RENEWABLE ENERGY OPTIONS FOR LARGE UTILITY CUSTOMERS

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Xcel Energy

Xcel Energy is a major U.S. utility company based in Minneapolis, Minn., serving 3.6 million electricity customers and 2 million natural gas customers. As a vertically integrated generation, transmission and

distribution utility, the company operates under cost-of-service regulation by public utility commissions in eight Midwestern and Western states — Colorado, Michigan, Minnesota, New Mexico, North Dakota, South Dakota, Texas and Wisconsin. In delivering on its strategic focus to lead the clean energy transition reliably and affordably, Xcel Energy is successfully reducing carbon emissions and providing clean energy solutions for customers from a variety of renewable sources.

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Introduction

By Lisa Schwartz, Berkeley Lab

For decades, electric utilities have offered voluntary tariff options that allow retail customers to purchase renewable energy for all or a portion of their electricity usage, above levels of hydro, wind, solar and other renewable resources that may be part of the utility's resource mix. While customers of all sizes participate, large corporations and cities are now driving much of the demand.

Utilities are taking innovative approaches to serve these customer interests. This report addresses key regulatory issues that public utility commissions are increasingly grappling with related to renewable energy options their jurisdictional electric utilities offer large customers.[1]

One issue is allocating the costs and benefits of voluntary renewable energy programs to participating customers to protect nonparticipants.[2] Another is claims about renewable energy attributes. Because renewable energy cannot be physically tracked — all electrons look the same — utilities and other renewable energy marketers use an accounting mechanism called a *renewable energy certificate* or *credit* (REC) to trace renewable energy sales and purchases. One REC represents one megawatt-hour of electricity generated from an eligible renewable energy source. Specifically, RECs represent the environmental attributes of renewable energy generation and can be bought or sold separately from the underlying electricity.[3] The Federal Trade Commission[4] issues *Green Guides*[5] to help marketers ensure claims about environmental attributes of products, including RECs, are truthful and nondeceptive.[6]

A growing number of corporations and cities have adopted a goal to meet all of their annual electricity needs with renewable energy sources. Some have already achieved that goal and are exploring new ways to match more closely their consumption with real-time electricity production from these and other carbon-free sources. For example, after meeting a 100 percent renewable energy purchasing goal, Google recently set a longer-term goal to source carbon-free energy for its operations on a 24/7 basis, focusing on data center campuses that account for the vast majority of its electricity consumption:[7]

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[1] Elected or appointed governing boards of rural electric coops and publicly owned utilities also face these issues.
[2] See Advanced Energy Economy, *Making Corporate Renewable Energy Purchasing Work for All Utility Customers*, 2017.
[3] https://www.energy.gov/sites/prod/files/2013/10/f3/rec_guide.pdf.
[4] Under Section 5 of 15 U.S.C. §45, the Federal Trade Commission (FTC) has authority to ensure that claims about specific products and services are substantiated by "competent and reliable scientific evidence."
[5] §16 CFR 260.15. See https://www.ftc.gov/news-events/media-resources/truth-advertising/green-guides.
[6] In addition to the FTC, the Federal Energy Regulatory Commission, U.S. Department of Energy's Federal Energy Management Program, U.S. Environmental Protection Agency, American Bar Association, and at least 35 U.S. states and territories recognize RECs as a valid basis for making claims with respect to renewable energy use. See Jones, T., R. Quarrier and M. Kelty. 2015. *The Legal Basis for Renewable Energy Certificates*. Center for Resource Solutions.
[7] Google defines carbon-free energy as "any type of electricity generation that does not directly emit carbon dioxide," including renewable energy resources as well as nuclear, storage and flexible electricity demand. Google, *Moving toward 24x7 Carbon-Free Energy at Google Data Centers: Progress and Insights*, October 2018.

Meeting this challenge requires sourcing enough carbon-free energy to match our electricity consumption in all places, at all times. Such an approach looks markedly different from the status quo, which, despite our large-scale procurement of renewables, still involves carbon-based power. Each Google facility is connected to its regional power grid just like any other electricity consumer; the power mix in each region usually includes some carbon-free resources (e.g. wind, solar, hydro, nuclear), but also carbon-based resources like coal, natural gas, and oil. Accordingly, we rely on those carbon-based resources — particularly when wind speeds or sunlight fade, and also in places where there is limited access to carbon-free energy.

This report presents diverse perspectives — utilities, corporate customers and cities — on the following regulatory questions:

1. How can utilities help large customers achieve their own renewable energy goals as they approach very high levels? And how should 100 percent renewable energy products be defined and disclosed?
2. What is the range of options for a utility providing 100 percent renewable energy products, and what are the implications of each of these options?
3. How can pace and cost be considered in procurement to achieve high renewable energy goals? And how can any negative impacts or risks be mitigated?

World Resources Institute (WRI) assists cities and corporations in purchasing large volumes of renewable energy through its American Cities Climate Challenge Renewable Accelerator and Special Clean Power Council for Customers and Utilities, and as a founding member of the Renewable Energy Buyers Alliance. For cities, low-cost solutions are key. Other factors include ease of procurement and community priorities and goals, such as local jobs and the economy, equity and resilience. With continued expansion of voluntary markets as cities and other large buyers meet their high renewable energy goals, WRI sees the need for continued evolution of product offerings to enable large utility customers to obtain the benefits of renewable energy they procure, consistent with their goals, and minimize impacts on other customers and the grid.

To achieve **Walmart's** goal to ultimately be supplied by 100 percent renewable energy, with an interim target of 50 percent by 2025, the company seeks out resources and product structures that deliver "industry leading cost" and RECs, with all the other potential benefits. Walmart works with utilities to develop programs that work well for a broad group of commercial and industrial customers and have minimal impact on nonparticipating customers. Walmart participates in regulatory proceedings throughout the United States to advance utility products that provide customers with benefits similar to those they can access in competitive markets.

Xcel Energy is transitioning its systemwide electricity mix to acquire clean, reliable and affordable energy at scale under bold new goals for renewable energy and emissions reductions. For customers that want to achieve higher levels of renewable energy usage sooner, the company offers a wide range of products and services to meet their needs for impact, additionality and transparency in disclosure.

1. Renewable Energy Options for Large Utility Customers: A City-Focused Perspective

By Lori Bird, Priya Barua, Heidi Bishop and Celina Bonugli, World Resources Institute

Introduction

Customer-driven markets for renewable energy in the United States have evolved over the past two decades, as renewable energy costs have fallen and new procurement options have emerged. In 2017, about 5.5 million retail electricity customers (both residential and nonresidential) voluntarily procured about 112 terawatt-hours (TWh) of renewable energy, representing 3 percent of all U.S. retail electricity sales.[8] Purchases have been growing rapidly, increasing 27 percent from 2016 and doubling in size since 2012.[9]

Large energy buyers, including local, state and federal governments; businesses; and institutional customers are driving much of this demand and are expected to continue to do so in coming years, based on their stated goals. A rapidly increasing number of cities and counties across the country have set ambitious renewable energy goals and are looking to utilities and other suppliers to help meet them. As of February 2019, 105 cities had committed to 100 percent renewable energy, up from just 57 cities prior to 2019.[10] While some city goals are aimed at using renewable energy to serve municipal loads, others are established for the entire community Table 3-1 lists a sample of cities with communitywide goals.

Table 1-1. Example U.S. Cities with 100 Percent Renewable Energy Goals

City	Stated Commitment - Communitywide Load (% RE)	Target Date
Atlanta, Ga.	100	2035
Boulder, Colo.	100	2030
Fayetteville, Ark.	100	2050
Madison, Wis.	100	TBD
Orlando, Fla.	100	2050
Portland, Ore.	100	2050, already met
Salt Lake City, Utah	100	2032
San Diego, Calif.	100	2035
San Jose, Calif.	100	2022
San Francisco, Calif.	100	2030
Santa Monica, Calif.	100	2030
St. Louis, Mo.	100	2035

Sources: America's Pledge Initiative on Climate (2018); CDP Worldwide (2016); DOE (2018)

[8] O'Shaughnessy et al. 2018.
[9] *Ibid.*
[10] Sierra Club 2019.

Cities[11] are already making sizable renewable energy purchases but are poised to increase investments in coming years to meet new goals. The top 30 local governments participating in U.S. Environmental Protection Agency's Green Power Partnership program purchase 4.2 TWh of renewable energy.[12] Cities continue to announce new large-scale procurements. For example, Philadelphia recently completed a 70 megawatt (MW) solar energy purchase, which can serve 22 percent of the city's municipal load by 2020.[13]

Municipalities are well positioned to benefit from and build off experience of large corporate customers that have developed innovative purchasing strategies in recent years and made large-scale clean energy purchases that are driving substantial new investment in renewable energy generation (see text box). However, cities may have additional objectives with respect to driving community benefits compared to corporate renewable energy buyers.

Corporate Renewable Energy Purchasing

- Global corporations have been forerunners in setting clean energy goals and driving innovations in renewable energy procurement over the last decade.
- Over the past five years, large corporate customers brought online 15.6 gigawatts (GW) of new renewable energy capacity, including contracts for 6.5 GW in 2018 alone (Business Renewables Center 2018).
- Nearly half of the Fortune 500 have set clean energy consumption or emissions reduction targets — up 5 percent since 2014 (WWF 2017).
- More than 150 global brands have committed to match their operational energy consumption with the purchase of renewable energy (RE100 2018).
- Nearly 500 companies have announced plans to reduce carbon emissions in line with climate science (Science Based Targets 2018).

To meet their goals, cities are looking to utilities for new renewable energy procurement options that address their objectives of procuring low-cost, resilient, clean energy at scale. Cities typically prefer to source renewables from local generators, when cost-effective and feasible, so utility options can be key. In seeking to procure renewables, cities face similar issues to other large buyers, as they typically have the same procurement options, regulatory context, cost considerations and voluntary program reporting frameworks. However, cities can have additional challenges in terms of contracting constraints, differences in ability to take on risks, the need to address equity within the community, and concerns for low-income customers. Utilities have developed new large-scale renewable energy product offerings to meet the needs of both government and corporate customers. In this essay, we discuss how utilities can help cities and other large buyers achieve their renewable energy goals and procure clean energy at scale.[14]

[11] For simplicity we mainly discuss cities in this essay, but many of the issues apply to local governments broadly.
[12] U.S. EPA 2018.
[13] Philadelphia Energy Authority 2018.
[14] This essay does not focus on community choice aggregation, which is another form of procurement allowed in some states, where a municipality can create an agency to procure power on behalf of residents.

1. How can utilities help large customers achieve their own renewable energy goals as they approach very high levels? And how should 100 percent renewable energy products be defined and disclosed?

Utilities are uniquely positioned to meet the renewable energy needs of cities and other large energy customers, particularly in traditionally regulated electricity markets. Since utilities provide physical delivery of electricity to customers, with growing customer demand and as more renewable energy comes online, utilities will play an increasingly important role in effective integration of renewable energy resources, while ensuring that the grid continues to deliver reliable and affordable electricity to all. Utilities can pursue approaches that ensure that renewable energy is integrated both flexibly and cost-effectively. Collaboration between a utility and its customers is often the key to making large-scale, local grid-based offerings successful and helping these solutions continue to evolve alongside customer needs.

A. How Customers Meet Their Renewable Energy Goals Today

Today, cities and other large customers procure renewable energy equivalent to their annual energy needs from either local or remotely located energy facilities. A variety of procurement approaches exist, and market innovations have expanded options particularly for large sophisticated buyers in recent years, but local options can be limited in some states.

Under most procurement approaches, buyers match annual electricity consumption with the purchase of an equivalent amount of renewable energy. Therefore, 100 percent renewable energy commitments continue to depend on existing fossil-fuel generation capacity and integrated grid services to support hourly electricity consumption. Regardless of how renewable electricity is purchased, any claim by the customer about renewable electricity usage must be supported through ownership of the associated renewable energy attributes, ideally in the form of retired Renewable Energy Certificates (RECs).

As more local governments and companies make large renewable energy commitments, a growing cadre of buyers are looking for forms of procurement that clearly drive new renewable generation capacity and provide the buyers with the economic benefits of these resources, to maximize both the economic and environmental benefits of their purchases. Many local governments and companies want to drive material impact (commonly referred to as "additionality") through their renewable energy purchases.[15] The following are key paths buyers are taking to meet this goal:

- **Supporting new renewable energy facilities**, whose generation the customer can claim is due to their contribution/participation
- **Ensuring replicability of solutions** so that a customer's actions increase access to renewable energy for others
- **Creating local projects**, ideally in the same utility service territory where the customer has facilities and operations

[15] Tawney et al. 2018.

- **Driving deliberate, long-term grid decarbonization** through contracts for technologies, services and new approaches that enable emissions-free energy over the long term

In addition, cities are typically interested in procuring clean energy in a way that can minimize costs, benefit the local economy, support local jobs, lead to a resilient grid and is equitable for all members of the community. Often cities must balance these priorities and make compromises. In evaluating energy options, cities must consider impacts to the broader community, including environmental justice considerations and impacts to low-income customers. Philadelphia, for example, has integrated local economic development considerations into their goal of sourcing 100 percent clean electricity for municipal operations by 2030. The city is working towards sourcing local jobs for projects, collaborating with their high school solar training program, and developing other workforce training programs. Their Solar Philly program, which offers group purchasing options for solar, includes special financing for low- and moderate-income households as well.[16]

B. Interaction Between Customer, State and Utility Renewable Energy Goals

Aside from customer renewable energy goals, states and utilities are also increasingly setting higher renewable energy targets as costs decline. Ten states, plus the District of Columbia, set Renewable Portfolio Standards (RPS) at 50 percent or more renewable energy by 2030 to 2045.[17] Similarly, many utilities across the country are voluntarily procuring renewable energy beyond levels required by the state's RPS. For example, Xcel Energy expects to source over 40 percent of its energy from wind by 2022, which surpasses RPS requirements across all eight states in which it operates well ahead of schedule. Xcel also recently announced plans to rely on 100 percent carbon-free electricity by 2050. (See Xcel Energy's essay in this report.) Michigan's CMS Energy announced in 2018 that by 2040 it will procure more than 40 percent of its energy from renewable resources and energy storage.[18] California's investor-owned utilities are on track to meet the state's 2030 RPS targets a decade early.[19] MidAmerican has also announced that its Wind XI repowering projects and new Wind XII projects will allow it to generate renewable energy equal to 100 percent of its customers' usage on an annual basis by 2020.[20]

The proliferation of higher state and utility renewable energy goals raises questions about interactions with customers' own renewable energy goals. Traditionally, voluntary renewable energy purchasing has been designed to drive renewable resources that are additional to those used to meet state requirements. Increasing amounts of renewable resources on the grid, driven in part by utility procurement beyond RPS requirements, raises the question of how a customer counts on reaching its own 100 percent renewable energy goal.

[16] Greenworks Philadelphia 2018.
[17] EIA 2019.
[18] CMS Energy 2018. The utility also plans to reduce carbon emissions by 80 percent.
[19] Gattaciecca et al. 2018. Meeting RPS requirements early is in part due to loss of load through community choice aggregation.
[20] MidAmerican Energy Company 2018.

For example, if renewable energy comprises 40 percent of the utility's generation portfolio, does a customer with its own 100 percent renewable energy commitment need to acquire only 60 percent more renewable energy? This seems reasonable from the customer's perspective. However, existing reporting platforms and programs, such as RE100 and the EPA Green Power Partnership, for which customers are held accountable, have varying guidelines and practices for what can credibly count towards renewable energy goals. Some programs require all eligible customer purchases from renewable resources that are additional to the existing electricity grid mix to ensure that the impact of the customer's actions exceed business as usual. In our example, this implies that a customer of a utility with 40 percent renewable energy in its grid mix can only report that it has reached a maximum of 60 percent of its renewable energy goal, rather than 100 percent.

Since many U.S. regions still have low penetration of renewable energy and the voluntary demand for renewable energy is still a small portion of total supply, this accounting approach to meet 100 percent renewable energy goals is workable. However, as electricity systems move to higher levels of renewable energy and more customers set ambitious goals, this approach will eventually become untenable.

C. It is important to start thinking about approaches to drive more alignment between customer, utility and state goals, while still accelerating deployment of renewable energy.

Opportunities for customers to collaborate with utilities can facilitate this transition at a systemwide level, but supporting accounting and reporting mechanisms that enable customers to get credit for that type of impact would need to be revised. One potential approach that some utilities are beginning to use (see Xcel and MidAmerican below) is to retire RECs on behalf of all customers to enable them to take credit for renewable energy in the grid mix used to meet all customer demand. Other approaches also may be feasible. Additional approaches may emerge as utilities and customers increase their levels of collaboration.

D. Emissions Accounting and Disclosure in Renewable Energy Products

Another issue — one that is exacerbated by the rate at which customers and utilities are procuring renewable energy — is the treatment of renewable energy in disclosure of the utility grid mix. That has implications for greenhouse gas (GHG) accounting and emissions reporting processes.

Customers that procure renewable energy want to be able to clearly account for the emissions reductions realized through their purchases and substantiate associated claims. Clarity is needed around how renewable energy and associated RECs are treated in supplier/utility emission factor calculations. Currently, RECs serve as the only instrument for large energy customers to track and quantify the progress that they are making to achieve their renewable energy goals. Clarity on the treatment of RECs, to avoid double-counting, is important.

Where a customer is procuring renewable energy from the utility to reduce emissions, it is beneficial to use a supplier-specific emissions factor rather than a regional or national emissions factor (e.g., eGrid factors), which masks results of those efforts and may be three to four years old. In addition, utility-

specific emissions factors should be used for each service territory, account for purchased and sold energy, and retire RECs in the same reporting year for any renewable resources included in the emissions factor.[21] Some voluntary utility reporting programs, such as Xcel Energy's CO_2 emission intensity metric reporting, provide supplier-specific CO_2 intensity factors that include a "residual mix" emission factor adjusted to exclude any RECs the utility has sold or retired on behalf of subscribers to voluntary renewable energy programs. In this way a customer receiving bundled energy and RECs in a special product can exclusively claim the CO_2 attributes, and a customer reporting Scope 2 emissions from the utility's overall resource mix do not claim those same attributes.

However, mandated utility reporting requirements focus on emissions from generation within the utility boundary and do not address the REC retirement in emissions factor calculations. Therefore, there is an automatic mismatch, which leads to repeated requests for information, and confusion. This problem is exacerbated by multiple methodologies and reporting platforms for both customers and utilities. More transparency, improved alignment, consistency and streamlining in the way information is presented are needed to address these challenges.

E. Approaches Utilities Can Take to Help Customers Achieve Their Renewable Energy Goals

As utilities add increasing quantities of renewable energy to their electricity portfolios, there is an opportunity to align goals between cities and utilities to support higher levels of renewable energy. Utilities can integrate customer renewable goals with their own generation portfolio goals and planning in several ways:

- **Integrating renewable energy into the utility's resource base.** Mid-American Energy has committed to sourcing 100 percent of its retail customers' electricity needs from renewable energy. The utility is building renewable energy projects where it makes the most sense on their system and retiring the associated RECs on behalf of all customers. This allows all customers to use their local grid to meet renewable goals.[22] Xcel Energy is also innovating on a similar approach through its proposed Certified Renewable Percentage offering (see the utility's essay in this report). Since the utility expects its portfolio for its multistate service territory to be 48 percent renewable energy resources in 2022, it has proposed retiring RECs that are incremental to its RPS obligation on behalf of all retail customers each year. In this way, customers can claim grid resources toward their renewable energy goals.
- **Integrating customer renewable energy goals into the utility's long-term plans and strategies.** An existing example of this is Georgia Power's Commercial & Industrial (C&I) REDI program, which has enabled the utility to integrate C&I demand for renewable energy directly into its systemwide integrated resource plan. Using this approach, the program was designed to install new renewable energy to meet demand from existing utility customers, as well as new customers, without negatively impacting the costs for

[21] WRI 2018b.
[22] Sweet 2018.

any other customers. This approach can serve the needs of cities and communities with renewable energy targets as well as demand from corporate customers.

In the coming years, we can expect to see utilities exploring a range of new product offerings and innovative approaches to integrate new renewable energy to meet the growing demand from cities and communities, including the integration of electric vehicles, demand response and other distributed energy resources to drive cost-effective solutions with broader grid benefits.

2. What is the range of options for a utility providing 100 percent renewable energy products, and what are the implications of each of these options?

A variety of products are available to enable large buyers to procure 100 percent renewable energy from their utilities, including green tariffs, and in some cases community-scale solar. Customers can also procure onsite renewable projects, although often utility involvement is limited. These options differ in the benefits they provide and which customer goals they address. For example, while procurement of onsite projects can be an important component of a city or corporate renewable energy strategy, most large energy buyers simply cannot purchase renewable energy at the scale they need through onsite opportunities alone. Given the intermittency of renewable energy sources and the limited roof capacity available, even the most energy-efficient big box retailer may get only up to 30 percent of its energy needs through onsite solar, and a data center may only be able to achieve far less.[23] This makes access to renewable energy through the grid a critical element to meeting renewable energy goals and a key consideration for new investment decisions.

Considering that only 13 U.S. states and the District of Columbia have restructured retail electricity markets (and functional access is limited in some of these states),[24] utilities can play an important role in supporting customers in meeting their renewable energy goals. By offering customized solutions and a range of options, utilities can enable large customers to support projects in their service territories that help retain and attract new load and support economic development in local communities.

A. Product Options

Utility Green Tariffs

Green tariffs are rates offered by utilities which allow customers to source up to 100 percent of their electricity from a renewable energy project — both the energy generated and the associated RECs. For regulated utilities, programs must be reviewed and approved by the state public utility commission. Once approved, these programs provide a voluntary renewable energy product for an entire class of customers. Participation in green tariff programs has been growing rapidly. As of the end of 2018, nearly 20 percent of all corporate renewable energy deals executed in 2018 were through green tariff

[23] WRI 2014.
[24] NREL 2017.

programs with regulated utilities, up from less than 0.5 percent in 2013.[25] Cities in Minnesota and Washington also have purchased renewable energy through green tariffs.

In contrast to power purchase agreements (PPAs) with third-party providers, where each customer is responsible for contracting (or one-on-one deals between a customer and utility where the details are not readily disclosed), an approved utility green tariff is typically open to a class of customers and, in some cases, can be more widely used. In addition, the customer typically is not responsible for resource bidding and contracting and, in some cases, can still weigh into the resource decision-making process. For cities and other large customers with limited capacity and expertise with project development, a green tariff can facilitate access to large-scale renewable energy projects (see Table 3-2 for examples).

[25] Dewhurst 2018.

Table 1-2. Example Utility Green Tariffs

State - Utility	Colorado - Xcel Energy	Missouri - Ameren	Washington - Puget Sound Energy	Wisconsin - MG&E
Green Tariff Name	RE*Connect, Schedule RC	RE Choice Program	Green Direct	RE Energy Rider
Tariff Type	Subscriber Product	Subscriber Product	Subscriber Product	Sleeved PPA, and/or Subscriber Product
Tariff/Contract Structure	Xcel enters a 20-year PPA with solar facilities. A second contract between Xcel and customer for solar subscription assigns renewable energy capacity share and costs.	Customer enters into a fixed-price renewable service offering with the option to subscribe up to 100% of annual usage. Ameren Missouri procures renewable energy resources through a third party.	Customer enters into service agreement with the utility that outlines energy costs for renewable resources. Customer must contract for 100% of the load at all meters located at each service address.	Customer enters into a RE Energy Rider service agreement for new or existing renewable resources.
Pilot Size	Capped at 50 MW; considering second tranche	Capped at 400 MW; additional capacity will be considered when program fully subscribed	Aggregate subscription limited to ~287 MW across two tranches	Existing customers capped at 25 MW with potential to increase cap. No limitations for new customers.
Contract Time Commitment	Month-to-month, 5 or 10 years; longer terms have lower prices	15-year term	10, 15 or 18 years	Negotiated term approved by the Commission
RE Deals Signed/Committed	Fully subscribed by communities and C&I customers; demand has outstripped supply.	Enrollment period has closed.	Fully subscribed by local governments, state agencies, universities and corporate customers.	8 MW solar project will be used by a county.

Source: Barua and Bonugli (2018).

Green tariffs differ by structure.[26] They can generally be set up as a sleeved PPA, subscriber program or market-based rate program. The development and delivery of these tariffs differ across utilities because of state context, regulatory considerations, and collaboration with customers on how to best meet their goals, which influences tariff design. Many successful green tariffs begin with a cross-functional team within the utility that has executive sponsorship and regularly consults with customers while creating and implementing the tariff. The team works to find the best opportunities for a value-added package that customers understand and avoids unfair cost-shifting to nonparticipating utility customers.

[26] For additional details on green tariff programs and their differing structures, see Barua and Bonugli (2018).

Sleeved PPA Programs. Essentially the basis for all green tariffs is a contract between an electricity generator and a power purchaser. The green tariff can be structured as an individual PPA, where the utility contracts with a developer to build a new renewable energy project to meet customers' needs. Often these projects have been developed to serve new load (e.g., a new data center) in the utility service area. The utility links this PPA to individual customers through a tariff that covers the total cost of the new renewable energy supply and sometimes a credit for services that are not used under the new agreement. This kind of green tariff is often called a sleeved PPA or an off-site physical PPA. One benefit of this model is that customers and the utility work together to identify appropriate renewable resources. However, this approach often requires a commitment from the purchaser for the length of the PPA, so is best suited to large, new energy load.

For example, Public Service Company of New Mexico's Special Service Rate No. 36 B provides Facebook's Los Lunas data center with 396 MW of new renewable energy.[27] The utility contracted new projects through PPAs to meet this demand and adjusts Facebook's electricity bill moving forward, through the Special Service Rate, to cover the project costs. An Excess Energy Production Credit is also applied, providing the customer with a credit for any additional energy the project produces above the data center's demand. In green tariffs such as this, the customer's needs are met, no additional costs are passed onto nonparticipating utility customers, and the amount of green power in the service area increases.[28]

Subscriber Programs. Under this structure, utilities first contract for a large renewable energy project and then allow customers to subscribe to a portion of the project. The standard energy charge on participating customers' electric bills is replaced with the cost of renewable energy from the project. Ultimately, these programs allow the utility to aggregate customer loads to make the single, larger project cost-effective. This is an effective approach to meet the needs of smaller, existing customers across a utility service territory, as opposed to customers who bring new load to the utility. These types of programs typically offer customers shorter contract lengths compared to a sleeved PPA.

Puget Sound Energy's Green Direct illustrates how utilities can use subscriber programs to meet needs of existing customers across a wide range of sectors. Offering access to local wind and solar in two tranches, both of which were fully subscribed quickly, nearly 40 customers have used the program,[29] including local governments, state agencies, corporate customers and universities. Through this green tariff model, customers meet their own renewable energy goals while creating new local renewable projects. For example, the city of Bellevue, Wash., is using the program to offset its energy needs,[30] alongside Bellevue College and local T-Mobile stores.

[27] Hill 2018; Dawn-Hiscox 2018.
[28] Barua and Bonugli 2018.
[29] PSE 2018.
[30] City of Bellevue.

Market-Based Rate Programs. Dominion's Schedule Market-Based Rate[31] is an example of an innovative collaboration on a green tariff between a utility and a customer. Unlike a physical PPA, this form of green tariff provides less connection between the power generated and load. In this arrangement, Dominion manages the sale of the new renewable power in the wholesale market and then offers Amazon a rate based on the wholesale energy, capacity, ancillary services and administrative fees in the PJM market. This rate replaces the charges for generation on a customer's bill. The green tariff allows Amazon to offset the cost of power consumed from the market with revenue from the renewable energy earned in the market, reducing the risk created by market volatility.

This approach is similar to Virtual PPAs (vPPAs),[32] where large electricity consumers can access renewable power through centrally organized wholesale markets without their utility. While vPPA structures can differ, customers often enter into a vPPA that sets a fixed energy price for the project developer to enable the project to be financed. The developer sells the power into the wholesale market at the current market price, which may be higher or lower than the contract price, and the customer either pays or receives a credit for the difference between the market price and agreed upon PPA price. The customer typically retains the RECs. Although cities have not used a market-based green tariff to date, Boston is taking the lead to pursue a vPPA to meet the collective load of 20 U.S. cities.[33]

Community Scale Solar

Community solar programs, also called shared solar, differ from green tariffs in that the solar projects are typically smaller and customers collectively purchase shares of the project. These projects can provide opportunities to meet customer needs with local solar resources, particularly for those customers without ideal conditions for rooftop solar. While community solar may only be able to serve a small portion of city loads given the relatively small project size (i.e., typically 1-2 MW or less), cities may be interested in these programs to expand solar access among community members, including low- and moderate-income residents. In community solar programs customers subscribe to a share of the solar project and receive monthly bill credits based on the production from their portion of the array. State law may specify the program details and utility role. Utilities typically provide customers with bill credits associated with the output of the array and may have other roles in implementation, although they may not necessarily develop and own the project. Customers may not retain the RECs from these projects, which limits their ability to make claims of using renewable energy.

For example, the Sacramento Municipal Utility District (SMUD) SolarShares Program is the largest utility community solar program in the nation.[34] The program offers subscriptions for generation from a solar project at a fixed monthly rate that is locked in, allowing customers to hedge against potential future increases in the utility's electricity rates.

[31] Barua and Bonugli 2018.
[32] Sometimes referred to as Financial PPAs, Synthetic PPAs or Contracts for Differences.
[33] City of Boston 2018.
[34] Sacramento Municipal Utility District 2018.

Communitywide Procurement

Cities can expand their role beyond renewable energy procurement for municipal operations and lead programs that drive communitywide procurement of renewable resources. Some cities have made communitywide procurement a priority and have set specific goals. For example, Minneapolis has a 100 percent clean electricity communitywide goal by 2030 on top of their 2022 goal that focuses on renewable energy for city operations. One approach to meeting such goals is for the city to work with groups of homeowners or businesses to aggregate their load and procure a large negotiated purchase of renewable energy from a solar provider or their utility. Recently, Rocky Mountain Power worked with Park City, Salt Lake City and Summit County to pass legislation needed for the local governments to procure 100 percent renewable energy from qualified utilities by creating guidelines, such as rates and terms, for establishing a renewable energy program between a community and an electric utility.[35]

In addition, the city can use partnerships with nonprofit organizations, technology installers and the utility to motivate and support adoption of distributed renewable energy projects across a community. One popular format has been "solarize campaigns," in which the city takes an active role in recruiting members of a community to invest in rooftop solar with a goal of achieving costs savings through a bulk order of systems from an installer. Bulk purchasing programs have focused on rooftop solar but could also be used to incentivize investment in other technologies, such as electric vehicles or solar water heaters.

When cities lead communitywide procurement programs, the targeted communities benefit from new educational outreach and may be motivated by collective action. Bulk procurements for large off-site renewable resources through a utility can provide greater benefits than standard aggregations if the city can explore new product offerings in the agreement for resilience improvements or special program features. For rooftop photovoltaic (PV), the programs often provide cost savings compared to installing solar individually, and may offer additional incentives and rebates. For utilities and solar installers, the city's relationship with the community is leveraged and they are able to lower their customer acquisition costs. Such programs can also provide technical value, as permitting and installation of residential solar is streamlined.

When considering procurement options to achieve 100 percent renewable energy goals, cities and other customers weigh several factors to choose the option that best fits their needs and constraints. Project cost, risk, ease of procurement and grid impacts are often important. Cities also consider how the project aligns with their community priorities and goals (e.g., local jobs, equity), as well as environmental impact — both the overall net impact and the local impact. They also may be required to follow specific rules and regulations in the procurement process, which can affect options. In some

[35] Means 2019.

cases, the best option may even require a mix of products. For example, Phoenix is hosting 32 MW of solar on its city's properties through a mix of PPAs, land leases and fully owned resources.[36]

Project Costs and Risk. The financial attractiveness of each procurement method and the financial risk associated with the project are a key starting place for considering options. For customers seeking price certainty, green tariffs have been a leading solution for 100 percent renewable energy goals as they provide access to long-term renewable energy contracts, which are often seen as a hedge against market volatility, or through market-based rates, for which customers take on the risks and benefits of fluctuating market prices.

For cities, low-cost solutions are key. Often local governments are limited to options that are not costlier than their current service. Text boxes in this section highlight two examples of cities purchasing 100 percent renewable energy through their utility.

Ease of Procurement. In addition to the costs and risks of potential projects, the relative ease of procurement can impact the types of projects large customers pursue. Large corporate customers benefit from in-house energy purchasing teams that have experience and dedicated time to undertake more complex projects. Cities and smaller companies, however, with less experience and staff capacity may choose projects that already exist, can be executed quickly, or do not require detailed analysis and outside assistance, such as a consultant. For customers seeking relative ease in procurement, while still achieving access to large-scale renewable energy, green tariffs are one solution because they are commission-approved offerings from the utility, with more simplified contracting than other options.

Grid Impacts and Benefits. As green tariffs for regulated utilities must be approved by state public utility commissions, a crucial part of tariff approval is demonstrating that the cost of building the project will not be shifted to nonparticipating customers, and that the associated renewable energy projects will not strain the local grid in a way that creates additional costs that are borne by nonparticipants. In many cases, utilities have been able to craft solutions that tie the costs directly to the customer and create systemwide benefits for all customers. A recent green tariff deal in Utah between PacifiCorp and Facebook was structured to cover the cost of a new electrical substation, which was integral not just for development of the project but also to support future renewable energy projects for other customers.[37]

Environmental Impact. Customers judge the environmental impact of their projects in many ways. The development of new renewable energy projects to serve their loads is one key consideration. Local projects also yield greater local environmental benefits (e.g., air quality or water savings). Increasingly, the effect that procured power has on offsetting the customer's demand also is becoming a factor. For

[36] For additional details, see Phoenix Environmental and Sustainability Goals: https://www.phoenix.gov/sustainability/energy.
[37] WRI 2018c.

example, when a project is in close proximity to their operations, customers can tie the project more closely to their demand and show they are providing benefits to their communities.

Puget Sound Energy and the City of Bellevue

The city of Bellevue entered into Puget Sound Energy's Green Direct program under a 20-year contract to supply 70 percent of the city's municipal load with new wind and solar. Starting in 2019, the city's Fire, Parks, and Finance and Asset Management departments plan to purchase 10.3 million kilowatt-hours (kWh) of renewable energy through the program, while the city's Utility Department agreed to purchase 3.2 million kWh starting in 2021. With a fixed energy charge and credit structure, the city anticipates paying a premium for the first 10 years of participation and then to break even, followed by savings in future years. The city will use savings from a municipal energy conservation program to pay for the initial premium (City of Bellevue 2019).

For cities, the ability of a project to illustrate clean energy leadership and drive tangible deployment of clean energy is another element of its environmental impact. How cities define leadership varies but can include actions where benefits are shared across the community, others are inspired to join in their efforts, or solutions can be easily replicated by others. Onsite and community-scale solar, for example, provide tangible local impacts that the public understands and are options that are available to many. However, these options alone may not offer the scale needed to meet 100 percent renewable energy goals and may not enable customers to meet their procurement goals, if they do not retain the RECs.

Additional Community Goals. Finally, cities have broader community goals that are often considered alongside environmental concerns. These include the impact of the projects on local jobs and the economy, equity, low-income populations and resilience. For example, cities interested in addressing equity concerns in renewable energy plans may consider the costs of participation, who will accrue benefits of the program elements, and how community and stakeholder consultation is conducted in developing the plan.

B. The Next Generation of 100 Percent Renewable Energy Products

A new wave of renewable energy products and strategies are attempting to match renewable energy production and customer demand by shifting from annual to hourly matching. These products are designed to address the concern that customers currently rely on conventional generation sources when their loads do not align with the timing of the renewable energy generation that the utility procures on their behalf. Utilities can structure programs that better mimic physical supply by matching renewable resource load shapes to average customer load shapes, which may be more in line with grid needs. One consideration with these types of products is that it may be more cost-effective to manage the mismatch between renewable generation and loads in aggregate on a systemwide basis, after netting out differences in customer loads, rather than matching to each individual user. Utilities are well positioned to offer products that address this issue on a systemwide basis.[38]

Xcel Energy and Minneapolis

To minimize cost of premium pricing products, some cities choose to make changes to their entire resource mix by investing in additional carbon-free options. For example, Minneapolis invested in community solar gardens and solar PV systems to achieve greater cost savings and ultimately offset the cost of participating in a green tariff program.

In 2017, it joined Xcel Energy's Renewable*Connect program under a 10-year contract that allows the city to source 17.8 million kWh from a blend of local solar and wind resources to match system average on- and off-peak demand. Although the program has a ~$0.008/kWh premium over standard retail electricity rates, the city increased its Community Solar Garden subscriptions, reaping cost savings that ultimately offset the cost of participating in Renewable*Connect. The RECs stay with the utility, so they do not count toward the city's goal. But the contract structure allows the city to save money from the outset and hopefully an increasing amount over time.

Xcel Energy has requested that the Minnesota Public Utilities Commission allow the city to obtain an additional 50 million kWh each year through the program under a five-year contract. That change would directly tie 70 percent of the city's electricity consumption to renewable energy sources. (City of Minneapolis, 2017a, 2017b; Rotatori and Bonugli 2018)

Google recently announced goals to match renewable energy with load on an hourly basis throughout the year, and Microsoft has announced an innovative approach to managing the financial risk of variable energy production.[39] These activities signal growing interest in strategies that involve closer consideration of renewable energy variability and grid impacts. Google has data centers globally, but it sources most of the renewable energy it uses from U.S. markets. Sourcing PPAs from projects on grids serving its data centers is a potential way to increase the local benefits of its efforts. The company plans to contract with diverse technologies that have varying generation profiles to better match demand hourly, as well as make use of storage to shift resources to times needed.

[38] See Xcel Energy's Renewable*Connect program, https://www.xcelenergy.com/programs_and_rebates/business_programs_and_rebates/renewable_energy_options_business/renewable_connect_for_business

[39] Google 2016; Janous 2018.

Microsoft's approach is more focused on financial arrangements and reducing its risk related to renewable energy variability. The company is using new Volume Firming Agreements — contracts that are stacked on top of PPAs that shift the risk of weather impacts on generation to third parties that manage this risk as a service. The company also is using Proxy Generation PPAs, which transfer project operational risk such as mechanical failures curtailment, or maintenance, to the project developer, rather than splitting the risks with the buyer. Microsoft believes the management of these risks will provide an incentive for future procurement of storage resources and other assets capable of physically balancing variable renewable energy resources.[40]

If successful, these innovations could become replicable solutions for other large corporate purchasers and perhaps cities. However, such solutions may be difficult for smaller or less-sophisticated buyers to implement, unless managed by the supplier. For cities, utility products that address hourly matching or products that address their other community concerns may be of greater interest. Utility solutions that provide cities with measurable increases in resiliency break down barriers to participation among low-income communities, or provide other innovative solutions will be of great interest as more cities craft their plans.

3. How can pace and cost be considered in procurement to achieve high renewable energy goals? And how can any negative impacts or risks be mitigated?

A. Pace and Cost of Achieving High Renewable Energy Goals

The pace of city renewable energy procurement is driven by city-approved targets, as well as cost considerations and procurement options. Sometimes city renewable energy goals are staged to first procure renewable energy for municipal facilities and then for the entire community load.

Aside from the timing of established target dates, cost considerations are influencing action. The falling costs of renewable resources have made it financially attractive to buy more renewable energy, often ahead of goals. In some places, renewable resources are now the least-cost generation option. Customers are also motivated by the ability to fix the cost of the energy component of their electricity bills — a benefit that utilities are increasingly incorporating into their product offerings, as we have seen with Puget Sound Energy's Green Direct program in Washington state.

Onshore wind and solar PV technologies are now among the least expensive types of new large-scale generation in the United States. According to Lazard, onshore wind plants range from $29-$56 per megawatt-hour (MWh) and crystalline PV ranges from $40-$46/MWh, compared to combined-cycle natural gas plants at $35-$81/MWh, and some utilities have reported substantially lower prices recently for renewable energy contracts.[41] Utilities in Nevada and Arizona have announced record-breaking bids

[40] Janous 2018.
[41] Lazard 2018.

for utility-scale solar projects or solar combined with storage, with prices coming in under $30/MWh.[42] Because of favorable pricing, renewable energy sources comprised more than half of new generating capacity each year from 2014 to 2017 and are expected to represent more than one-third of capacity additions in 2018.[43] The phase-out of federal tax credits by 2022 has encouraged cities and companies to accelerate procurement. They are expected to continue to do so over the next few years, until the credits are phased out.

As a result of these market trends and aggressive timelines, some cities and large energy buyers have already met their 100 percent renewable energy goals. For example, six U.S. cities (Aspen, Colo.; Burlington, Vt.; Georgetown, Tex.; Greensburg, Kan.; Kodiak Island, Ala.; and Rockport, Mo.) and 14 U.S. businesses (including Apple, Google, Lyft, Microsoft, Starbucks, Steelcase and Wells Fargo) report that they are procuring renewable energy for all of their loads. They have done so through a variety of approaches including onsite installations, offsite purchases (either directly or through a local utility), and unbundled REC purchases.[44]

A. Grid Impacts of Voluntary Renewable Energy Purchases

The grid impacts of voluntary renewable energy purchases are influenced by a variety of factors, including the procurement methods, project sizes, characteristics of the grid where the project is located, and how well the renewable energy production matches the customer's load (i.e., both location and timing). In many cases, cities and companies are supporting the development of new renewable energy projects in locations where cost-effective projects can be sited and built. Therefore, buyers are still reliant on the utility and other generators to serve their loads on an hourly basis.

Large cities that plan to shift their entire community load to renewable sources have the potential for greater local or regional grid impacts, depending on their procurement methods and the location of the renewable energy generators. Smaller cities may focus on more localized procurement, but also have smaller overall loads and, therefore, less sizable system impacts. Other factors that affect how variable renewable energy (wind and solar) impact the local grid include the presence or absence of a centrally organized wholesale power market, the overall mix of generators and the fraction of variable renewable generation, the size of the balancing area, the frequency of dispatch, the ramping ability of existing generators and other operational practices.[45] Therefore, impacts are not uniform across locations.

While voluntary renewable energy purchases can result in negative impacts to the grid (as discussed below), in general these purchases can help utilities and other grid operators prepare for integrating expected higher levels of renewable energy stemming from state policies and cost reductions. Even large renewable energy buyers generally represent a modest fraction of overall electricity

[42] Bade 2018.
[43] EIA 2018a.
[44] For more information, see the U.S. EPA Green Power Partnership website: https://www.epa.gov/greenpower/green-power-partnership-top-partner-rankings.
[45] Schwartz et al. 2012.

demand. Large buyers are helping to drive substantial, but still incremental, change in the overall grid mix ahead of state RPS targets, which are often focused on 2030 and beyond. By bringing on additional renewable energy capacity sooner through their voluntary purchases, large customers can help utilities and grid operators understand and implement changes needed to accommodate greater amounts of variable renewable energy resources. While voluntary demand for renewable energy has been substantial, the overall U.S. grid mix is still fossil-fuel dependent, with 60 percent of generation from coal and gas, and about 17 percent from renewable resources, including large hydroelectric facilities.[46]

To address the evolving generation mix, utilities and other grid operators have begun to effectively modify operational practices and make infrastructure investments to accommodate changing grid needs. Some regions have higher instantaneous generation from renewable resources. ERCOT and the Southwest Power Pool have reported hourly wind penetrations of 50 percent to 60 percent of load at certain times of the day, while CAISO recently hit a record of 93 percent solar this year.[47] Wholesale markets have instituted new procedures and rules to address the operating characteristics of variable generators, such as improving forecasting practices for wind and solar generation, modifying dispatch practices for variable generators, modifying and streamlining curtailment protocols, adding new market products to compensate generators for providing fast-ramping capabilities needed for system flexibility, and implementing processes to enable renewable energy generators to better support balancing.[48]

B. Mitigating Grid Impacts: Customer and Utility Roles

As markets grow and evolve, both cities (as well as other large customers) and utilities can take steps to minimize the grid impacts of voluntary renewable energy procurement. While new approaches and products are needed to encourage actions that serve evolving grid needs, the following types of activities can be taken by customers and utilities to help integrate renewable resources on the grid.

City and Customer Roles

Using storage. To minimize grid impacts, cities and other large buyers can incorporate storage with onsite or grid-scale renewable energy systems. The 30 percent federal investment tax credit can offset the cost of a storage installation if it is charged with renewable energy generation.[49] With the falling costs of storage, pairing it with onsite solar is becoming increasingly economic. That reduces the need for exports of generation to the grid and avoids grid concerns for the distribution system and bulk power system. It can also enable customers to shave peak usage to help reduce demand charges on their electricity bills and help grid operators manage solar production, particularly as PV systems collectively ramp up at sunrise and ramp down at sunset. Daily production cycles are not a large concern at low penetrations of solar PV, and can be managed even at higher penetrations because they are predictable,

[46] EIA 2018b.
[47] ERCOT 2018; RTO Insider 2018; Weaver 2019.
[48] Beiter et al. 2017; Schwartz et al. 2012.
[49] For additional information, see NREL's Federal Tax Incentives for Energy Storage Systems at https://www.nrel.gov/docs/fy18osti/70384.pdf.

but grid challenges become more acute (though still predictable), in states such as in Hawaii and California.

Flexing demand. Large buyers with flexible loads can manage their demand levels to more closely match the timing of renewable energy generation on the grid or minimize utility system peaks. For example, significant deployment of solar generation in California and Arizona has created a situation where there is excess solar generation midday, prior to peak demand in the early evening hours. The challenge for grid operators of this so-called "duck curve" is meeting evening peak demand with other generators when the solar generation declines at sunset. In these states, customers may be able to shift some of their loads to midday to help use the renewable energy on the grid or shift usage away from peak periods to minimize the size of ramping resources needed when solar output declines at sunset.

Grid-beneficial charging of electric vehicles. Utility programs for municipal or workplace electric vehicle charging can be designed to help manage renewable energy production. By participating in managed charging programs, cities and corporations could match the timing of charging their fleets (and their employees' vehicles) to the profile of solar generation on the grid. In some areas of the country, such as the Midwest, wind generation is the dominant renewable resource. Excess generation often occurs at night when customer loads are low, so controlled charging of fleet vehicles at night can be beneficial.

Tapping local renewable resources. Through use of locally procured resources, the cost of integrating renewable energy is tied to the local grid, where both the customer load and the renewable resources are located. This enables a more accurate representation of the full costs of the resources, given the constraints of the local grid. It also allows large buyers to more meaningfully undertake demand-side measures to help with integration. Another benefit of local procurement, where cost-effective options exist, is enabling customers to change the emissions characteristics of the local generation mix.[50]

Matching demand on hourly basis. Hourly matching requires new product offerings, particularly where retail competition does not exist. While the approach of matching purchases to loads minimizes grid impacts by eliminating reliance on other generating sources, there may be diminishing returns in doing this for every hour of the year. Ultimately, it may be more cost-effective to use the grid for mismatches in the timing of renewable energy supplies and customer loads. That approach takes advantage of differences in the timing across all customer loads, their load-shifting potential, and variations in renewable energy generation in the region (e.g., some wind plants may be operating while others are not). At the same time, products that match renewable production to an individual customer's consumption can be a beneficial step to address costs associated with integrating large renewable energy purchases. Utilities could play a role in offering new products for customers that address supply and demand mismatches, taking into account broader grid conditions.

[50] In regions dominated by coal, in some cases renewable energy projects developed remotely may yield greater emissions reductions.

Utility Roles

Integrating customer renewable goals in planning. By including voluntary customer demand in integrated resource planning processes, utilities can anticipate the associated additional renewable energy capacity within the generation portfolio. This can help minimize grid issues by enabling utilities to identify potential integration challenges and system changes that can accommodate the energy. Advanced planning provides utilities with additional time to assess and respond to changes and help integrate customer purchases in transmission planning processes.

Adopting tariffs to encourage load response for renewable energy integration. Utilities can add time- and location-based elements to electricity rates to send more accurate price signals to customers, which can help cost-effectively shift loads to manage the variability and temporal profile of wind and solar resources. Cities and other customers may be able to benefit from cost savings if they can shift loads to less expensive periods, while at the same time help the grid manage peak loads and variable renewable generation. For example, Arizona Public Service introduced a "reverse demand response" program in 2017 to help balance system load with excess renewable energy generation that would otherwise have to be curtailed. The program is open to all of the utility's nonresidential dispatchable loads that are 30 kilowatts or higher that "serve the community in some way," so it can include loads from municipal buildings and C&I customers. During negative pricing periods, consumers who can take the power are paid by generators who want to avoid curtailment. Those revenues help lower bills and the utility passes on all the cost savings from these purchases to their customers.[51]

Adopting programs or tariffs for distributed energy resources. Utilities can develop programs to enable customers to aggregate onsite distributed energy resources, such as onsite generation and storage, to increase grid flexibility. Through such programs, utility customers can help play a role in cost-effectively managing peak demand and variability of renewable energy generation. For example, Microsoft and Black Hills Energy in Wyoming collaborated on an innovative new tariff, the Large Power Contract Service, which gives Black Hills Energy the ability to tap into the customer's backup generation capacity to meet peak demand needs, while bringing new renewable energy to the grid.[52] This arrangement eliminated the need for redundant generation capital costs and accommodated Microsoft's anticipated growth on the system without negatively impacting other utility customers.[53] Utilities also can develop electric vehicle rates to shift charging to periods of excess wind and solar on their system.

[51] Walton 2017.
[52] Docket No. 20003-146-ET-15, 2016.
[53] Trabish 2016.

Conclusion

In coming years, voluntary markets for renewable energy resources are poised to expand as cities and other large buyers meet their aggressive renewable energy goals. A continued evolution of product offerings will be needed to enable cities and other large utility customers to obtain the benefits of renewable energy they procure, consistent with their goals, and to minimize impacts on other utility customers and the grid. Through continued dialog and communication, customers and utilities can craft solutions and product offerings that benefit the electricity system while meeting the needs of both participating and nonparticipating customers.

2. Renewable Energy Options for Large Utility Customers: A Corporate Perspective

By Steve Chriss, Walmart Inc.

Introduction

Walmart started in 1962 as a small discount retailer in Rogers, Arkansas, and has since expanded to operate over 11,300 stores under 58 banners in 27 countries and e-commerce websites in 10 countries.[54] Walmart has established aggressive and significant companywide renewable energy goals, including: (1) to be supplied 50 percent by renewable energy by 2025 and, ultimately, (2) to be supplied 100 percent by renewable energy.[55]

Additionally, Walmart has set a science-based target to reduce carbon emissions in our operations by 18 percent by 2025 through the deployment of energy efficiency measures and the consumption of renewable energy.[56] To date, Walmart has contracted for or currently takes electricity from one or more renewable resources in 25 states and Puerto Rico.

Through Project Gigaton,[57] we are working with our value chain to avoid one billion metric tons of greenhouse gases by 2030. Energy is one of the six areas in which action can be taken by suppliers, which also includes waste, packaging, agriculture, forests and product use. Suppliers can join by submitting their emissions reductions goals to the program and reporting progress against those goals annually. In the program's first year, suppliers reported reducing more than 93 million metric tons of greenhouse gas emissions in the global value chain.[58]

Walmart has a dedicated energy team that works to deliver on the company's mission to save our customers money so they can live better, by focusing on the operational success of our stores, energy cost management, and cost-effective procurement of renewable energy and energy efficiency technologies.

Our desire for renewable energy resources must be balanced against our business needs. As a general rule, we do not enter into premium structures or programs that only result in additional costs to our facilities. Rather, we seek renewable energy resources that deliver industry leading cost, including renewable and project-specific attributes such as renewable energy credits (RECs), within structures

[54] Over 5,300 of our stores are in the United States and are supported by a logistics network comprised of more than 176 facilities. Walmart employs approximately 2.2 million associates around the world and approximately 1.5 million in the United States alone. https://corporate.walmart.com/our-story/our-locations
[55] Walmart. 2019. Sustainability. http://corporate.walmart.com/global-responsibility/environmental-sustainability
[56] Walmart. 2016. Walmart Offers New Vision for the Company's Role in Society. http://news.walmart.com/2016/11/04/walmart-offers-new-vision-for-the-companys-role-in-society
[57] Walmart Sustainability Hub. 2018. Project Gigaton. https://www.walmartsustainabilityhub.com/project-gigaton
[58] Walmart. 2019. Walmart Announces 20 MMT of Supplier Emission Reductions through Project Gigaton; Unveils Plans for Expanding Electric Vehicle Charging Stations and Doubling U.S. Wind and Solar Energy Use. https://news.walmart.com/2018/04/18/walmart-announces-20-mmt-of-supplier-emission-reductions-through-project-gigaton-unveils-plans-for-expanding-electric-vehicle-charging-stations-and-doubling-us-wind-and-solar-energy-use

where the value proposition allows the *participating customer* to receive any potential benefits brought about by taking on the risk of being served by that resource instead of, or together with, the otherwise applicable resource portfolio. Additionally, we do not typically enter into programs with terms in excess of 15 years.

To meet our renewable energy goals, we utilize three primary channels to secure renewable energy resources:

- **Contracting for off-site resources:** These products are typically structured to replace other energy, both physically and on the bill. This mechanism allows Walmart to leverage its scale to drive the best project economics while simultaneously minimizing transaction time and costs. To date, we have primarily contracted for load-serving resources in deregulated markets through Texas Retail Energy, a competitive retail electric supplier wholly owned by Walmart that serves as our electric supplier in most deregulated retail markets, to directly serve our load. In deregulated wholesale markets we also have entered into "Virtual Power Purchase Agreements" that do not directly serve our load but allow us to bring new large-scale renewable resources to the market.

- **Contracting for on-site resources:** Walmart contracts for on-site, behind the meter resources through power purchase agreements and leases that allow performance guarantees. These resources replace grid energy and are priced with the expectation that the operating costs for the site are reduced.

- **Utility partnerships:** Walmart works with our utility partners to develop useable commercial and industrial programs and economic structures targeted to function within the confines of the regulatory compact and with minimal impact to nonparticipating utility customers. When this option is pursued, Walmart works to ensure that programs it helps to develop can be used by the broader group of large commercial and industrial customers, not just Walmart. We leverage our significant in-house rate and regulatory expertise to create opportunities to move the entire industry forward. The largest of these partnerships to date includes the development and participation in Georgia Power's 177 megawatt (MW) Commercial & Industrial Renewable Energy Development Initiative program[59] and Alabama Power's 72 MW solar farm in Alabama.[60] While Walmart assisted in development of both opportunities, the opportunities are open to other interested large customers.

Walmart also works within the broader energy community to advocate for access to renewable energy and create opportunities for a large range of business customers. We have been engaged in the Renewable Energy Buyers Alliance since its inception and sit on the organization's board of directors and

[59] Makower 2018.
[60] Sznajderman 2018.

advisory board.[61] We are also a signatory to the Corporate Renewable Energy Buyers' Principles, which call in part for:

1) Greater choice in renewable energy procurement options;
2) More access to cost competitive renewable energy options;
3) Access to longer- and variable-term contracts;
4) Access to new projects that reduce emissions beyond business as usual;
5) Increased access to third-party financing vehicles as well as standardized and simplified processes, contracts and financing for renewable energy projects; and
6) Opportunities to work with utilities and regulators to expand choices for buying renewable energy.[62]

Finally, Walmart is unique among our retail peers in that we have a team that focuses on energy regulation and policy at the state and federal levels. At the state level, the team engages in regulatory and legislative processes to advocate on behalf of Walmart on a broad array of issues, including securing reasonable rates that reflect utility costs to serve our stores, greater access to renewable energy resources and competitive retail options. At the federal level, the team has engaged in proceedings at the Federal Energy Regulatory Commission (FERC) and maintains a presence in independent system operator stakeholder processes as both a customer and a supplier. Since 2007, we have participated directly or as part of a group in over 500 cases in 42 state jurisdictions and the FERC, and our regulatory associates have testified in over 225 proceedings.

Through our utility relationships and regulatory and legislative work we have engaged with utilities, regulators and legislators in 29 states on renewable energy opportunities and are participating or have notified the utility of intent to participate in programs in 12 states. The discussion below is based on Walmart's experience in those engagements.

1. How can utilities help large customers achieve their own renewable energy goals as they approach very high levels? And how should 100 percent renewable energy products be defined and disclosed?

The first step for utilities to help large customers achieve their own renewable energy goals is actually broader and more comprehensive than simply crafting a tariff — it is to establish a customer-centric culture within their customer service and regulatory operations. Utilities who have successfully implemented renewable energy programs have disposed of the notion of "ratepayers," who exist in a one-way relationship simply to provide cost recovery for investments and operating costs, and have

[61] REBA Renewable Energy Buyers Alliance. https://rebuyers.org/about/
[62] Corporate Renewable Energy Buyers' Principles. https://buyersprinciples.org/principles/

embraced “customers” and “partners” and the dialog necessary to help those customers meet their needs and goals in a constructive manner.

Walmart takes service from approximately 1,000 electric utilities in the United States, and for a number of those utilities we work regularly with key account managers who are responsible for the customer service relationship between us and the utility. We are also able to leverage forums such as the Edison Electric Institute Key Accounts Program, the Touchstone Energy NET Conference, and the American Public Power Association’s Customer Connections Conference to engage with our electric utility suppliers.

This diversity has informed our approach to working with utilities and underlines three key operational principles:

1) Communication and openness are critical;

2) There is no single best structure that can be used for any utility; and

3) Understanding and working within each utility’s unique system and regulatory[63] and ratemaking structures will lead to success.

In determining how best to help large customers meet their goals, it is important that the utility and customer understand each other’s needs and constraints, particularly because the information asymmetry common in the regulatory and ratemaking processes also exists in the renewable energy product development process. From a customer perspective, utilities occupy a unique space in that they are likely the only vendors with which the customer does not ordinarily negotiate price and term for the products they purchase, and navigating the regulatory and ratemaking processes is not an oft-performed or well understood task. This imbalance is exacerbated for multisite customers with load under multiple utilities in multiple jurisdictions. Conversely, utilities are not experts in their customers’ businesses, and there is not a single set of sustainability or renewable energy goals, metrics or preferences held by all customers.

The opportunity for a customer can be mapped against the needs and constraints of both the utility and customer. Table 2-1 illustrates some of the high level needs and constraints from Walmart’s viewpoint as a customer. A utility or regulator may disagree or add items.

[63] “Regulatory” is used as a catch-all term for the structure that governs a utility’s rates and tariffs, so this would include but is not limited to public utility or service commissions, co-operative boards and city councils.

Table 2-1. Mapping the Opportunity for Renewable Energy Options From the Customer Viewpoint

Mapping the Opportunity from the Customer Viewpoint		
• Renewable energy and associated environmental attributes • Capture the full economic value of the transaction and opportunity to realize bill savings • Flexibility to meet risk and financial preferences	**NEEDS** ↓	• Maintain existing business load and attract new load • Diversify generation portfolio, reduce fuel risk • Benefit or at least have no negative impact for all customers
CUSTOMER →	**PROGRAM**	**← UTILITY**
• Cost versus otherwise applicable rates • Contract/program length • Termination provisions • Footprint within the utility territory • Scale of available resources • Ability to participate in the approvals process	↑ **CONSTRAINTS**	• Impact on nonparticipating customers • Approvals process • Disconnect between wholesale and retail • Program administration • Size of utility • Customer footprint within the utility territory • Scale of available resources

Renewable energy and associated environmental attributes: Bottom line: The purpose of creating a renewable energy program is so that the customer can purchase renewable energy. While the obviousness of this statement should render it unnecessary, utilities have proposed programs in which the RECs are not transferred to or retired on behalf of the participating customer, which eliminates the "renewable" from renewable energy, regardless of the generating source.[64]

Views on additionality differ from customer to customer, but from a best practice standpoint, a new renewable energy program, or incremental tranche of an existing program, should feature a new resource or portfolio of new resources dedicated to serve the program or tranche. While a "system" resource, or a resource procured with the intent of serving all customers, can be used, the value proposition of the program and allocations of resource cost must be very carefully considered to avoid cross-subsidization between participants and nonparticipants. The resource(s) should be identifiable to the participating customer(s) and the RECs and any other environmental attributes should be transferred to the participating customer(s) or retired on their behalf.

Capture the full economic value of the transaction and opportunity to realize bill savings: As noted in the introduction, Walmart's desire for renewable energy resources must be balanced against our business needs. We seek structures where the value proposition allows the customer to receive any

[64] See Federal Trade Commission, Environmentally Friendly Products: FTC's Green Guides (https://www.ftc.gov/news-events/media-resources/truth-advertising/green-guides) for more information about renewable energy claims.

potential benefits brought about by taking on the risk of being served by that resource instead of, or in addition to, the otherwise applicable resource portfolio. For Walmart, this premise aligns utility partnership strategy with on-site resource development and wholesale and competitive retail market procurements.

Ensuring that the incremental costs and benefits of the program are assigned to participants minimizes nonparticipant impacts. Walmart has engaged in regulatory dockets for proposed utility programs that would prohibit participants from realizing bill savings (the credit side of the value proposition), meaning that participants ultimately would be charged for benefits that go to nonparticipants. Even well-intentioned measures, such as fixing credits for an extended period of time instead of a floating credit structure based on a more timely and granular comparator — such as hourly system price that more closely reflects actual system conditions — can create cross-subsidies between participants and nonparticipants.

Figure 2-1 demonstrates, for each year of a hypothetical program, the cross-subsidy outcomes that can occur if a program utilizes a fixed credit structure as opposed to a floating credit structure based on actual utility system costs. When the actual utility system costs exceed the fixed credit, the participant subsidizes other customers because the full value of the program resource to the system is not assigned to the participant. Conversely, when the fixed credit exceeds the actual utility system cost, the participant receives a subsidy from other customers because the participant is being paid more than the value brought to the system by the program resource.

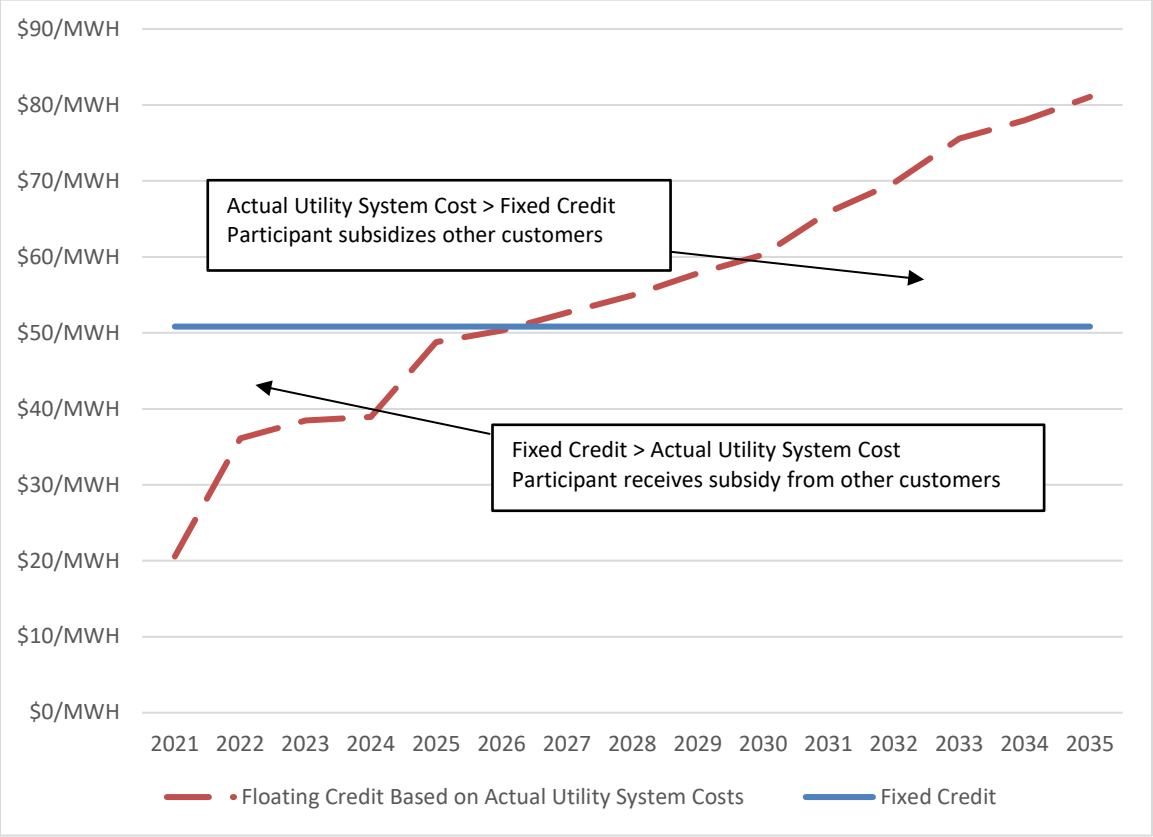

Figure 2-1. Fixed Credit versus Floating Credit: Cross-Subsidization Outcomes

Ultimately renewable energy programs should be designed to not create subsidies between participants and nonparticipants. Not only do cross-subsidies violate cost causation principles, they create a reputational issue for the programs and can limit the appetite of regulators, utilities and nonparticipating customers for future programs.

2. What is the range of options for a utility providing 100 percent renewable energy products, and what are the implications of each of these options?

The range of options for a utility to provide 100 percent renewable energy products is as diverse as the utilities that can offer them. Additionally, the profile of interested customers for each utility will differ, and few single solutions can work for all customers given the range of financial and risk preferences that different customers have.

As Figure 2-2 shows, generally the outcome of collaboration between customers, utilities, regulators and other stakeholders is the intersection of three types of solutions.

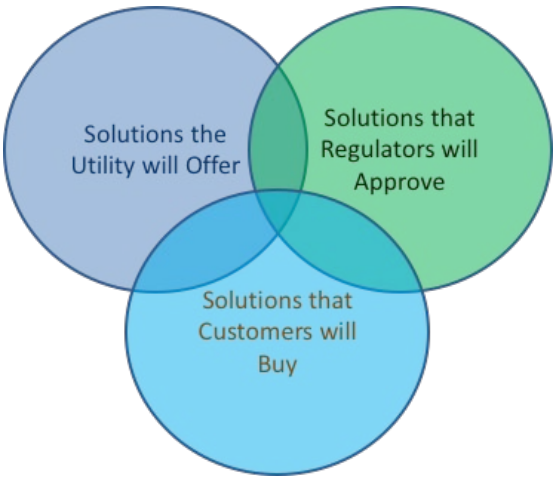

Figure 2-2. Outcome of Collaboration in Utility Regulatory Settings

As Table 1 shows, consideration needs to be given to the size of the utility and the footprint of its interested customers. Even within the same state regulatory jurisdiction, one solution may not work for two utilities if one has large loads and a high concentration of interested customers and the other has a relatively small load and a low concentration of interested customers. From Walmart's perspective, these factors need to be understood by customers, utilities and regulators to manage expectations when developing renewable energy products. When all factors are considered, it is reasonable to come to an outcome where each utility has its own program structures, and within those, different structures can be developed to serve different customer classes.

Walmart is open to both utility ownership of resources and power purchase agreements to serve utility renewable programs. It is most important to ensure that the resource is procured at the lowest possible cost. From our experience, power purchase agreements appear to be the simpler procurement methodology to manage from a regulatory perspective, as the resources can be targeted solely to serve their respective programs and the utility will not have a resource that needs to be incorporated into rate base at the conclusion of the program.

Walmart supports customer engagement in the choice of resource to serve the product, which is a feature of a handful of approved green tariff products that are structured such that the contracted program resource(s) support the load of a single customer.[65] As we assess opportunities, these

[65] See, for example, Rocky Mountain Power (Utah) Schedule 32 (https://www.rockymountainpower.net/content/dam/rocky_mountain_power/doc/About_Us/Rates_and_Regulation/Utah/Approved_Tariffs/Rate_Schedules/Service_From_Renewable_Energy_Facilities.pdf) and Schedule 34 (https://www.rockymountainpower.net/content/dam/rocky_mountain_power/doc/About_Us/Rates_and_Regulation/Utah/Approved_Tariffs/Rate_Schedules/Renewable_Energy_Purchases_for_Qualified_Customers_5000kW_and_Over.pdf) and Dominion (Virginia) Schedule RG (https://www.dominionenergy.com/library/domcom/media/large-business/renewable-energy-programs/schedule-rg/compliance-filing-schedule-rg.pdf?la=en).

provisions are most useful where we have significant load under the utility to drive significant economies of scale in the procurement.

The unique nature of each utility and jurisdiction drives the value proposition for each program as well. In our experience, the cost side of the value proposition reflects the cost of the resource itself plus any additional costs incurred to procure or transmit the power. On the credit side of the value proposition, the structures tend to reflect underlying utility cost and rate structures, and regulatory familiarity is important — a program has a better chance of acceptance if the credit can be structured in a way that the regulators have worked with and understand.

From Walmart's experience, the best starting point for deriving the credit portion of the value proposition are the marginal energy costs avoided by the utility bringing on the program resource, which can include avoided fuel, purchased power and other variable generation costs. In different jurisdictions this looks different. Some states may use the fuel cost recovery clause rate, some may use avoided costs, and if the utility is in a regional transmission organization (RTO), the state may use wholesale power prices. Optimally, the extent to which the program resource brings capacity value to the utility system should be included in the value proposition, but this tends to be more controversial in practice, particularly in non-RTO states. In an RTO setting the capacity value is more easily calculable as the value of the capacity payments received by the resource in the RTO capacity market.

As a result of the circumstances of each utility, the credit structures can range from very simple (program cost versus fuel rate) to highly complex (program cost versus hourly liquidation at wholesale market or utility marginal cost). From a customer standpoint, the more complex a credit is the harder it is for the customer to understand and forecast the potential cost impacts of the program. However, as discussed earlier, the more fixed and simple a credit is, the less likely that it directly reflects the value of the program resource on the utility system and the more likely that either participants or nonparticipants are subsidized.

3. How can pace and cost be considered in procurement to achieve high renewable energy goals? And how can any negative impacts or risks be mitigated?

Speed to market and empowered regulators are crucial for the development of renewable energy products. In competitive retail electric markets, customers have the ability to forego generation service from their territorial utility and choose to take service from a generation supplier who can provide products that better meet their needs, including but not limited to pricing needs and generation mix. Through renewable energy programs, customers are relying on their utility to provide programs to mimic the choices that would be available and demanded by customers in a competitive retail market. However, unlike a competitive market, the regulated environment can require an extended amount of time to develop and approve programs to be offered to customers.

The regulation of utilities serves as a substitute for the price discipline of competitive markets in order to protect utility customers from the exercise of monopoly power. With the growth of demand for access to renewable energy, regulators should ensure that they serve as an enabler of utility products that can provide customers with benefits similar to those they can access in competitive markets. This requires that regulators have authority to approve programs in a time-efficient manner, but also that they ensure that interested stakeholders have a process to provide input.[66]

Given the extended participation time frame of most utility renewable energy programs for large customers — 10 to 20 years — at the time of program review it is likely not possible to fully anticipate and quantify any and all costs and benefits that: (1) the program resource, in addition to other resource additions and subtractions during the program life, could have on wholesale market prices and grid reliability; (2) the total cost or savings to participating customers; or (3) potential impact to nonparticipants. To that concern, it is imperative to ensure that programs are created with cost of service principles in mind and that participants bear the responsibility for the full economic value of the transaction.

Conclusion

Renewable energy products for utility customers have come a long way in recent years, but there are still many opportunities yet to be realized. This essay can serve as a roadmap for success. As customers, utilities and regulators seek to develop new opportunities, it is important to follow the three key operational principles discussed earlier in this essay:

1) Communication and openness are critical;

2) There is no single best structure that can be used for any utility; and

3) Understanding and working within each utility's unique system and regulatory[67] and ratemaking structures will lead to success.

Additionally, as we have engaged in program development and the regulatory and policy work needed to support successful implementation, we have learned that it is important that customers who desire renewable energy products communicate this to their utilities, simply to establish that broader demand exists for those products. We have also learned, and recommend as an action item for other customers, that a customer's specific requirements for program characteristics be matched by a willingness to engage in regulatory interventions and other processes where program characteristics are determined.

[66] Walmart would note that this is not an endorsement of moving away from traditional regulation for the review of utility rates.

[67] "Regulatory" is used as a catch-all term for the structure that governs a utility's rates and tariffs including, but not limited to, public utility commissions, co-operative boards and city councils.

3. Renewable Energy Options for Large Utility Customers: A Utility Perspective

By Xcel Energy

Introduction

In the eight states Xcel Energy serves and across the country, communities and corporations are increasingly committing to renewable energy. For example, through the RE100 pledge,[68] more than 150 companies from around the globe have committed publicly to 100 percent renewable energy for their own electricity consumption. Even more companies, including several of Xcel Energy's major corporate customers — such as IBM, 3M, Target and Best Buy — have publicly announced climate goals that rely in part on increased use of renewable energy. The company also serves 17 cities or counties that have set goals to increase renewable energy use, including 14 cities with 100 percent renewable energy goals (see Appendix A). In many cases, these customers have also set ambitious goals for reducing greenhouse gas emissions across their operations and supply chains.

For the purposes of this essay, it is important to differentiate between community customers and commercial and industrial (C&I) customers. While C&I customers are focused on goals and programs related to their own business load, community customers represent a collective load of business and residential customers. Some of those communities have set different goals for municipal operations versus their communitywide scope.

As a major provider of electricity and natural gas service, Xcel Energy is committed to enabling and supporting customer interests through our own goals and clean energy transition. Companywide, our vision is to serve customers with zero-carbon electricity by 2050 and reduce carbon dioxide (CO_2) emissions 80 percent by 2030.[69] Beyond this, we are delivering the energy products, collaborative partnerships, and technical assistance to help customers account for and reach their specific goals. We aim to provide our customers affordable options to meet their own goals, while also enabling them to contribute to the long-term transition to an affordable, reliable, zero-carbon electricity system.

1a. How can utilities help large customers achieve their own renewable energy goals as they approach very high levels?

The utility industry is undergoing significant change as customer needs and technologies evolve. We have the ability today to transform our system to rely more on renewable and other clean energy resources, as well as the opportunity to offer product and service options that enable interested customers to meet their objectives.

[68] Re100. http://there100.org/.

[69] Our carbon reduction vision is based on absolute, companywide emissions from the electric generating plants that we own and from electricity that we purchase from others that serves our retail customers, measured from a 2005 baseline.

A. Xcel Energy's standard energy mix will be 50 percent renewable energy in a few years, and we have committed to delivering carbon-free electricity by 2050 companywide.

Utility customers want cleaner energy from renewable sources, but also expect electricity that is affordable and reliable. Through our clean energy transition, we offer clean, reliable and affordable energy at scale, which helps customers achieve their renewable or greenhouse gas goals and decreases emissions across the board. Xcel Energy owns or contracts for over 29,600 megawatts (MW) of electric generation capacity to serve our customers, and our carbon-free commitment covers this entire generation fleet. The great advantage of this systemwide clean energy transition is that all customers — including those with specific goals — are receiving lower-carbon electricity over time, at low cost.

For more than a decade, Xcel Energy has demonstrated leadership on clean energy — proactively reducing greenhouse gases at levels that surpass state and federal goals. Since 2005, we have reduced carbon emissions 38 percent. Under current plans, we expect to supply 60 percent renewable electricity and 70 percent carbon-free electricity by 2030 (Figure 1-1). Our clean energy strategy includes investing in cost-effective wind and solar resources and offering customers a comprehensive portfolio of energy efficiency and renewable energy options, as well as maintaining our carbon-free nuclear plants in the Upper Midwest and working to retire and replace aging coal plants with more flexible natural gas and clean energy sources.

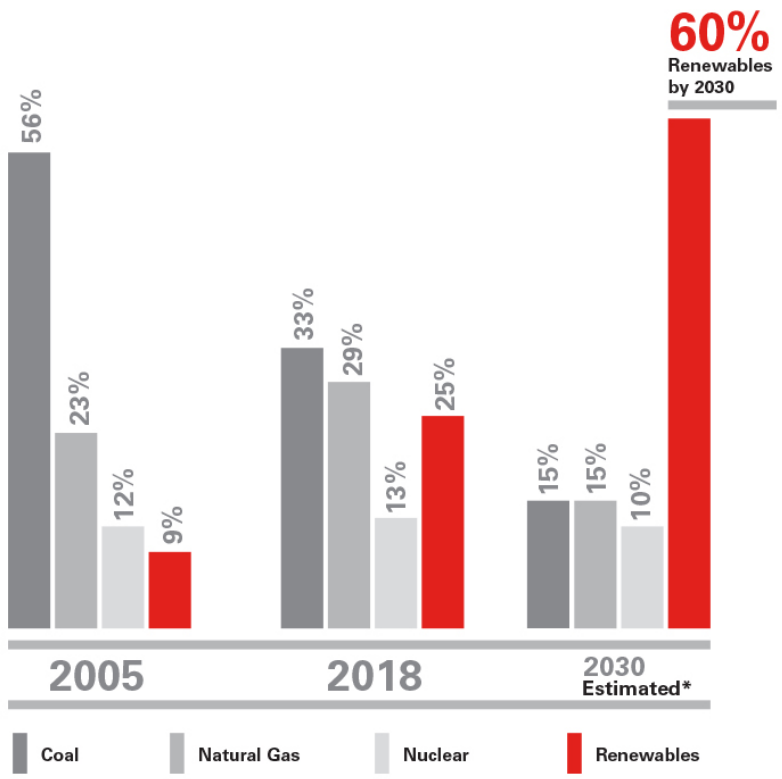

Figure 3-1. Xcel Energy Systemwide Energy Mix

Based on our success thus far, we have also set the most ambitious carbon reduction goals in the industry. By 2030, we aim to reduce carbon emissions 80 percent over 2005 levels. We believe these emissions reductions can be achieved cost-effectively with the renewable and carbon-free generation and energy storage technologies available today. By 2050, we aspire to provide our customers across all states with zero-carbon electricity (Figure 1-2). To reach this long-term goal, we will continue to increase renewables on our system, as well as technologies that can be dispatched to integrate increasingly higher levels of wind and solar energy. But we also will need new carbon-free dispatchable technologies that are not yet commercially available at the needed cost and scale. These technologies, such as flexible demand and long-duration energy storage among others, will take significant research and development to deploy in the coming decades. We provide more detail on our carbon reduction vision, the analysis that supports it, and the opportunity it provides for reducing carbon in other sectors through electrification, in our recently published carbon report.[70]

As a company we are focused on the greatest CO_2 emissions reductions at the lowest cost. When planning an integrated system, there are challenges to relying exclusively on variable renewable energy such as wind and solar, including the need to overbuild capacity to meet load at times of low generation; excess generation created by that capacity at certain times that may have to be exported, curtailed or stored; the need for long-term energy storage and much more flexible demand; and large transmission expansion to smooth regional variability. We expect these challenges are manageable at levels up to about 60 percent renewable energy penetration, but the cost to manage them increases steeply thereafter. To achieve our carbon reduction goals most cost-effectively, we should include a variety of clean energy resources rather than artificially constraining the portfolio of choices to only a few technologies.[71]

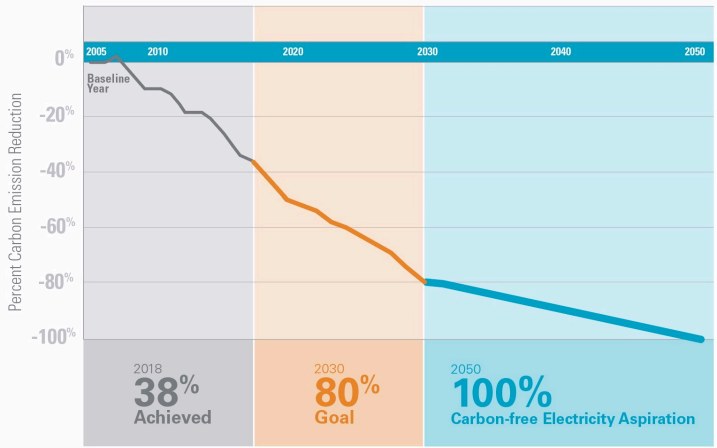

Figure 3-2. Xcel Energy Carbon Reduction Vision

[70] Xcel Energy. 2019.
[71] See for example Sepulveda, Jenkins et al. 2018; Jenkins, Luke and Thernstrom 2018.

B. We also offer a variety of products that empower customers who want to go further to do so.

For those customers — from residential customers to corporations and cities — that desire to go further and faster than Xcel Energy's systemwide transformation, the company provides an increasing array of voluntary renewable choice products, summarized below. This includes options to procure up to 100 percent renewable electricity at attractive pricing and a comprehensive portfolio of industry-leading energy efficiency programs.

As the array of options available to customers increases, and as renewable energy goals proliferate, Xcel Energy strives to provide customers with more options to meet those goals within the context of the regulated utility business model. Utilities must continue to innovate in product offerings in order to meet a wide range of customer needs. Residential and small business customers typically want simple, meaningful actions they can take to use renewable energy, while large customers are more often interested in comparatively sophisticated long-term contracts. Table 1-1 briefly describes the current portfolio of renewable energy products we offer. We include more detailed program descriptions in Appendix B.

Table 3-1. Xcel Energy Customer Renewable Energy Options

Program	Description	REC Attribution	MN	WI	ND	SD	CO	NM	TX	MI
Renewable*Connect	A flexible and affordable way to subscribe for up to 100% renewable energy	Participant	■	■			■			
Windsource	An easy, low-risk way to subscribe to clean wind energy	Participant	■				■	■		■
Solar*Connect Community	Subscribe to a solar garden and get full rights to the solar claims, plus a bill credit for choosing solar energy	Participant		■				■*		
Solar*Rewards Community	Subscribe to third-party solar gardens and receive electric bill credit payments for the solar energy produced	All Customers	■				■			
Solar*Rewards	Install your private on-site solar system and earn an incentive for transferring the RECs to Xcel Energy	All Customers	■				■	■**		
Net Metering	When you produce wind or solar energy through on-site equipment, you are able to retain RECs, and sell any excess energy back to the grid	Participant	■	■	■		■	■	■	■

REC = Renewable Energy Certificate. In addition to the programs summarized here, Xcel Energy continually evaluates expanding offerings to additional states and developing new product offerings.
**Solar*Connect Community has been filed but not yet approved in New Mexico.*
***New Mexico Solar*Rewards availability varies from year to year and is not currently available.*

C. Utilities are a source of valuable technical assistance for customers.

Impactful action by utilities to help customers meet ambitious renewable energy goals is not limited to renewable product offerings. Utilities can play a key role in advising customers in how to meet their sustainability and renewable energy targets and providing support as customers move forward to implement their plans.

A key component of this assistance is transparent and robust annual reporting of renewable energy and CO_2 emissions. For example, Xcel Energy joined The Climate Registry[72] as a founding member in 2007 to help establish a consistent and transparent standard for calculating, verifying and reporting greenhouse gases. Today, our reporting is based on The Climate Registry and its Electric Power Sector Protocol,

[72] The Climate Registry. https://www.theclimateregistry.org/

which aligns with the World Resources Institute and ISO 14000 series standards. All of our greenhouse gas data is also third party-verified.

Based on these protocols, Xcel Energy provides data in multiple formats our customers can use. For example, we publish CO_2 emission intensity information[73] each year along with our Corporate Responsibility Report.[74] This summary provides various CO_2 intensity metrics: a basic one for typical residential and small business customers, one for customers who follow The Climate Registry/World Resources Institute protocols for quantifying indirect emissions from their purchase of electricity, and finally a residual mix CO_2 intensity metric excluding renewable electricity associated with special products. We provide similar information in the Community Energy Reports[75] we generate for our communities upon their request, which also include information about the number of customers participating in our renewable energy programs for that community. We also routinely respond to requests from our customers and cities for additional information needed for particular renewable energy and greenhouse gas reporting protocols they are using. Through the partnerships outlined below, we work with our large customers to help them define their clean energy goals and advise them on implementation of those goals.

D. We are implementing successful, replicable models for direct partnership with large customers and cities.

Xcel Energy has also worked to redefine the relationship with key local government and large corporate customers through a variety of partnerships in some of our states, summarized below. Each of these programs provides opportunities to partner with communities and stakeholders to identify and prioritize their energy needs. We can then provide tools and resources to develop a plan and support putting that plan into action.

Minnesota Sustainable Growth Coalition:[76] Xcel Energy is part of a coalition of about 30 companies and organizations with headquarters in Minnesota committed to joint action on circular economy principles, including energy, water, and waste sustainability. The Minnesota Sustainable Growth Coalition (MSGC) includes Fortune 500 companies and smaller businesses, state agencies, and academic and nonprofit organizations. Some members' entire footprint is in Minnesota; others are national or global in scope, so they work with tens or hundreds of utilities.

An early goal of the MSGC was to help design products — both utility green tariffs and non-utility options like virtual power purchase agreements (VPPAs) — to enable members' renewable energy goals, with a stated long-term aspiration of 100 percent renewable energy. MSGC members provided

[73] 2017 Energy and Carbon Emissions Reporting summary here: https://www.xcelenergy.com/staticfiles/xe-responsive/Company/Corporate%20Responsibility%20Report/CRR-Energy-Carbon-Summary-Final.pdf. 2018 Carbon Dioxide Emission Intensities Information Sheet: https://www.xcelenergy.com/staticfiles/xe-responsive/Environment/Carbon/Xcel-Energy-Carbon-Dioxide-Emission-Intensities.pdf

[74] 2018 Corporate Responsibility Report: https://www.xcelenergy.com/company/corporate_responsibility_report

[75] Community Energy Reports. https://www.xcelenergy.com/working_with_us/municipalities/community_energy_reports

[76] Minnesota Sustainable Growth Coalition. https://environmental-initiative.org/work/minnesota-sustainable-growth-coalition/

significant input in the design stages of Renewable*Connect, on issues such as how members define additionality, needs for bundled energy and RECs and/or REC retirement on their behalf, preferred wind/solar mix, geographic proximity of wind/solar farms to member facilities, preferred contract term and exit options. This input influenced the first tranche of Renewable*Connect. Members then engaged actively with Xcel Energy in the design of later tranches, now pending Public Utilities Commission approval, which focus on new resources, multiple contract term options, and different resource mixes for customers with high off-peak usage. Many MSGC members signed non-binding MOUs to participate in these options if approved.

MSGC discussions have evolved from their initial focus on members' own renewable energy goals and procurement options — which remain important — to a broader focus on how members can use their collective influence to accelerate the overall transition of the energy system toward a higher share of clean energy. This has manifested in three ways:

1) Adoption of a Clean Energy Vision that is broader than the original 100 percent renewable goal. The Vision focuses on carbon-free energy and achieving economywide greenhouse gas reductions, fueling economic growth, and increasing access to affordable, reliable, clean energy to improve racial, economic, social and public health outcomes.[77]

2) Support for "Certified Renewable Percentage," discussed further below, which aligns members' own goals with the overall transition of the system toward higher levels of renewable resources by allowing participants to take advantage of renewable resources on the system and go further with voluntary products.

3) Engagement in integrated resource planning to support the long-term evolution of the electricity system toward more renewable and carbon-free resources, and potential engagement in other Commission proceedings that address other parts of members' carbon footprints through electrification, energy efficiency, new natural gas options and more.

Partners in Energy:[78] We launched this program in 2014 for communities in Minnesota and Colorado that were looking for resources to jump-start their energy planning. Over a two-year period, Xcel Energy works with communities to identify energy objectives, develop a robust Energy Action Plan, and implement strategies that incorporate local resources. Participating communities have set goals to add renewable energy, reduce electric and natural gas consumption, or lower CO_2 emissions. Partners in Energy offers an inventory of a community's baseline energy consumption, information on available energy efficiency and conservation programs, and current participation in program offerings, as well as tracking and reporting for participating communities to measure progress toward their Energy Action Plan goals. We have worked with 37 communities to date through Partners in Energy in Minnesota and Colorado. This model for community engagement has created a framework for the utility to provide

[77] See Minnesota Sustainable Growth Coalition Clean Energy Vision here.
[78] Xcel Energy Partners in Energy. https://www.xcelenergy.com/working_with_us/municipalities/partners_in_energy.

resources, data, and advisory support to our cities and customers in identifying, planning and implementing their energy visions and goals.

Energy Future Collaborations:[79] This new approach in Colorado was created in response to feedback from our municipal partners, as a way to unite the specific energy goals of communities with the company's services and expertise to achieve shared objectives. The collaborations are aimed at addressing a wide range of priorities, including how best to meet specific renewable energy targets, reduce a city's carbon footprint, maximize energy efficiency program participation, support economic development, and integrate emerging energy-related technologies into area homes and businesses. Energy Future Collaborations tap into existing Xcel Energy programs and offerings, but also focus on uncovering creative solutions to new ideas and needs. From the company's standpoint, we develop a more meaningful relationship with some of our largest customers — our communities — and provide an opportunity to inform key leaders and community members about our business and significant initiatives. Ultimately, the collaborations can help increase support for company initiatives that support community goals, such as the Colorado Energy Plan.[80] The company has signed or is in the process of finalizing Memoranda of Understanding for Energy Future Collaborations with eight communities that represent about 32 percent of the retail load in our Colorado service territory and reflect a cross-section of diverse municipalities — from rural to urban to mountain settings. We also believe the collaborations can be replicated with other cities and towns throughout our service territory.

In summary, helping our customers and communities achieve their renewable energy goals starts with our own system, advancing the clean energy transition reliably and affordably. Our initiatives, from product offerings to innovative partnerships, provide a model for how we can go above and beyond this system transition to work with large customers — both corporate entities and communities — to help define and achieve their specific energy goals, including renewable energy ambitions.

1b. How should 100 percent renewable energy products be defined and disclosed?

With the variety of renewable energy products available from one utility, let alone across the multiple utilities that a large customer might interact with — some of our nationwide customers purchase electricity from hundreds of utilities — it is important for utilities to provide clear and transparent information on their product offerings. The Corporate Renewable Energy Buyers' Principles, created by the World Resources Institute and World Wildlife Fund, capture best practices from the buyers' perspective.[81] As a utility, we seek to be responsive to these principles, but we also bring a perspective

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79 https://www.xcelenergy.com/company/corporate_responsibility_report/library_of_report_briefs/partnering_with_communities.

80 The Colorado Public Utilities Commission approved our most recent Electric Resource Plan in Colorado in August 2018. With this approval, we are moving forward to implement the plan, which will achieve nearly 55 percent renewable energy on our Colorado system by 2026, and reduce carbon emissions by about 60 percent from 2005 levels — all while keeping customer bills low.

81 Corporate Renewable Energy Buyers' Principles. https://buyersprinciples.org/principles/.

of creating renewable energy products that adhere to certain principles and best practices from the perspective of a renewable energy supplier, and a regulated utility responsible for providing affordable, reliable and increasingly clean electricity to all customers. We see the potential for a parallel (and partially overlapping) set of "renewable energy suppliers' principles" as complementary to and aligned with the Buyers' Principles, but highlighting the most important elements of a renewable offering from a utility perspective. Below we outline what these renewable energy suppliers' principles could include.

A. Customers should have mechanisms to count the overall grid mix against their goals.

It is not fully clear whether and how customers should count renewable energy in the overall grid mix as a part of their renewable energy usage, particularly when it comes to renewable energy certificate (REC) ownership and attribution. Historically, energy consumers, utilities, developers, policymakers and environmental stakeholders have looked at utility Renewable Energy Standard compliance and corporate voluntary goals as two separate markets. Renewable energy purchasers sought to ensure that their purchases were from energy that went above and beyond state Renewable Energy Standard (RES) requirements. This concept works well when the overall grid is at low to medium penetrations of renewable generation, but as penetration increases, this approach ignores real grid operational concerns — seasonality, matching generation and load shape curves, transmission congestion, etc. — that correspondingly become more challenging. Customers who seek additional renewables in high-penetration grids can cause more harm to other customers by pushing large volumes of renewables onto the grid in an unplanned way.[82]

Furthermore, it is becoming increasingly common for utilities to build or procure renewable energy resources that go above and beyond RES requirements simply because they are the most economic new generation to add. All these changes point to a need to align customer interests with the evolution of the grid, and provide a way for customers to take credit for renewable energy on the overall grid, which they are already paying for through their utility bills.

To provide customers more clarity regarding the claims they can make about counting system renewable energy resources toward their goals, Xcel Energy is proposing in some of our jurisdictions a "Certified Renewable Percentage" concept. This approach will involve retiring RECs — the established accounting mechanism for both the compliance and voluntary markets — on our retail customers' behalf equal to the total renewable generation for the prior calendar year. The Certified Renewable Percentage includes RECs that are retired for RES compliance (which represents renewable energy that is delivered to customers) with additional retirements to reflect that Xcel Energy exceeds the amount of renewable generation required by the RES. That will allow our customers to claim a renewable energy supply reflective of the renewable energy share of delivered electricity in each state on our system. Xcel Energy will continue to offer incremental voluntary renewable options, such as Renewable*Connect,

[82] We are required to file resource plans in some of our states to determine the size, type and timing of new generation resource additions. When resources come onto the system outside of that process, that may not take into consideration the resource need or adequacy considerations that are part of a planning process, as they are fulfilling an individual customer need versus a system resource need.

that customers could participate in if their goal is to go above our current and planned system renewable percentage.[83]

B. Renewable Energy Certificate accounting practices should be transparent and avoid double-counting.

There is no standard definition when it comes to customers' renewable energy goals. Those goals are typically defined on an annual basis, meaning that the goal is to produce enough renewable energy through the course of the year to equal total annual energy consumption irrespective of when usage and generation occurred during the year. Likewise, there is also no universally accepted accounting practice for renewable energy goals. Our view is that an appropriate tracking mechanism is the retirement of the quantity of RECs that aligns with the energy usage associated with a company's or community's renewable energy goal.

Within this construct, however, there are many ways to meet a renewable energy goal depending on REC characteristics. In the compliance market, the vintage, generation type, location of generation, and other aspects of the renewable generation used to meet RES or Renewable Portfolio Standard (RPS) requirements is established through statute and varies by state. In the voluntary market, customers have varying perspectives on the approach to renewable energy procurement that best meets their needs. Among other elements, the Corporate Renewable Energy Buyers' Principles state a preference for "access to new projects that reduce emissions beyond business as usual" and "result in new renewable power generation," which the Principles suggest is demonstrated by: [84]

- "Bundled" renewable energy products (energy and RECs sold together),
- The ability to prevent double-counting within the energy consumer community, and
- Renewable energy from sources within a reasonable proximity to the facility being supplied with renewable electricity.

Xcel Energy has taken these principles as core tenets in designing Renewable*Connect.

Other entities have played important roles in the voluntary REC market. Since 1997 the Center for Resource Solutions has offered Green-e certification of RECs associated with renewable energy offerings. Green-e certification provides a trusted mechanism for purchasers to be assured that their REC purchases meet a certain standard. However, a one-size-fits-all standard is not always effective. As energy procurement strategies continue to be more tied to the needs and perspectives of specific customers, and as the evolution of the energy system varies significantly in different locations, product offerings will get more customized.

Despite the seeming simplicity and clarity of RECs as a mechanism to avoid double-counting, a few areas of confusion still exist. Some renewable products are focused on ways that customers can participate in

[83] More details of this approach will be made available as it is rolled out starting in Wisconsin in 2019. The Certified Renewable Percentage is available now in Wisconsin and is planned to be implemented soon in Minnesota and Colorado (https://www.xcelenergy.com/energy_portfolio/renewable_energy/certified_renewable_percentage).
[84] Corporate Renewable Energy Buyers' Principle 4, at https://buyersprinciples.org/principles/.

renewable energy generation — for example, Xcel Energy's Solar*Rewards and Solar*Rewards Community programs — but not necessarily renewable energy consumption. In the case of customer-sited generation, incentive payments for RECs can lead to counterintuitive situations in which the owner of a home or facility with rooftop solar cannot claim credit for their solar generation. For many customers the act of installing rooftop solar is more important than the ability to formally claim that they are solar-powered, but for some this can complicate their calculation of this generation as part of a formal renewable energy accounting or marketing claim.

Community solar poses additional challenges in terms of REC attribution. Community solar subscribers (in many cases) do not receive the RECs associated with their subscription.[85] Subscribers also do not have a solar installation on their premises to provide a visual statement of their engagement with a solar project. Customers understandably want a simple and clear way to talk about their subscription, and we observe some customers claiming their subscriptions as part of meeting a renewable energy goal. This claim may be inaccurate because the credit for the environmental attributes of the energy may belong to a solar garden developer or to all customers. When program participants are incentivized to forfeit REC ownership or attribution, they are not able to make any claims about using renewable energy. This situation is not always clear to customers.

As a utility, Xcel Energy strives to provide clear and reliable information to customers at every step to make sure they are fully informed, but ultimately the Federal Trade Commission has jurisdiction over green energy claims. As customers and communities make progress toward ambitious renewable energy goals, we anticipate a need for further clarifications related to the proper accounting of these resources. We also anticipate increasing interest from customers in counting the renewable energy that is brought onto the overall system for all customers.

C. Renewable product pricing should reflect the net costs and benefits.

When designing renewable energy products, cost impacts to nonparticipants must be considered. We have designed our voluntary customer renewable energy offerings to avoid cost shifting, with the acknowledgement that there are system costs associated with providing these services. While renewable energy technologies are experiencing record low costs, that cannot be conflated with the total system cost associated with delivering service. This issue is important from the perspective of policymakers and regulators in addition to energy purchasers.

As described in the previous section, within Xcel Energy's product portfolio, both the Solar*Rewards and Solar*Rewards Community programs in Colorado and Minnesota provide an incentive payment in exchange for RECs. Because this incentive payment is recovered from all customers, in essence nonparticipating customers are providing a financial incentive to help a project get built, in exchange for REC attribution. Some renewable products may come with more attractive pricing in part because the environmental benefit claims do not belong to the customer. For this array of renewable product

[85] Subscribers to Xcel Energy's Wisconsin and New Mexico solar garden program, Solar*Connect Community, do retain the RECs; in other states, REC ownership may be the solar garden developer's choice.

offerings to be sustainable, correct attribution of the benefits is important. We are careful with our messaging to help customers accurately account for progress toward their goals.

Consistent with the Corporate Renewable Energy Buyers' Principles, there is a desire among buyers to purchase renewable energy that reflects the net costs and benefits to the system without impacting other customers.[86] In order to design an offering that is beneficial to all customers, Renewable*Connect was designed with mechanisms to reflect the true costs and benefits of the renewable energy procurement to support the program. A component of the Renewable*Connect pricing is a "neutrality adjustment" which includes consideration for line losses, curtailment costs, renewable energy integration and system balancing costs. If these costs were not incorporated into the product, they would default to all customers. By collecting neutrality adjustment revenues, cost impacts to nonparticipating customers are minimized. Similarly, to ensure that true benefits (such as emissions reductions, fuel savings, capacity value) to the system are also reflected, Renewable*Connect participants receive a capacity credit reflective of the value of additional capacity driven by participation in the program that partially offsets participation costs.

D. Customers want to see that their actions have an impact. Getting the definitions right is important.

The concept of "additionality" — contributing to the development of renewable generation beyond business as usual — has gained significant traction in recent years among renewable energy buyers. Put another way, additionality ensures the impact of a program or investment will go beyond what would "happen anyway." The term is adopted from the carbon offset market, where it is used to describe projects that result in a verifiable reduction in greenhouse gas emissions relative to a project-specific, counterfactual baseline scenario representing what would have occurred in the absence of the project. Because renewable generation is in many cases now the lowest-cost resource, the term additionality (in its strict carbon offset markets definition) should only be used in certain project circumstances.[87]

Xcel Energy has had extensive discussions of additionality with large customers through the Minnesota Sustainable Growth Coalition. We learned that although the term does not have a uniform interpretation among our customers, it is most often used to indicate that the project supporting a renewable product offering is: (1) at a minimum, surplus to renewable energy mandates or (2) newly built or procured specifically to support the product. Moreover, the Corporate Renewable Energy Buyers' Principles do not include the term *additionality.* Principle 4, "Access to new projects that reduce emissions beyond business as usual," speaks to the desire to support projects that result in new renewable power generation, and suggests this can be demonstrated by adhering to three criteria: bundled energy + RECs, ability to prevent double-counting through REC ownership and/or retirement, and proximity of projects to the buyers' facilities. Notably, none of these criteria speak directly to additionality, newness or what would make a project beyond business-as-usual. They do address avoiding double-counting and ensuring projects are additional to regulatory mandates (since RECs

[86] Corporate Renewable Energy Buyers' Principle 6, at https://buyersprinciples.org/principles/.
[87] See WRI 2018a.

bundled with energy or retired on a customer's behalf could not also be retired for RES compliance). Rather than focusing on additionality, the World Resources Institute suggests focusing on clearly communicating the *impact* a renewable energy purchaser is seeking to make: "what you did" (scale, scope and term of purchase; how it goes beyond mandates; whether it comes from new or existing generation); and "how you did it" (purchaser's role in the outcome, financial and risk positions, role in influencing policy changes, etc.).[88]

The Minnesota Sustainable Growth Coalition discussions also have highlighted the challenge of applying the concept of additionality to a regulated utility product that is offered by a utility subject to integrated resource planning. All new generation that is added in an integrated resource plan is reviewed and approved by the relevant regulatory commission to ensure that it is a prudent investment from the perspective of the entire system. Because renewable energy has become so much more cost-effective in recent years, Xcel Energy and other utilities are now proposing renewable energy additions significantly in excess of those needed to meet RES mandates. It would be a perverse outcome, in our view, if utilities were incented to include less renewable energy in their resource plans in order to be able to offer these projects to a specific purchaser with a strict view of additionality.

Instead, we believe both utilities and purchasers share the goal of having impact at the system level and accelerating the clean energy transition. Helpful in this regard is the "Certified Renewable Percentage" concept discussed above, which helps align the interests of customers who have renewable energy goals with increasing the renewable energy share of the overall system. Giving credit to customers for renewable energy in the overall system incentivizes cooperation between the utility and customers to push the system toward more renewable generation, while making it easier for customers to meet their own goals.

Our preferred future construct is that customers take credit for both the contribution of renewable energy on our system, and for their own voluntary purchases that go above and beyond what is on our system toward their renewable energy goals. Both of these pathways to renewable energy are accounted for with RECs to ensure no double-counting and promote consistency with national standards and best practices.

2. What is the range of options for a utility providing 100 percent renewable energy products, and what are the implications of each of these options?

A. A systemwide transition offers significant benefits.

As discussed in question 1, the most effective and affordable way to transition the electric sector to clean energy is through a systematic, large-scale change at the grid level. We seek to lead that transition through our *Steel for Fuel* strategy — adding renewable resources at a net savings because the capital costs of projects are more than offset by future avoided fuel costs — and also by pushing the market toward a variety of carbon-free energy options in the long term. Policymakers are also considering and implementing new policies and programs that accelerate the clean energy transition and providing

[88] WRI 2018a.

economic opportunities for communities, such as the coal plant retirement securitization laws adopted in New Mexico and Colorado that can help utilities finance this transition. The great advantage of this systemwide transition is that it benefits all our customers while maintaining the highest level of reliability and affordability. Systemwide reductions mean that everyone is a participant, thus there are no issues with protecting nonparticipants. Further, we are able to more effectively utilize renewable energy on a systemwide basis as we can bring our integrated system and regional markets to bear in balancing intermittency. As long as utilities take measured, balanced and forward-looking steps to reduce carbon and add renewables to the grid, all customers should benefit and any negative impacts can be minimized. (See Xcel Energy's response to question 3.)

Utilities are well positioned to take advantage of the cost-reducing benefits of larger-scale projects on behalf of their customers. The utility industry has long been built around developing and operating large-scale infrastructure — from the largest generating facilities, to continent-spanning transmission, to distribution networks serving nearly every home and business in the United States. The business model, history and culture of utilities have focused on economies of scale since the early twentieth century.

Zero-carbon generation technologies such as solar and wind can be most cost-effectively obtained at larger scale. Recent results from Xcel Energy's Colorado Energy Plan request for proposals (RFP) led to a final resource portfolio with solar in the range of $22-$27 per megawatt-hour (MWh) and wind from $11-$18/MWh. These facilities are all at larger scale for their technology type. The largest wind project selected was 500 MW, and the solar projects ranged from 72 MW to 250 MW. The wind and solar industries have gone to larger project sizes to pursue the cost reductions associated with scale. Analyses comparing solar installations from rooftop to the largest utility-scale systems, such as work produced by The Brattle Group for First Solar,[89] show that as projects or systems grow larger, they also grow less expensive.

In more recent times, as renewables have grown from a niche player to now representing more than 50 percent of new capacity additions from 2014 through 2017,[90] utilities have followed their historic pattern of focusing on scale. Whether the generation is obtained from independent power producers (IPPs) through power purchase agreements, or the utility itself develops and owns the projects, utilities have grown increasingly capable of sourcing renewables for their customers. The recent Xcel Energy all-source RFP attracted more than 400 bids, representing proposals for both IPP and utility ownership. Utility power purchase agreements offer a valuable source of revenue stability to IPP owners, who in turn can benefit from the creditworthiness of the utility off-taker to assist in project financing. Most utilities are considered to be very creditworthy.

Utilities also can offer a compelling ability to finance and own renewables. The same creditworthiness and long-term stability of utilities allow them to finance renewable projects on favorable terms, with debt rates in current market conditions ranging from 4 percent to 5 percent and equity rates typically at 9 percent to 10 percent. Beyond the favorable financing terms, utilities also can offer other benefits to

[89] The Brattle Group 2015.
[90] EIA. 2018a.

customers, such as retaining ownership and use of the renewable facility after the term of the power purchase agreement runs out, providing a stable, long term cost trajectory for these resources for customers. In this case, there is no need to negotiate terms with an operating renewable resource if the utility owns it; the resource simply remains in service on behalf of the customer as long as it is reliably operating. Utility ownership also allows for the potential to obtain cost reductions in ongoing operations and pass them on to customers, and do so under the purview of state public utilities commissions (PUCs).

In the Colorado Energy Plan, Xcel Energy worked with the Colorado Public Utilities Commission and intervening stakeholders to develop extensive customer protections as part of the acquisition of new company-owned wind projects. These protections include a point cost (or capital cost) cap, a generation performance metric, and a customer protection mechanism. The point cost cap places a higher burden of proof on the company for the recovery of any capital construction costs that exceed a level set before the project is constructed. The generation performance metric is designed to protect customers during the later years of a wind project's lifespan by ensuring that the project is properly maintained and that the company takes appropriate steps to mitigate performance degradation. Finally, the customer protection mechanism, which is a separate metric from the evaluation of upfront capital construction costs, ensures that customers receive the value from the wind resources at the cost that the company put forth in the selection of bids in the resource plan. This mechanism allows for the Commission to compare the costs of a company-owned wind facility against IPP bids.

By contrast, an IPP-owned project would not retain any benefits from operating and maintenance or ongoing capital savings, as the contract purchase rate would not be reduced for savings. For example, under the Tax Cuts and Jobs Act, IPP contracts will retain the same purchase price even though the costs of operating the project may go down due to lower taxes. However, many state PUCs and utilities have worked to adjust their rates downward to reflect the reduced costs from lower federal taxes. These cost reductions include those associated with utility-owned renewable investments. Utilities increasingly taking on an ownership role in renewable technologies has been among the reasons that they have matured and grown in scale.

B. New product offerings can help customers reach goals, with minimal negative implications.

The next step beyond systemwide changes is refining the range of options for renewable product offerings we make available to our customers to meet their goals, including green tariffs, onsite generation incentives, and ways to account for our systemwide clean energy transition. Green tariff offerings serve customers with specific renewable resources, without negatively impacting customers who choose not to participate, in some cases through a "neutrality adjustment"[91] specifically designed for this purpose — as with our recent and upcoming Renewable*Connect offerings. For each of these offerings, we have gone through painstaking effort with our regulators and stakeholders to maximize

[91] The neutrality adjustment is a program payment that is then provided to nonparticipants. It accounts for line loss costs, renewable energy integration and system balancing costs, and the potential for stranded resources or adverse economic impacts associated with Renewable*Connect customers migrating away from resources that were procured for the system and approved or ordered by the Commission.

the benefit to participants and ensure that nonparticipants are not impacted with higher prices or other negative outcomes. Another issue we consider is how to match supply and demand, even though the resources supporting any given program may vary in generation seasonally. A key innovation for our Renewable*Connect offering that will expand upon the initial pilot is how seasonal balancing is handled for the specific resources that support the program.

Other products and new approaches can be appealing to certain types of customers. Virtual power purchase agreements (see WRI essay in this report) are one pathway that does not involve working directly with a utility. They are complex financial instruments with significant risks, so generally only larger customers with more resources, sophistication and appetite for risk opt to participate. Part of the value in working with the utility to implement renewable goals is that we manage that risk for customers by providing them with options that are relatively simple and flexible, renewable energy that is in proximity to their operations and consumption, and renewable energy bundled with RECs.[92]

We are also looking to provide pathways for customers who want to take more control of their energy and become "prosumers" who both consume and generate electricity at their homes and businesses. In offering onsite generation options for customers, we must have methods to appropriately value both the energy provided by a customer's system and how that distributed generation can provide value to the distribution system. (See examples in Xcel Energy's response to question 3.)

C. Some customers are looking for new objectives beyond a 100 percent renewable goal

Another emerging trend is renewable energy goals that seek to not only match a customer's energy usage with renewable generation on an annual basis, but to be renewable (or carbon-free) on a real-time basis. In meeting this goal, the challenges will soon shift from creating the right incentives and purchasing options for customers to buy renewable energy and help drive the addition of new renewable capacity. As an example, Google has accomplished its goal of being 100 percent renewable, which included purchasing a surplus of renewable energy in regions or hours when wind and solar are abundant. In order to go farther, they also have a longer term goal of being powered by carbon-free electricity on a 24/7 basis.[93] They recognize that meeting this goal is not only about purchasing more wind and solar energy, but also requires broadening the scope of energy sources to include technologies or services that enable 24/7 clean energy.

Xcel Energy has been working to help bring a new Google data center to Becker, Minn., adjacent to our Sherburne generating stations (Sherco), which involves providing a renewable energy offering to help meet the tech giant's carbon-free goal. We have proposed in our most recent Upper Midwest Resource Plan to retire the remaining coal units at the Sherco site as part of our overall transition toward a less carbon intensive fleet. After announcing the initial plant retirements, Xcel Energy worked with the city of Becker and Sherburne County to help find new

[92] Consistent with Corporate Renewable Energy Buyers' Principle 4.
[93] Google 2018.

investments for the community. The Google data center project would not only bring incremental carbon-free generation to our Upper Midwest system, it would also create new jobs and generate economic development for the state, supporting a just transition for employees and the local community.

In May 2019, Xcel Energy received approval from the Minnesota Public Utilities Commission for a proposal to procure new, incremental renewable energy resources and retire the associated RECs to match the Google data center's annual energy usage and to match the data center's peak load with incremental, new, carbon-free generation.[94] If Google decides to move forward with the project in Becker, it is expected to create 50 permanent jobs, and we hope it provides a model to attract other high-tech industries and companies with ambitious renewable energy goals to our states.

The Special Clean Power Council for Customers and Utilities, in which Xcel Energy participates, recently published a white paper, *Beyond Renewable Energy: New Strategies for Low-carbon Impact,* that highlights challenges with respect to enabling technologies for renewable integration and other technological advancements that can lead to deep carbon reductions for the electric grid. We welcome new perspectives and approaches to achieve carbon reductions that look to go beyond adding solar and wind capacity, but we encourage maintaining the focus on a systemwide perspective.

3. How can pace and cost be considered in procurement to achieve high renewable energy goals? And how can any negative impacts or risks be mitigated?

A. Moving at the speed of innovation and achieving scale is critical.

The importance of pace in the clean energy transition cannot be overstated. This transition must be balanced, affordable and reliable. If we adhere to each of these design criteria, working together with policymakers, customers and stakeholders, we can achieve a successful transition.

In recent years, renewable technologies have seen dramatic decreases in prices. In many cases, renewables have proven to be the greater value option for new generation resources and cost less than even existing low-cost resources. However, history provides some examples of policies that have demonstrated the risks and costs to our system. Two such examples follow.

Xcel Energy customers have access to community solar gardens in several of our jurisdictions. These policies are well intentioned and bring value to our customers by creating new opportunities for solar energy, but the programs require us to purchase energy at costs that are far above both the value we receive and the market price of solar energy. In Minnesota, 2 percent of our energy is provided by community solar gardens at a cost that is equal to 10 percent of the total cost of our Upper Midwest

[94] In the Matter of the Petition by Northern States Power Company, d.b.a. Xcel Energy, for Approval of Contracts and Ratemaking Treatment for Provision of Electric Service to Google's Data Center Project (Docket E002/M-19-39, E002/M-19-60).

integrated system. In Colorado, similarly, net metering policies are popular because of their simple mandate that we pay customers with rooftop solar based on the retail rate of electricity. These policies fail to recognize the relationship between the cost of solar energy and the value it provides, as well as removing the market forces that have resulted in record-low solar prices for large-scale installations we have seen in our Colorado Energy Plan.

Sensible renewable energy policies must recognize the continuous change that we have experienced in renewable energy markets. A recent example is biomass power purchase agreements in Minnesota. Xcel Energy entered into two power purchase agreements in fulfillment of a 1994 biomass power mandate.[95] However, since that time the costs of other renewable alternatives like wind and solar have declined dramatically, making the high cost of those power purchase agreements no longer justifiable — in part because some of the benefits of biomass power (e.g., for forest health and agricultural waste disposal) are arguably statewide benefits that should be addressed by the legislature rather than funded by Xcel Energy customers. Under a new state law passed in 2018, Xcel Energy terminated the power purchase agreement and purchased and retired the Fibrominn turkey litter/wood biomass plant. In seeking approval from regulators, we noted that taking these actions and replacing the plant with lower cost energy would save customers $345 million net present value (NPV)/$480 million nominal value compared to continuing to purchase power from the plant to the agreement end date. Likewise, we estimate terminating the power purchase agreement for the wood-based biomass Laurentian Energy Project plants will save customers $87 million NPV/$122 million nominal.

It is important that policymakers avoid locking the industry into a technology that is too early in the cost curve, or too late and no longer in need of a mandatory market (e.g., carve-outs in Renewable Energy Standards) in order to get established. Moving at the speed of value — that junction when customer interest meets favorable economics — is the most cost-effective approach. There may also be opportunity to adapt our regulatory structures to keep up with the pace of technology innovation and customer expectations, balancing the need for innovation with a management of risk.

B. Our Steel for Fuel strategy is a successful demonstration of pace and scale.

Our *Steel for Fuel* initiative is taking advantage of the fact that the energy resources of the future are on sale today and through the current expiration of the federal production tax credit. Xcel Energy operates in regions of the United States with some of the best wind and solar resources for producing electricity. Under our *Steel for Fuel* strategy, we are currently implementing the country's largest multistate wind plan with 12 new wind farms approved by utility regulators. When the projects are complete in 2022, they will increase our owned wind portfolio fourfold to about 3,900 MW. Achieving scale is critical to achieving cost-effectiveness.

The basic concept is that we are adding low-cost wind energy to benefit customers, where the impact of the capital costs of these projects on our customers' bills is more than offset by avoided fuel costs over the lives of the projects. It resonates with constituents across the spectrum because it delivers carbon-free renewable energy without raising customer bills. This proposal showcases our ability to move

[95] Minn. Stat. 216B.2424.

swiftly, taking advantage of the federal tax credits while they are available. Building wind farms and the accompanying substations and transmission lines needed to deliver the energy to the marketplace provides a powerful source of economic development in rural America. Our multistate proposal is expected to create construction jobs and full-time positions and generate hundreds of millions in landowner lease and property tax payments over the lives of the projects.

C. Integrating higher levels of renewable energy on the grid may require greater customer engagement.

Electric utilities have over a century of experience balancing supply and demand on the grid. Today, we have a wide variety of tools available to help integrate high levels of renewable energy without compromising reliability, including new pricing programs that help inform customers of the impacts of their decisions and new technologies that change how and when energy is consumed.

In Colorado, our Time of Use and Peak Demand pilot programs introduce prices that vary based on the time of day that customers use energy, allowing us to send signals about energy demand and the cost of resources that are available to serve customers. Wind provides our largest source of renewable energy, and peak wind production typically occurs overnight. By incentivizing our customers to shift loads — whether it is their heating and air conditioning, electric vehicle (EV) charging, or even their dishwasher — to these low-demand but high-renewable generation hours, we can ease the way for more renewables on our system while providing our customers with opportunities to save on their energy costs.

New technologies will also enable more sophisticated and capable demand response programs that will allow us to manage both highs and lows of renewable generation. In Minnesota, we are launching a pilot program for smart EV charging that will allow us to manage customers' EV charging during times of peak demand as well as integrate additional renewables that might have otherwise been curtailed. We are also testing EV charging rates in Minnesota that significantly reduce customers' energy costs during off-peak times that coincide with high wind generation to encourage the use of this cleaner, lower-cost energy.

In the Stapleton neighborhood of Denver, Colorado, we are testing the ability of batteries to integrate higher levels of renewable energy. Through this program, we have installed six customer batteries and six larger grid batteries to learn how energy storage can help us manage the impact of high concentrations of solar PV on distribution system feeders. We are learning how batteries can help regulate voltage, reduce peak demand, reduce energy costs, store excess solar power during the day, and discharge stored power during times of peak energy use. This will help ensure that we can maximize the value of batteries across our distribution system and provide value to our customers.

In the future, we anticipate an even greater number of utility-managed distributed energy resources being available, such as electric water heaters, to help us integrate higher levels of renewable energy. Our management of the grid and integration of new technologies will help ensure that we are able to capture all of the benefits of renewable energy.

D. Technology improvements can help ensure that grid resiliency and reliability are maintained.

A resilient grid is at the heart of Xcel Energy's operations. Utilities strive to ensure reliable and cost-effective service to all customers, to limit the risk of outages, and recover from outages as quickly as possible. A diverse set of generating resources, including significant amounts of renewable energy, plays an essential role in maintaining the resilience of our energy system and delivering reliable energy to all of our customers.

A robust transmission and distribution system is critical to system resilience. The ability of the transmission system to play its role in ensuring system resilience is challenged by aging infrastructure, changes in load patterns and congestion. Further, wind generation tends to be built in the wind-rich areas of the country, and solar generation tends to be built in the solar-rich areas. However, these geographic areas do not align with where our customers live and do business. A significant expansion of the transmission system will help ensure that resource-rich areas are connected to our customers.

We are also taking advantage of new technologies on our distribution system to ensure that customers maintain access to reliable and resilient energy. In Colorado, our Advanced Grid Intelligence and Security program adopts new communications and monitoring technologies on our grid that will allow us to more proactively respond to outages, as well as more efficiently manage distributed energy resources and provide greater value to our customers. As the use of renewables and new technologies continues to increase, deployment of new technologies that manage energy delivery and consumption will be needed to meet the integration challenges.

E. The shared goal and desired policy outcome is carbon dioxide reductions. Renewable energy is one tool to get there.

To date, renewable energy has been one of the most effective tools to help us reduce carbon emissions across our system, to the benefit of all our customers. Our system energy mix is moving toward more renewable energy than we once thought possible. Once our approved wind farms in the pipeline are completed in 2022, renewable energy will generate roughly half of the electricity to serve our customers companywide. By 2026, Colorado customers will be served with 55 percent renewable energy, and by 2030 our Upper Midwest customers will be served with about 50 percent renewable energy and our Upper Midwest CO_2 emissions will be more than 80 percent below 2005. These system changes, combined with our customer products, mean we can help customers achieve their goals of 100 percent renewable energy. But, when we talk about our system more broadly, the advancement of renewable energy has just been the tool to help us address the larger issue of carbon emissions. As we look to the future, Xcel Energy believes the best long-term goals should be CO_2 emissions reductions, and we should utilize all the tools available to get there.

To achieve really aggressive carbon reduction goals, such as our zero-carbon electricity by 2050 vision, renewables will be critical, but they cannot get us all the way there. Many experts in the electricity sector research community have been making a similar point when it comes to greater levels of

renewable energy on the grid.[96] They find that, depending on the region of the country, renewable energy deployment will likely encounter diminishing returns in its ability to deliver cost-effective CO_2 reductions when it reaches between 60 percent and 80 percent of annual energy delivered. While an all-renewable energy grid may be technologically feasible, the challenge is that the grid would need to be overbuilt — by three to eight times according to some estimates, require 8 to 16 weeks of storage, and would lead to high levels of curtailment.[97] In short, an all-renewable grid would not be the most cost-effective, nor the most reliable, pathway given today's technology.

Ultimately, some form of 24/7, flexible zero-carbon resource will be needed. There are a variety of new technologies that hold promise for meeting this demand, including power to gas (hydrogen), natural gas with carbon capture and storage, deep-rock geothermal and small modular reactors. In addition, seasonal storage will play a critical role in the integration of renewable resources. Further research and development are needed to find the new resources that can be deployed cost-effectively at scale.

As the electric sector continues its impressive progress in transitioning to renewables and clean energy, the carbon reductions will spill over into other sectors of the economy that may not be as far along in achieving long-term carbon reductions. From 2005 to 2018, Xcel Energy reduced CO_2 emissions about 38 percent, and the entire electric utility industry reduced its CO_2 emissions 27 percent.[98] This progress in the electric sector will lead to opportunities to enable sectors like transportation or heating to reduce emissions. In order for electricity to play a role in economywide carbon reductions, it must remain reliable and affordable for customers to be willing to depend on it for an increasing share of their overall energy needs.

Conclusion

Xcel Energy has the technical expertise and products that our customers will need to achieve their 100 percent renewable energy goals. We can help them get there. Our base offering will provide roughly half of the electricity needed to serve our customers companywide in a few years from renewable energy, and renewables will provide roughly 60 percent of our electricity needs by 2030. For some customers, this pace is sufficient. Others will want to achieve higher renewable energy usage sooner. Enhancing our customers' experience is a strategic priority for Xcel Energy, which we aim to achieve by offering products and services that meet varying customer needs and strengthening our partnerships with community and C&I customers. Along this transition, utilities can be a trusted advisor to customers to ensure that the products they are purchasing meet their criteria for impact, additionality and transparency in disclosure.

As we think about public policy goals, we believe our focus should be on reducing CO_2 emissions. Xcel Energy is focused on this outcome and the drivers that will get us there as efficiently and cost effectively

[96] Sepulveda, Jenkins et al. 2018; Jenkins, Luke and Thernstrom 2018; Energy+Environmental Economics 2018; Vibrant Clean Energy 2018.
[97] Jenkins and Thernstrom 2017.
[98] See Carbon Dioxide Emissions From Energy Consumption: Electric Power Sector. https://www.eia.gov/totalenergy/data/monthly/pdf/sec12_9.pdf.

for all customers. Our industry-leading goal to reduce CO_2 emissions 80 percent from 2005 levels by 2030 and to provide zero-carbon electricity by 2050 will position our company and customers for success in a low-carbon future and provide long-term value for all stakeholders.

Appendix A. City Carbon and Renewable Energy Goals

Xcel Energy's service area includes 16 communities that have set renewable energy goals, 11 of which call for 100 percent renewable energy. Another 16 cities have set carbon emissions reduction goals, seven of which are carbon neutral goals. See Tables A-1 and A-2.

Table A-1. Xcel Energy Community Renewable Energy Goals

Minnesota	
Minneapolis	100% by 2022 for municipal facilities 100% by 2030 community-wide
St Louis Park	100% by 2030
St. Cloud	80% by 2018
Wisconsin	
Eau Claire	100% by 2050
La Crosse	100% by 2035
Colorado	
Boulder	100% by 2030
Breckenridge	100% by 2025 for municipal facilities 100% by 2035 community-wide
Denver	100% by 2030
Fort Collins	100% by 2030
Frisco	100% by 2035
Lafayette	100% by 2030
Lakewood	45% by 2025
Longmont	100% by 2030
Nederland	100% by 2020 for municipal facilities 100% by 2025 community-wide
Garfield County	35% renewables by 2020
Pueblo County	100% county-wide by 2035
Summit County	100% community-wide by 2035

Table A-2. Xcel Energy Community Carbon Reduction Goals

Minnesota	
Mahtomedi	100% by 2050
Edina	30% by 2025
Minneapolis	80% by 2050
Saint Paul	100% by 2050
Eden Prairie	80% by 2050
Saint Louis Park	100% by 2040
Red Wing	25% reduction
Winona	100% by 2050
Mahtomedi	100% by 2050
Wisconsin	
Eau Claire	100% by 2050
Colorado	
Boulder	80% by 2050
Denver	80% by2050
Englewood	12% by 2030
Fort Collins	100% by 2050
Lafayette	80% by 2050
Lakewood	50% by 2050
Garfield County	100% by 2040
Boulder	80% by 2050
Denver	80% by2050
Englewood	12% by 2030
Fort Collins	100% by 2050
Lafayette	80% by 2050

In some cases, these goals are for city-owned or controlled facilities (i.e., government buildings and operations); in others they are aspirational goals for all electricity users within the jurisdictional boundaries of a community. City facilities are similar in scale to a large business customer. These goals can generally be met with the portfolio of renewable choice products described in this essay. Citywide goals are potentially more challenging, both because the scale — providing a renewable option for tens or hundreds of thousands of individual customers — has a bigger impact on our system, and because the city government setting the aspiration generally does not have a mechanism to oblige all residents and businesses within its borders to choose renewable energy.

Nonetheless, through the programs described in our essay, Xcel Energy is partnering with many of these cities to explore a portfolio approach that may include energy efficiency (to reduce the total electricity load to which the goal applies), solar on city facilities, community solar gardens, Renewable*Connect and other options. The certified renewable percentage approach that we are working to offer will be especially powerful in this regard since it does not require a subscription or purchase by a specific customer. Instead, it will allow any retail (residential or business) customer of Xcel Energy to claim a

certain percentage of their consumption is renewable, which they can potentially combine with a renewable choice product to increase that percentage even further.

Appendix B. Xcel Energy Renewable Energy Products

Windsource: Xcel Energy has one of the oldest and largest green-tariff offerings, in place since 1998. The concept of Windsource is relatively simple: Customers pay a small premium on their monthly bill to be powered by a customizable amount of wind energy. Windsource is offered in five of the eight states we serve and provides customers with a scalable way to procure renewable energy blocks in increments of 100 kilowatt-hours (kWh).

Net Metering: Net metering is available across our service territory for customers with a renewable generation source behind their meter. The specific rules and requirements vary by state. The option has proved particularly popular for residential customers in Colorado, where the economics of onsite solar allow them to have a solar PV system often at no cost, or with net bill savings.

Solar*Rewards: The Solar*Rewards program complements net metering for qualifying systems. In addition to receiving a net metering bill credit, customers receive an incentive payment per kWh for all of their generation. Solar*Rewards is currently available in Minnesota and Colorado only.

As of December 2018, Xcel Energy had nearly 450 megawatts (MW) of interconnected solar through Net Metering and Solar*Rewards.

Solar*Rewards Community: Xcel Energy has the nation's largest community solar garden program, with over 550 MW of capacity from over 200 gardens in Minnesota and Colorado as of December 2018. Launched in 2011 in Colorado and expanded in 2014 into Minnesota, the Solar*Rewards Community (S*RC) program offers an opportunity for customers that do not have homes or businesses suitable for solar installations or prefer not to install solar on their property. Customers can subscribe to a community-based PV system operated by a developer, known as a garden operator, who installs community solar and interconnects to Xcel Energy's grid. The operator markets and sells or leases shares of the garden to subscribing customers in their communities under terms and conditions they create. Subscribing customers receive bill credits from Xcel Energy for their share of the solar garden's electricity production.[99] The Solar*Rewards Community programs in Colorado and Minnesota were created by legislation specifically to make more solar options available to customers and create markets for third-party developers.

Solar*Connect Community: Xcel Energy has proposed its own solar garden programs in Wisconsin and New Mexico, states that have not yet legislated community solar gardens or otherwise created those

[99] With both Solar*Rewards and Solar*Rewards Community, the RECs may be transferred to Xcel Energy in exchange for an incentive payment. In that case, Solar*Rewards and Solar*Rewards Community participants cannot claim that they are powered by solar energy, and participation in a community solar garden alone does not allow customers to claim their subscriptions toward meeting their renewable energy goals. Still, customers see it as a financially attractive and impactful way to demonstrate support for solar energy.

programs. Xcel Energy has subscribed 3 MW of gardens in Wisconsin and is currently seeking regulatory approval to offer 2 MW of solar gardens in New Mexico. Like Solar*Rewards Community, the Solar*Connect Community program offers customers the ability to subscribe to a nearby community solar garden. However, the Solar*Connect Community program is offered directly by Xcel Energy, not a third-party developer, and provides an unsubsidized bill credit that allows the customer to maintain ownership over the RECs.[100]

Renewable*Connect: The newest renewable product offering from Xcel Energy, Renewable*Connect allows customers to subscribe to a blend of wind and solar energy from specific resources that are partially or entirely dedicated to supporting the program. Participants receive a credit on their bill for the value the resource provides to the overall system and pay for all the costs to deliver the program. This structure ensures that nonparticipants do not pay for any of the costs of providing this voluntary renewable program. The use of large-scale renewable resources allows for greater economies of scale to bring the costs down for participating customers. Renewable*Connect is currently sold-out, with a waitlist in Colorado and Minnesota, and recently launched in Wisconsin. Xcel Energy is working on expanding the program in Minnesota with new offerings and more options that are responsive to the needs of large customers and residential customers.

[100] Solar*Connect Community therefore allows customers to claim their subscriptions toward their renewable energy goals.

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