entire electric sector. These include, among others, relatively flat demand for electricity, which tends to limit the funds flowing to utilities. With the exception of rare instances in which the rates that utilities charge have been decoupled from customer demand, entities providing electricity to customers make money when they sell more kilowatts of electricity. And when utilities build expensive infrastructure designed to meet certain demand, and this demand is not met, financial challenges ensue. Further, more efficient appliances, light bulbs, and other energy efficiency technologies and practices at the end user level have changed demand to which electricity providers respond. Additionally, several fuels and technologies have had disruptive effects. Many electricity providers built power plants or entered into long-term contracts to purchase power before the U.S. "shale gas" revolution—a change that greatly increased the supply of natural gas and caused gas prices to plummet. Although gas prices will continue to be volatile, they are lower and less volatile than in the recent past, and gas is now consistently one of the least expensive power plant fuels, outcompeting coal and far undercutting nuclear. Renewable energy, too, has substantially declined in price. In some regions of the country wind and solar are now cost-competitive with natural gas and offer one of the cheaper, if not the least expensive, electricity options. Renewable prices also continue to decline. Other potential technology disruptions are on the horizon, with promising gains in the areas of battery storage of electricity and the use of electric vehicles (EVs). EVs could provide additional storage opportunities if utilities could properly connect and communicate with them in order to harness their capacity.

In addition to technological and fuel-based disruptions, certain business models in the electricity sector have recently emerged and now compete with traditional utilities for certain customers. For example, third-party providers of rooftop solar are very common in certain parts of the United States; these companies own solar panels that they install on customers' roofs, and they sell electricity to these customers at a fixed rate over time; alternatively, they lease the panels to the customer. This "distributed" model of electricity generation is foreign to the common centralized electric utility model that currently dominates the electricity sector, including munis and co-ops.

Conference Lessons: Three Case Studies

With the recognition that munis and co-ops operate under somewhat unique circumstances, while also sharing certain important characteristics with IOUs, the conference explored the challenges and opportunities that munis and co-ops face as these entities incorporate more low-carbon sources into their generation mix. As compared to IOUs, munis and co-ops have somewhat more flexibility in choosing their generation mix and the rates charged to support this generation. They are also able to respond more directly to certain types of consumer demand for low-carbon energy. But like IOUs, they also struggle to retire carbon-intensive generation that still has a useful life; small munis and co-ops, in particular, might be even more constrained than IOUs in this respect due to the limited resources available to them.

To meet the goals of the conference, this paper explores three case studies that highlight some of the lessons learned from a day of productive discussion in hopes that these lessons may be transferable. They include examples from small and large, geographically diverse munis and co-ops, as well as from munis that act independently or as part of an association of utilities that draw from a larger pool of electricity generation and distribution options. Case Study #1 focuses on large munis, specifically the Sacramento Municipal Utility District and Austin Energy. Given the differences between small and large munis, this case study focuses on what larger systems have learned about transitioning to a lower-carbon future. Case Study #2 focuses on municipal public power associations. Many smaller munis band together to make generation choices through municipal public power associations. This case study explores how these associations are developing choices for members to move toward a lower-carbon future. Case Study #3 describes opportunities and challenges faced by co-ops, using the Pedernales Electric Cooperative, which has a split suburban/rural customer base, as an example. In addition to facts about the organizations profiled, the case studies discuss the steps these entities have taken to meet the specific challenges they face in moving toward a lower-carbon future. The paper concludes with lessons that may be applicable to other organizations in their own journey. These lessons are not universally transferable, but by providing examples from these diverse entities, we hope that munis and co-ops around the country might find some information relevant to their circumstances.

Case Study #1: SMUD and Austin Energy

Introduction

This case study examines efforts to reduce greenhouse gas emissions at two relatively large municipal utilities: Sacramento Municipal Utility District ("SMUD") in Sacramento, California, and Austin Energy in Austin, Texas.

SMUD is the sixth largest publicly owned electric utility in the nation, serving a population of 1.5 million residents with a $1.6 billion budget. SMUD's service territory is approximately 900 square miles, and its system consists of more than 10,400 miles of power lines.[18] It generates 60% of its power through hydropower, solar, wind and natural gas,[19] while the remaining 40% is obtained through power purchase agreements.[20] Approximately 50% of its power currently comes from non-carbon-emitting resources.[21] SMUD is governed by an elected Board of Directors, each of whom represents a geographic ward and serves a staggered four-year term.[22] Directors must be a resident of their ward, but elections are open to the entire district.[23]

Austin Energy is the eighth largest publicly owned electric utility in the nation, serving more than 1 million residents with a $1.51 billion budget.[24] Austin Energy's service territory is more than 437 square miles,[25] and its transmission and distribution systems combined total more than 12,000 miles.[26] The utility owns 3,485 megawatts (MW) of generation, and, for FY 2013, 40% of its power came from non-carbon-emitting resources (28.5% from renewables and 11.5% from nuclear).[27]

Unlike SMUD's independent governance structure, Austin Energy is part of the City of Austin, with policy and budget oversight provided by the Austin City Council.[28] Councilmembers serve a term of either two or four years depending on their district.[29] Austin Energy is also guided by a citizen's advisory committee called the Electric Utility Commission (EUC), which reviews and analyzes policy, procedure, budget, rate structure, fuel costs, new generation facilities, and strategic planning.[30] Citizen advisory committees are most common in large munis governed by a city council, such as Austin Energy, and less common in small munis governed by an independent utility board.[31] Austin City Council appoints eleven EUC members, each of whom serves a four-year term.[32] EUC members are drawn from the entire service area, including outside the city limits where customers cannot participate in city council elections.[33] Five former Austin Energy General Managers were interviewed for this case study, and four agreed that the utility would benefit by changing its governance structure from the city council to an independent utility board.[34] They expected that this change would increase efficiency by insulating the utility from the city bureaucracy, thus allowing the utility to operate more like a business.[35]

This case study is informed by these interviews, panel presentations and Q&A sessions that occurred during the conference, and publicly available information, and it details SMUD's and Austin Energy's efforts in the fields of generation and greenhouse gas emission goals, rate design, renewable energy investments, and energy efficiency improvements. Customer demand has played a role in each of the utility's actions to date.

Transitioning to Lower-Carbon Sources: Procedure and Process

Generation and GHG Emission Goals

As evidenced by the generation mixes introduced above, both SMUD and Austin Energy operate in political environments driving ever-increasing renewable penetration.

SMUD's goal is to reduce greenhouse gas emissions to 10% of 1990 levels (less than 350,000 metric tons of carbon dioxide (CO_2) per year) by the year 2050.[36] In the short term, SMUD aims to supply 33% of its energy from renewable sources by 2020.[37] California has adopted a 50% renewable energy portfolio standard (RPS) by 2030, the highest in the country.[38] This RPS does not allow large hydropower as a qualified renewable resource.[39] Therefore, while SMUD already obtains 50% of its power from non-carbon-emitting resources, this will have to increase to around 75% or more by 2030 to achieve the RPS target, as it will be required to have 50% qualified (non-large hydro) renewables and will maintain generation from its large hydropower generation projects. SMUD's transition to lower-carbon energy sources is also driven by a number of other factors, including: increasingly sophisticated customer expectations; new technologies (e.g., distributed generation, battery storage, electric vehicles, and home automation); third-party entrants to the energy market; the rise of big data; and flat revenues.

Likewise, Austin Energy has aggressive goals to achieve 35 percent of its energy from renewable resources by 2020 and reduce carbon emission levels to 20 percent below those reached in 2005.[40] The overall goal for Austin Energy is to reach net zero carbon emissions by 2050.[41] In line with these aspirations, in 2007, Austin Energy kicked off a goal with the City of Austin Climate Protection Plan to offset another 800 megawatts of peak energy demand by 2020.[42] Despite difficulties with incorporating more wind and solar into its energy mix, ongoing regulatory uncertainty, and often challenging market conditions, Austin Energy is on track to produce 55% of its energy from renewable sources by 2025. Austin Energy currently purchases 1,360MW of renewable energy, most of which is produced from west Texas wind, and receives 77MW of solar power within the service area.[43] Austin Energy also has a goal to remain affordable during the transition to lower-carbon power sources; currently, the average residential bill is the second lowest in Texas, and the aim is to keep rate increases at less than 2% annually, although this has been challenging to achieve in conjunction with the low-carbon goal.[44] Austin Energy conducts a rate review every five years; the latest rate review resulted in decreased base rates starting in 2017.[45] Other challenges are likely to remain through at least the near future, such as zoning ordinance issues with community solar installations counting as impervious surfaces and drought conditions having the ability to negatively impact hydropower generation.

Rate Design

SMUD, like Austin Energy, has attempted to respond to customer concerns during its transition. To move toward its low-carbon goals while accounting for consumer preferences, SMUD implemented the SmartPricing Options Pilot Program to gauge customer reactions for different rate structures.[46] These rates were designed to reduce reliance on relatively dirty peaker plants that are necessary during periods of peak demand. Approximately 12,000 customers participated in the pilot during the summers of 2012 and 2013.[47] Three different rate structures were implemented: time-of-use (TOU), critical period pricing (CPP), and time-of-use - critical peak pricing (TOU-CPP). TOU rates increased every weekday from 4PM to 7PM, whereas CPP used more dramatic increases on twelve critical days where customers were notified 24 hours in advance. TOU-CPP used a combination of these strategies. SMUD surveyed all participants and found that customers preferred TOU to CPP by a factor of two to one. Participants perceived the less dramatic rate changes under TOU as a lower financial risk. Additionally, the communicative aspects of CPP proved burdensome for the utility and confusing for the customers.[48]

The SmartPricing Options Pilot Program also examined customer recruitment strategies, specifically default enrollment versus opt-in.[49] SMUD notified default enrollment customers three times during the three months prior to rate change implementation. This provided customers with ample opportunity to opt out of the pilot study. Opt-in participants were targeted through a multi-faceted marketing campaign with brochures, direct mail, outbound calling, print ads, and web-based marketing.[50] SMUD was able to test the efficacy of various wording choices. It found that the most effective strategy involved wording that emphasized benefit to the customers and their community, rather than the utility itself.[51] Customer focus groups revealed that photographs of local, real-life activities were the most effective images for marketing. Ultimately customer satisfaction was identical for both default enrollment and optional opt-in.[52]

Dynamic pricing reduced SMUD's load up to 25% during peak hours. Furthermore, more than 95% of customers reported being satisfied with the new pricing strategies.[53] Consequently, SMUD's Board of Directors decided to make TOU rates the default for all customers by 2018. In January 2016, SMUD began the process of migrating customers to a default TOU rate. The first customers to receive TOU rates were participants in the pilot program, owners/lessees of solar generation, and users of plug-in electric vehicles.[54]

Austin Energy's 2016 Rate Review similarly demonstrates how transparency and customer input can shape a utility's decision-making process. The rate review is a year-long public review on a proposed rate change.[55] The process requires an impartial hearing examiner to conduct an independent review of the rate recommendation, and an independent consumer advocate to represent customers. Last year, 26 intervenors participated in the hearings for 30 hours of live testimony. Austin Energy answered more than 1,100 questions prior to the Austin City Council unanimously passing the rate change. Austin Energy originally proposed to reduce base rates by $24 million; however, the rate review process concluded with a $42.5 million reduction in base rates.[56] The lower base rates that resulted from this process led to more stratified rate tiers, with high-energy users paying significantly more.[57] The utility initially sought smaller base rate reductions so that it could be less financially reliant on high rates expected during peak summer months, but public input required a different approach. The rate review also produced an agreement that Austin Energy would develop a roadmap to a coal-free power portfolio, starting with the retirement of its stake in the Fayette Power Plant by 2022.[58]

Renewable Energy Investments

Both SMUD and Austin Energy have built their own renewable generation in addition to purchasing renewable energy through long-term contracts. SMUD's solar generation capacity went from 9 MW of solar generation in 2006 to 170 MW in 2017. According to Arlen Orchard, CEO and General Manager of SMUD, much of SMUD's success in renewable generation is due to its adoption of green pricing strategies, wherein residential, commercial, and government users pay more to have their energy needs met by renewable sources. SMUD is committed to investing in tools for increased information and an increased sense of control for customers, executing dedicated strategies for each distributed energy resource, and facilitating informed choices for customers; green pricing allows for this type of customer control. Through green pricing, residential customers can choose to pay an additional $3 or $6 per month to join the Greenergy® program and have 100% of their electric demand satisfied with renewable sources.[59]

Commercial participants in the Greenergy® program can become Green-e Energy certified, which comes with significant local recognition.[60] Customers are increasingly sophisticated and are using new technologies; this trend, combined with big data and flat revenues, is driving SMUD to move to a lower-carbon future, and that future is reshaping resource portfolios and causing the reimagining of utility infrastructure.

SMUD also boasts one of the first community solar programs in the nation, SolarShares®– a program that offers promising lessons for other munis considering means of increasing renewable generation. Munis benefit from community solar because they own all of the generation and transmission equipment, unlike most distributed solar systems. Community solar as implemented by SMUD works by offering customers the option to have a portion of their power provided by locally-owned and operated solar farms by enrolling in SolarShares® online.[61] Participants pay a flat monthly rate determined by their historical energy use, and their monthly SMUD bill is credited based on the solar output of that month.[62]

In addition to ensuring that SMUD owns the generation and can control its cost, SolarShares® provides an opportunity for willing customers to utilize solar energy when a home installation is impracticable.[63] This program is well-suited for renters, homeowners in shaded areas, and homeowners unable to pay the high up-front cost of installation.[64] SMUD is continuing to expand its solar generation, including at the Rancho Seco Solar farm, which it built on the site of a decommissioned nuclear plant. SMUD is also in the process of developing solar options for all segments of the customer population, including low-income populations. Low-income customers may enroll in SMUD's Energy Assistance Program Rate (EAPR) to receive a 48% monthly discount, with a maximum monthly discount cap of $42.[65] EAPR participants have the option to work with SMUD's partner, GRID Alternatives, to install home solar systems funded by a statewide program called California Climate Investments.[66]

Austin Energy has also invested in renewable energy options for customers. Austin Energy's GreenChoice® program "is the nation's most successful utility-sponsored and voluntary green-pricing energy program" according to the utility,[67] allowing residential and commercial customers to procure 100% wind energy. For residential customers, the cost is an additional $0.0075 per kW hour, or, on average, $6.70 per month. Business owners can either opt for the same price as residential consumers and sign a 12-month contract, or a cheaper rate when signing a 5-year contract. In 2016, more than 10,000 GreenChoice customers invested in more than 719 million kWh of Texas wind, avoiding more than 430,000 metric tons of carbon emissions.[68] Austin Energy also has more than 250 plug-in electric vehicle charging stations that are powered through the GreenChoice program. To further incent the adoption of electric vehicles, EV owners can get unlimited charging at any public charging station for $4.17/month, and may also be able to get assistance in paying for a 240v charging station for a home location. Bike riders may also qualify for a rebate for the purchase of an electric motorcycle, bike, scooter, moped, or Segway. Additionally, businesses, multifamily properties, and auto dealers may qualify for incentives for EV charging.[69]

In addition to its GreenChoice program, Austin Energy offers rebates and incentives for residential or business customers to install solar panels and provides community solar options. For residential solar incentives, the incentive has been ramping down as capacity is installed. With 12,000 kW either installed or requested, the current tranche is for $0.50/watt, with another 2,400 kW available in this tranche. For small commercial customers, the current tranche is $0.06/kWh; for medium commercial customers, the current tranche is $0.05/kWh. Large commercial customers – those with projects greater than 400 kW and less than 1000 kW – still have incentives available at $0.04/kWh.[70]

Austin SHINES, funded through a $1 million grant from the State of Texas and a $4.3 million grant from the U.S. Department of Energy SunShot Initiative, includes a community solar plus storage project and technology platform pilot to enable and promote integrated distributed energy resources. The project is estimated to be completed by April 30, 2019.[71] The utility anticipates that the community solar program will add an extra $10 - $19 per month to completely offset a home's usage.[72]

Energy Efficiency Improvements

In addition to owning renewable generation or purchasing electricity from this type of generation, utilities can often achieve a substantial portion of their low-carbon goals through programs that reduce energy use by incentivizing efficient appliances and improved building design and construction, among other measures. SMUD and Austin Energy both offer energy efficiency options to customers. SMUD provides rebates, incentives and financing for a variety of energy efficiency investments, including in the areas of pools and spas, appliances, heating and cooling, and lighting. Rebates include $350 for a qualifying variable-speed pool pump, and range between $50 and $1,500 for appliance replacements and $25 to $1,500 for heating and A/C units and upgrades.[73] Additionally, SMUD provides energy efficiency financing to help customers replace high energy-using equipment with more efficient models. SMUD works with participating contractors to provide whole house efficiency programs, starting with an energy audit and developing a customized upgrade plan. Rebates can be up to $8,000 per house, depending on the upgrades performed.[74]

Austin Energy has invested heavily in smart grid technology, including one of the first distribution management systems in the country.[75] This technology connects more than 1 million customers and 5,000 businesses to power plants through a communication network. Smart thermostats and interpretive software allow customers and the utility to manage usage through web-based tools,[76] and Austin Energy pays customers $25 for the installation of qualifying wifi-enabled thermostats. This technology supports the demand-side management Energy Cycling Program, for which customers can receive $85 upon enrollment.[77] The Energy Cycling Program allows the utility to remotely adjust thermostats by a few degrees on a maximum of 17 days per year.[78] Customers may also sign up for the PowerSaver program, through which they receive email and text alerts to reduce energy usage during peak times.[79] Additionally, smart meters help Austin Energy address outages and implement creative rate structures such as time-of-use billing.[80] The utility has made smart meters the default while retaining the option for customers to opt out of the program.[81]

Energy conservation is also a critical part of the utility's low-carbon strategy. Austin Energy customers may not opt out of the city's Energy Conservation Audit and Disclosure Ordinance (ECAD).[82] Residential properties must be audited once they become 10 years old, and prior to sale of properties more than 10 years old. An ECAD Energy Professional performs the audit for about $200 to $300. Commercial properties more than 10,000 ft^2 must be audited annually. All High Energy Use Properties (properties using more than 150% the energy of similar properties) must reduce usage by 20%. Failure to comply with ECAD results in a Class C Misdemeanor and a $500 to $2,000 fine.[83]

The flexibility of being a muni has been key to implementing these types of programs according to Khalil Shalab, Austin Energy's Vice President of Energy Market Operations and Resource Planning, as the muni may not have been able to justify the costs associated with these sorts of projects to a public utility commission. Austin Energy is also benefiting from this flexibility in its quest to achieve net zero carbon emissions by 2050, prioritizing prudent spending in conjunction with efficiency measures. Since efficiency will continue to be critical and is the cheapest way to lower emissions, Austin Energy has implemented tiered rates to encourage conservation and continue carbon reductions.[84] The utility uses a five-tier structure in which rates are increased with every additional 500 kWh of usage, which rewards customers who use less electricity with lower rates.[85] Additionally, to manage the Texas market design and market conditions, the utility is a Qualified Scheduling Entity with around 40 employees. Qualified Scheduling Entities have the ability to purchase energy from Resource Entities generating power, and sell energy to Load Serving Entities such as competitive retailers.[86] This allows Austin Energy to settle financially with ERCOT—the operator of the Texas transmission grid—when participating in the day-ahead and real-time markets.[87] Qualified Scheduling Entities must also submit a Current Operating Plan for their resources and the ancillary services (last-minute services necessary to balance voltage in the grid, such as rapid ramp-up of a power plant) that they may offer/procure.[88]

Case Study #2 begins on the following page.

Case Study #2: Public Power Associations

Introduction

This case study examines challenges facing munis from the perspective of four Public Power Associations: Massachusetts Municipal Wholesale Electric Company (MMWEC), Utah Associated Municipal Power System (UAMPS), American Municipal Power (AMP), and Missouri Public Utility Alliance (MPUA).

Public Power Associations (PPAs) are non-profit, community-owned utilities that are subdivisions of state governments. They are generally smaller in size, with 2,006 PPAs providing 14.5% of power to forty-nine states. Compared to co-ops and investor-owned utilities, PPAs are less likely to be vertically integrated. Instead, PPAs use joint action agencies to obtain reliable and competitively priced energy by achieving economies of scale.[89] Joint action agencies have grown to provide technical, advisory, and training services that are otherwise unavailable to independent municipalities. Without shareholders, PPAs operate conservatively while retaining the flexibility to respond to customer needs.

MMWEC was founded as a joint action agency in 1969 and became a non-profit, political subdivision of Massachusetts in 1976.[90] Of the 40 munis in Massachusetts, 21 are members of MMWEC, and 28 are MMWEC Project Participants.[91] MMWEC is governed by a 12-member board of directors. Seven directors are elected from member utilities to serve 3-year staggered terms, two are appointed by the Governor of Massachusetts, and three are appointed from particular townships to vote on matters affecting their respective towns.[92] MMWEC owns approximately 500MW of generation from fossil fuels,[93] 200MW from nuclear,[94] 25MW from wind,[95] and 25MW from solar.[96] The organization has preserved its role as a joint action agency through efforts to pool the political, legal, and economic strength of individual municipalities to accomplish more ambitious projects.[97] MMWEC has the power to issue tax-exempt revenue bonds to finance generation projects.[98]

Utah Associated Municipal Power System (UAMPS) was founded in 1980 under Utah's Interlocal Co-operation Act.[99] UAMPS is comprised of 46 utilities throughout seven western states; each of the utilities is represented on the Board of Directors.[100] In 2016, UAMPS produced 75% of its power (40% from coal and natural gas combined, 28% from hydro, 6% from renewable resources, and 1% from nuclear) and purchased the remaining 25%.[101]

American Municipal Power, Inc. (AMP) was formed in Ohio in 1971 as a tax-exempt membership organization. AMP's 135 members serve 650,000 customers across 9 different states.[102] The PPA is governed by a 21-member elected Board of Trustees.[103] Member utilities own 1700MW of generation,[104] 40% of which is fossil fuel, 16% hydro, 2% landfill gas, and 3% solar and wind.[105] The remaining 39% is acquired through power purchase agreements and from the MISO and PJM RTOs (regional transmission organizations) that cover AMP's service area and provide competitive markets for power.[106]

Missouri Public Utility Association (MPUA) is an umbrella organization for three PPAs: Missouri Association of Municipal Utilities (MAMU), Missouri Joint Municipal Electric Utility Commission (MJMEUC), and Municipal Gas Commission of Missouri (MGCM). MPUA has 122 members throughout Missouri, Arkansas and Illinois.[107] The largest constituent PPA, MJMEUC, has 67 members and owns approximately 550MW of coal and natural gas generation. MJMEUC also has power purchase agreements for 10MW of landfill gas, 19MW of solar, and 25MW of wind energy.[108]

This diversity – in organization, size, membership, and governance – has led to a wide range of projects, developed by pooling resources to achieve individual goals. That pooling enables PPAs to take more risks than would otherwise be prudent given their sizes, allowing them to invest in higher cost projects. This risk sharing also allows less proven technology to be brought online.

Transitioning to Lower-Carbon Sources: Procedure and Process

While all PPA member utilities need reliable power and supporting services, members do not have identical roles within their PPA. This is because PPAs engage in numerous projects beyond purchasing and selling energy. Munis can choose to participate or not participate in a given PPA project. UAMPS currently has 16 different projects, from political lobbying campaigns to wind farm construction. The project-based system allows member utilities to individualize their path to a lower-carbon energy future. For example, UAMPS members from Idaho and Wyoming currently have less incentive to participate in low-carbon projects because they have no renewable portfolio standards (RPS). Alternatively, California members facing an ambitious RPS might be very interested in low-carbon projects. Yet some projects, like the Colorado River Storage Project, are less appealing to California members because its RPS does not recognize large-scale hydropower as renewable.[109] Members work together when their interests overlap without sacrificing resources when they do not.

PPA projects for new generation typically utilize take-or-pay contracts. Member utilities who wish to participate in a new generation project will agree to pay a "minimum bill" to the project developer for a specified period of time. This obligation stands regardless of whether the utility actually needs or takes the generated energy. Depending on asset utilization, rates for capital, and market conditions, it may take a significant period of time to pay off capital investments on energy projects; developers use take-or-pay contracts to protect themselves from deteriorating market conditions. From the perspective of a PPA, take-or-pay contracts ensure that both the risk and reward of a given project falls only on participating members.

Responses to Specific Challenges

One of the challenges facing PPAs as a group is the diversity of generation and load profiles. Electric load profiles are influenced by climate, elevation, commercial-to-residential ratio, weather, efficiency, day of the week, season, customer density, and more. These factors interact differently for each utility. For example, urban areas retain heat and thus need more energy for air conditioning in summertime, whereas rural areas need more energy for heat in the winter.[110] AMP has utility members from Virginia to Indiana, each with a unique load profile. PPAs must find a way to match these varied load profiles with equally unique generation profiles. No one generation source is the right fit. For example, MJMEUC has an extremely diverse power mix, but generates no hydro. UAMPS's power mix is less diverse, but the system gets 28% of its load from hydro. PPAs inevitably vary in the types of their generation assets, how much power they purchase, and whether they use power purchase agreements or the wholesale market. Such complexity requires each PPA to develop a personalized transition to a low-carbon future; there is no one-size-fits-all solution. The remainder of this section describes specific PPA projects.

Berkshire Wind

PPAs face challenges beyond matching load and generation profiles within the areas they serve, including, for example, permitting and litigation hurdles. The Berkshire Wind Project is a public power project owned and operated by 14 munis in Massachusetts. The project is the second largest wind development in the state, with ten turbines and 15MW of capacity. With no renewable portfolio standard for munis in Massachusetts, this project was largely driven by the will of customers and advocacy groups. Despite widespread support, the Berkshire Wind Project faced several challenges. The original developer encountered permitting issues and withdrew in 2008. MMWEC took over development beginning in June 2009. However, construction halted once again in October 2009 when the owner of a time share property complained of visual impairment from the turbines. Construction resumed a year later, but not before adding another $10 million to the project price tag due to the delay. The Berkshire Wind Project became operational in May 2011.[111]

> The City of Aspen offers a model for utilizing local resources to create a renewable generation profile. After experiencing 20 fewer days of annual frost and an average temperature increase of 3° over the past 25 years, Aspen implemented the Canary Initiative. The utility set goals of a 30% reduction in carbon emissions by 2020, and an 80% reduction by 2050. Widely adopted elsewhere, solar generation proved impracticable due to real estate prices. Instead, Aspen contracted new power purchase agreements from nearby generation sources. As of 2015, Aspen is 100% renewable, with generation coming from 46% hydro, 53% wind, and 1% landfill gas. The natural resources available in the area and customer desire allowed Aspen to make an efficient transition to a fully renewable generation profile.
>
> The challenge is reproducing the same transition in less affluent communities. Aspen residents currently enjoy the sixth lowest rates in Colorado, while Aspen's commercial rates are less competitive. Shifting the burden to commercial customers could be less effective in municipalities where there is not a robust tourism industry.

UAMPS SMR

Another innovative PPA project that faces permitting and financing hurdles is in the nuclear area. UAMPS launched the Carbon Free Power Project in 2015 to ensure a lower-carbon future of its members' energy supply. The project will focus on energy efficiency, distributed solar, and the development of NuScale small modular reactors (SMRs).[112] Even though nuclear power is carbon free, it carries a unique set of challenges such as safety, scalability, compatibility with renewable resources, and cost. Small reactors like the NuScale SMR provide solutions to these issues in a variety of ways. The 40% ramp rate allows the reactors to heat and cool quickly, making them "Fukushima proof." Improved ramp rate and scalability also make the reactors more compatible with intermittent renewable resources in terms of grid balancing. Each NuScale module is planned to be a 50MW pressurized water reactor.[113] This can be scaled up to twelve reactors in a single power plant for 600MW of generation. NuScale SMRs are expected to provide a lower-cost option for munis and PPAs compared to larger traditional nuclear reactors.

The development of NuScale SMRs relies partly on federal tax credits and loan guarantees. The 2005 Energy Policy Act requires nuclear power plants to be operational by 2020 in order to qualify for production tax credits.[114] However, designing, licensing, and constructing a nuclear power plant is a lengthy process that puts developers at risk of missing the 2020 deadline. NuScale is counting on legislative efforts to remove this deadline because the first SMR is expected to be operational at the Idaho National Laboratory by 2024. NuScale is the only U.S.-based company working solely to commercialize SMRs, and it has already received more than $250 million in matching funds and licensing grants from the Department of Energy.[115] In March 2017, the U.S. Nuclear Regulatory Commission accepted NuScale's Design Certification Application, a significant milestone in the design and licensing process.

AMP Solar

Solar developments, too, face financing hurdles, leading to creative financial solutions. One effective strategy for solar development is the use of ownership structures that allows PPAs to take advantage of tax incentives. The solar Investment Tax Credit (ITC) provides a 30% federal tax credit for both distributed and utility-scale solar installations.[116] This legislation has driven scale in the industry; now the average residential installation cost is 60% lower than in 2006 when the credits were first implemented.[117] Solar ITCs have been extended through 2019, with a current schedule that will phase out the program by 2023.[118] These incentives are unavailable to PPAs, which do not pay taxes due to their public, non-profit status. That is in part why PPAs use partnerships with private developers. AMP announced a joint development project with DG AMP Solar, a NextEra subsidiary, in March 2016. Twenty-two AMP members executed an agreement with DG AMP Solar to develop, construct, and operate 80MW of new solar generation. NextEra owns and operates the sites, while AMP purchases all the output. The first 20MW solar plant went into operation in 2017 at the Bowling Green site.[119] Building residential and commercial solar "behind the meter" (for use on site) is the most effective way for PPAs to benefit from federal tax credits as an energy off-taker.

Energy Efficiency Initiatives

Energy efficiency is another way for PPAs to reduce consumer costs and carbon emissions. AMP recruited the Vermont Energy Investment Corporation to establish Efficiency Smart, an Ohio-based operation that specializes in improving energy efficiency. AMP member utilities can subscribe to the service in exchange for technical expertise and efficiency incentives. Since 2011, 54 member utilities have used Efficiency Smart to reduce their load by an average 3.6%.[120] The program works by offering an array of à la carte energy efficiency measures that customers may choose from. For example, residential customers have access to discounted LED lights, home energy audits, and rebates for ten different products including, among others, advanced thermostats. Customers use only the efficiency measures that are effective and useful for their circumstances. AMP has used the collective resources of its member to achieve a level of demand-side expertise that would otherwise be unavailable to its members.

Transmission Upgrades

In addition to new generation and efficiency products, PPAs also participate in transmission planning to enable the growth of low-carbon generation. The Grain Belt Express Clean Line is a 780-mile transmission project intended to deliver 4,000MW of wind energy from western Kansas to Missouri, Illinois, Indiana and neighboring states. Direct current technology will allow the line to transmit more energy with less line loss than alternating current. Direct current infrastructure also has a smaller land-use footprint than alternating current. This helps utilize existing rights-of-ways, an important hurdle for private developers, which typically lack the power of eminent domain.

The eminent domain hurdle is still substantial, however, because states vary drastically in their willingness to grant this power to merchant transmission line developers, and every transmission project requires the approval of all of the states through which the line passes. Indeed, in 2017 the Supreme Court of Illinois determined that the developer of a similar transmission line project to support wind energy was not a "public utility" and therefore could not obtain a certificate of necessity that it sought from the state.[121] These types of impediments could derail the Grain Belt Express project; Indiana and Illinois cannot access Kansas wind without the cooperation of Missouri.

Despite legal hurdles to the transmission project, certain actions of the PPA have helped to move the project forward. MJMEUC helped incent cooperation with the Grain Belt Express by contracting for 200MW of wind energy, a move that could save dozens of Missouri cities hundreds of millions of dollars over the next 20 years.[122] In general, merchant transmission lines have better chances of success due to a 2009 policy shift from the Federal Energy Regulatory Commission.[123] It is now easier for developers to finance merchant transmission lines because PPAs can pre-subscribe capacity. Before, PPAs had to purchase at auction, which made it difficult to get the initial commitment needed to legitimize a project and attract additional investors. Construction of the Grain Belt Express Clean Line is expected to begin in 2018.[124]

Challenges with Siting New Generation

Similar to transmission-based obstacles, MPUA and Lakeland Electric (Florida) have both experienced challenges with siting new generation. MPUA's solar project in Butler, Missouri was delayed due to concerns over solar glare affecting pilots flying overhead. But developers addressed these concerns, and the 3.2MW Butler Solar Energy Farm has been operational since May 2014. MPUA's efforts to develop landfill gas energy also face siting concerns. Although it would be ideal to "play it as it lies" and develop landfill gas generation wherever landfills are located, not all landfills are conducive to grid access, so it is not necessarily easy to find good sites to develop. Additionally, not all landfills will continue to be productive after the time it takes to build power generation.

Lakeland Electric attempted to take advantage of favorable conditions for solar development in its territory. The city, as a distribution hub, has flat-roofed warehouse space that would be good for industrial-scale solar installations. However, the utility ran into a split benefit problem – the reduction in energy use would mostly benefit the tenants of the warehouses, whereas the burdens of construction, potential roof issues, and long-term contracts would fall to the building owner. Even after attempting to lessen this disparity in impacts, the utility found building owners unwilling to install solar panels on their warehouse roofs. While they have been unable to install solar capacity on buildings to the extent hoped, Lakeland has developed utility-scale renewable projects within its territory.

Case Study #3 begins on the following page.

Case Study #3: Pedernales Energy Cooperative (PEC)

Introduction

Electric cooperatives are private, non-profit, member-owned utilities. Co-ops are not governmental entities like munis but are rather governed by their customers. There are more than 900 utility co-ops across 47 states, and they generally serve low-density areas, powering 11.3% of the population across almost 75% of the overall U.S. land mass.[125] Unlike IOUs, co-ops are generally not subject to the authority of public utility commissions. However, renewable portfolio standards often do apply to co-ops, or can if they are of sufficient size. This case study explores challenges and opportunities facing co-ops' transition to a lower-carbon energy mix from the perspective of Pedernales Electric Cooperative (PEC).

PEC serves more than 270,000 meters, making it the nation's largest energy co-op.[126] Located just outside of Austin, TX, the co-op continues to grow by 1,200 new electric meters a month. The 8,100 square miles of service area within the co-op is split into seven districts, each of which is represented by a resident of the district on the seven-member Board of Directors.[127] Directors are elected for three-year terms, and they are limited to four consecutive terms.
[128]

PEC is a distribution and transmission co-op, meaning it does not generate power, but rather purchases it on the wholesale market and through power purchase agreements.[129] The Lower River Colorado Authority (LRCA) is a non-profit Texas utility and the wholesale provider for 75% of PEC's load.[130] For 2016, LRCA estimated that 50% of its generation was from coal, 44% from natural gas, and 6% from renewables like wind and hydro.[131] PEC has additional power purchase agreements, such as wind energy from AEP Energy Partners.[132]

PEC must balance the demands of both rural and suburban/urban customers, and this poses some challenges with respect to transitioning to lower-carbon energy sources. Its urban eastern territory borders Austin, TX; this area accounts for PEC's rapid growth. Its western territory is rural and has a low commercial to residential load ratio. Rural customers tend to be unwilling to pay for infrastructure that will only benefit urban customers, such as charging stations for electric vehicles. On the other hand, urban areas are driving profits with their rapid growth and high commercial to residential load ratio. Because of this duality, PEC's allocation of resources focuses on questions of equity and fairness. Additionally, rural customers generally support other low-carbon options, such as rooftop solar; some view this option as increasing independence and self-sufficiency.

In addition to PEC's specific challenges with respect to its diverse urban-rural customer mix, infrastructure is one of the obstacles that generally burdens co-ops more than munis, often because of large, majority-rural service areas. PEC, with its large rural territory covered, faces this challenge. Low density service areas result in higher costs per customer for infrastructure improvements.

PEC and other co-ops also differ from munis in terms of government resources to define and enforce certain energy goals. For example, Austin Energy, as a muni, can incentivize efficiency through its Energy Conservation Audit and Disclosure Ordinance, which makes it a misdemeanor for certain consumers to not complete an efficiency audit. (*See Case Study #1.*) PEC has no authority to promulgate these types of ordinances.[133]

Transitioning to Lower-Carbon Sources: Process and Procedure

Defining Goals

One of the most important aspects of successfully transitioning to lower-carbon energy sources is ensuring consumer buy-in. PEC traditionally uses Cost of Service studies to determine factors driving costs and revenue, avoid drastic rate fluctuations, and provide reference points for goal setting.[134] However, given new rate structure proposals, the co-op implemented a particularly robust study in 2015, including soliciting extensive customer feedback.[135] PEC employed an outside consulting firm to assist in the research. First, focus groups tested the delivery and presentation of survey materials.[136] PEC then refined and distributed materials that set out utility goals and invited participation. PEC increased participation by tailoring communication to specific stakeholder groups (direct mail, online surveys, text surveys, one-on-one interviews, social media, and public meetings).[137] Survey findings were then analyzed and presented to the Board of Directors. Based on these findings the Board developed a rate proposal, which was debated in further surveys and public meetings.[138] Following this second round of member scrutiny, the Board finalized and rolled out the new rate structure.

The All Member Survey was an integral part of the Cost of Service study and was PEC's primary effort to engage customers. Online and mail-in surveys were collected for a month in early 2015.[139] The survey investigated satisfaction and familiarity with PEC rates and services. PEC also surveyed the level of interest in various rate structures and renewable energy. Findings were evaluated against characteristics like age, length of membership, and rural/suburban self-identification.[140] Additionally, in-person forums were held at four different locations; all forums were recorded and posted online. The All Member Survey produced 7,736 survey responses, 2,691 member comments, and 57 forum attendees.[141] Results showed that members were more interested in time-of-use and block rates than demand response and pre-paid rates. "Undecided" comprised about a third of all responses regarding interest in various rate proposals. Members also showed strong support for renewables like solar; however, only 25% of respondents reported familiarity with PEC's rates and fees for renewable energy, compared with 66% who reported familiarity with PEC's rates and fees in general.[142] One of the most impressive findings was the strength of member participation, an indication that members are seriously interested in rate structure changes.

Rate Design

In its rate restructuring effort PEC rejected the use of inclining tiered rates because they were predicted to deepen residential subsidies;[143] poorer members are less capable of reducing usage because they have less access to energy-efficient homes, appliances, and air conditioning.[144] Renters in particular have little control over their dwelling's efficiency. Consequently, wealthy members are better able to reduce usage and not trigger the higher-tier rates during peak summer months, which ultimately shifts the financial burden to lower-income customers. This criticism has dogged PEC's utility neighbor, Austin Energy, which currently uses tiered rates.[145] Some argue that poorer customers tend to use less energy, and therefore will benefit from low tier rates. However, a study using 2011 and 2013 census data across 48 US cities found this not to be true. The energy burden for low-income households (a measure of energy bills in proportion to income) was approximately threefold the energy burden of non-low-income households.[146]

The study also found the median energy cost per square foot was higher for low-income customers.[147] This supports the notion that low-income households are less energy-efficient, and undercuts the presumption that larger homes automatically have larger loads. Although PEC's All Member Survey revealed that customers were interested in tiered rates, socio-economic considerations cautioned against this.

Infrastructure Investments

PEC has embraced customer segmentation to satisfy the needs of its diverse membership. Like many growing utilities, PEC has implemented advanced metering in order to monitor outages and increase grid efficiency through two-way communication. However, members retain the right to opt out of advanced metering if they wish.[148] Advanced metering benefits customers by providing detailed usage and billing reports through the SmartHub application.[149] Customers who utilize advanced metering are provided an additional choice between flat rate billing or time-of-use billing.[150] Time-of-use billing helps PEC balance the grid and save money by incenting energy conservation during peak hours.

Renewable Energy Investments

PEC's approach to solar energy demonstrates how the co-op strategically serves a bifurcated member base by taking consumer values into consideration. Rural members in the western part of the co-op's service territory perceive solar generation as an empowering source of independence. Urban members in the eastern part of their service territory perceive solar generation as a green solution to environmental issues. These motivators determine what options are provided, and how they are presented. PEC is currently building 15MW of distributed solar generation across the Hill Country.[151] This project will consist of several five- to seven-acre sites, each capable of 998 kW of generation. The Hill Country solar project is expected to eventually lead to community solar installations, which would give members an opportunity to subscribe to a share of the solar project.[152]

PEC prefers community solar over net metering because it allows electric utilities to recover the fixed costs of grid operation. Utilities often fail to recover the cost of transmission when they compensate net metering at retail price. Depending on the value of the solar to the grid – and whether that solar generation coincides with system peak – the cost of transmission and distribution services to customers who own solar generation may or may not be financed by customers that do not. Still, community solar may be perceived as an example of a green solution that fails to satisfy some members' desire for a sense of independence; those members want the option to purchase their own solar generation and use net metering.[153] PEC supports net metering by offering EmPower Loans, which finance solar installation and consolidate repayment with standard monthly billing.[154]

Energy Efficiency Improvements

PEC has also developed a number of energy efficiency programs "designed to help" customers "use less" of their product.[155] Rebates are available for residential HVAC systems.[156] For commercial customers, rebates for lighting, HVAC, and variable frequency drive equipment are available, with customers able to receive up to $17,500 per rebate type up to a project location cap of $35,000.[157] PEC also links to other state and federal programs available to its customers to encourage energy efficiency.[158]

FMPA: Another Study in Customer Surveys

Florida Municipal Power Agency (FMPA) is a 31-member public power association that serves the wholesale needs of it municipal electric utility members, which account for approximately two million customers from Key West to the Panhandle. Each member appoints one representative to the governing Board of Directors, and Board Officers are elected by popular vote of the members. FMPA supplies all the power needs for 13 members and 40% of the members' total power needs.

FMPA has taken the first step toward increasing solar generation by surveying customer willingness across ten Florida member cities. The 2,565 responses showed that 72% of customers want their community to investigate solar energy, but about a quarter of the respondents believed a solar program would lower their energy bill. Most respondents were unlikely to be willing to pay more for solar, while 13% said they were "very likely" and 25% said they were "somewhat likely" to participate in a solar program that increased rates. Of those willing to pay more for solar, 56% preferred a "voluntary" model where customers could choose whether to participate in the solar program. College graduates aged 18-44, and who make greater than $60,000 a year, were the most likely to show interest in a solar program. Willingness to pay for solar correlated with financial status more than any other demographic characteristic. Since the March 24, 2017, conference, FMPA and its members have responded to their customers' desire to investigate solar energy by issuing a request for proposals from a number of solar developers. As a result, FMPA, together with the Orlando Utilities Commission, have executed power purchase agreements with NextEra Renewables Florida, Inc., for the development and purchase of 223.5 MWs of solar energy beginning in 2020, and for a twenty- to thirty-year term. These solar facilities will produce clean, renewable energy necessary to serve approximately 45,000 typical residential households in Florida. According to the Southern Alliance for Clean Energy, if completed as planned, this joint action project will account for approximately 5% of the total projected Florida solar capacity in 2021.

A recent survey by the Smart Grid Consumer Collaborative shows consistencies with FMPA's findings: even minor rate increases lead to a sharp decline in support for clean generation and energy efficiency. Only 82% of respondents support clean energy expansion that is free for customers. Support drops to 39% when expansion costs an additional $10 per month. For energy efficiency, 98% of respondents agreed that smart-grid benefits are important. However, only 26% of respondents were willing to pay an additional $3-4 per month for smart-grid technology.

Sources: https://fmpa.com/energy/overview-2/; https://fmpa.com/florida-municipal-utilities-gather-customer-input-on-solar-power/; https://www.greentechmedia.com/articles/read/survey-what-electricity-customers-really-want?utm_source=Daily&utm_medium=Newsletter&utm_campaign=GTMDaily. Thanks to Dan O'Hagan, Associate General Counsel, Florida Municipal Power Agency, for providing updates and some of the text for this case study.

Lessons Learned

The three case studies presented here offer several broad lessons that are potentially transferable to other munis and co-ops, including that low-carbon initiatives do not necessarily stem from political mandates, accounting for customer preferences for low-carbon options is important, and energy efficiency measures can be a valuable tool in munis' and co-ops' low-carbon efforts. But we conclude that the examples presented here also show that there is no one-size-fits-all approach, and that munis and co-ops will have to follow their own path to a large extent.

The Political Environment Can Make a Difference – But Doesn't Have To

As evidenced by the work of SMUD, Austin Energy, Berkshire Wind, and Aspen, a political environment focused on low-carbon initiatives – and a concerned customer base – at the state or local level can push utilities toward a less carbon-intensive future. However, movement toward low-carbon sources of generation is possible without mandates at the state or local level, as evidenced by projects like those that have been developed or are being developed by UAMPS, MPUA, AMP Solar, and MJMEUC.

Focus on the Customer

Focusing on the customer can take different approaches, and some utilities are turning to surveys or other forms of outreach to help them understand what their customers want. SMUD has focused on market differentiation – segmenting its customers to ensure that customer engagement and other interactions meet that specific customer's wants and needs – and strives to make the customer experience easy, responsive, personal, and collaborative. This effort results from the recognition that customers value resources like solar generation for different reasons. Recognizing the breadth of its large member base, PEC worked to reach all customers with its survey, including numerous forums and facilitated one-on-one conversations. Based on that customer survey, PEC also recognized that low-carbon generation like solar would be attractive to different customers for different reasons, and incorporated that knowledge into its offerings and informational materials. FMPA likewise surveyed its customers to determine if they wanted more solar generation – and what they would be willing to pay for it. PPAs have the ability to learn what their members want based on the types of projects that receive support when they are proposed, and individual members buy into them through take-or-pay contracts. These diverse ways to address customer wants and needs demonstrates there are many paths available to munis and co-ops to focus on the customer.

Energy Efficiency Programs Abound

Transitioning to a low-carbon future can involve more than generation – there are also opportunities in the field of efficiency. SMUD, Austin Energy, PEC, and AMP have all pursued a wide array of energy efficiency measures. While these programs differ in what specifically is included and the incentives and rebates offered, each enables customers to better control electricity usage and spending by enabling the installation of more efficient equipment.

There Isn't One Solution

Transitioning to a lower-carbon future will involve a unique path for each utility. This may include increased investments in technology like smart meters to enable innovative rate designs, improved grid functionality, and new transmission. It could include options for customers like community solar, with co-ops already leading the community solar movement through 100 programs in 30 states, totaling 39.5 MW of generation,[159] and increased energy efficiency measures. While size and structure do matter, by partnering with each other, co-ops and munis can continue to meet the needs of their customers while shifting their generation mix, and potentially taking on a small part of a larger project with higher cost and higher risk. All of these initiatives can contribute to moving to a lower-carbon future.

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[5] Moderators, panelists, and hosts for the conference included: Diane Cherry, Strategic Director, NC Sustainable Energy Association; Randolph Elliott, Senior Director, Regulatory Counsel, National Rural Electric Cooperative Association; David Hornbacher, Director of Utilities and Environmental Initiatives, City of Aspen, CO; Douglas Hunter, Chief Executive Officer, Utah Associated Municipal Power Systems; Joel Ivy, General Manager, Lakeland Electric, FL; Terry Jarrett, Attorney, Healy Law Offices, LLC; Alexandra Klass, Distinguished McKnight University Professor, University of Minnesota Law School; Jonas Monast, C. Boyden Gray Distinguished Fellow, Assistant Professor and Director of the Center on Climate, Energy, Environment and Economics (CE3), University of North Carolina School of Law; Dan O'Hagan, Associate General Counsel, Florida Municipal Power Agency; Arlen Orchard, Chief Executive Officer and General Manager, Sacramento Municipal Utility District (SMUD), CA; Dalia Patino-Echeverri, Gendell Assistant Professor of Energy Systems and Public Policy, Duke Nicholas School of the Environment; Heather Payne, Assistant Director, Center on Climate, Energy, Environment and Economics (CE3), University of North Carolina School of Law; Troy Rule, Professor of Law and Faculty Director, Program on Law and Sustainability, Sandra Day O'Connor College of Law, Arizona State University; Khalil Shalabi, Vice President of Energy Market Operations and Resource Planning, Austin Energy; Ingmar Sterzing, Vice President of Power Supply and Energy Services, Pedernales Electric Cooperative; Pamala Sullivan, Executive Vice President Power Supply and Generation, American Municipal Power, Inc., Columbus, OH; David Tuohey, Director of Communications & External Affairs, Massachusetts Municipal Wholesale Electric Co.; Shelley Welton, Assistant Professor, University of South Carolina Gould School of Law; Richard Whisnant, Gladys Hall Coates Professor of Public Law and Policy, University of North Carolina School of Government; and Hannah Wiseman, Attorneys' Title Professor, Florida State University College of Law.
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