ORGANIZED WHOLESALE MARKETS AND CORPORATE ADVANCED ENERGY PROCUREMENT

How competitive markets help commercial and industrial buyers meet their sustainability goals, and how they can be improved

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ADVANCED ENERGY BUYERS GROUP
the policy voice of advanced energy purchasers

ABOUT THE ADVANCED ENERGY BUYERS GROUP

The Advanced Energy Buyers Group is a business-led coalition of commercial, industrial, and institutional energy users engaging on policies to expand opportunities to procure energy that is secure, clean, and affordable.

Members of the Advanced Energy Buyers Group are leading companies and organizations spanning a range of market sectors. These businesses share a common interest in expanding their use of advanced energy, such as renewable energy like wind, solar, geothermal, and hydropower; demand-side resources like energy efficiency, demand response, and energy storage; and onsite generation from solar photovoltaics, advanced natural gas turbines, and fuel cells. Analyses and internal business planning have shown that expanding use of such technologies will help companies to be more competitive, resilient, and sustainable far into the future.

For more information, visit advancedenergybuyersgroup.org.

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EXECUTIVE SUMMARY

With more than 24 GW of renewable energy contracted by corporate and institutional buyers since 2016 and voluntary buyers purchasing 32% of all non-hydro renewable energy generation in the United States in 2019, large corporate and institutional buyers have demonstrated a major commitment to a clean electricity system.[1] While the significant role of large voluntary buyers as accelerants of the energy transition is now well understood, one key foundational enabler of this market activity—organized competitive wholesale markets—has received relatively little attention. Considering that the vast majority of large-scale renewable energy procurements have occurred within competitive organized wholesale markets, any efforts to expand customer access to advanced energy should start with an understanding of how and why companies find more opportunities to pursue their renewable energy and sustainability goals in the presence of organized competitive wholesale markets than they do elsewhere.

To make progress toward ambitious sustainability goals, companies rely on a few key pathways, which can be divided into three broad categories: procurement of electricity from development of large-scale, off-site renewable energy projects; pursuit of onsite distributed energy resources (DERs), such as solar PV and battery storage; and engagement in policy or regulatory efforts to "green the grid" for all customers and, by extension, for their own facilities. The presence of an organized competitive wholesale market overseen by a regional transmission organization or independent system operator (RTO/ISO) is foundational for some of these pathways, and expands the opportunities to pursue these and others more easily and cost-effectively. This report details the procurement strategies companies use to obtain advanced energy for their operations, demonstrating that organized competitive wholesale markets better facilitate these strategies by providing:

- **Access to power purchase agreements (PPAs) and virtual PPAs (VPPAs) for large-scale renewable energy projects:** VPPAs have become the primary vehicle companies use to meet their renewable energy and sustainability goals, and VPPAs are only possible in organized wholesale markets. While the signer of a VPPA can be located anywhere, the renewable energy project developer must be able to deliver the power into a competitive, liquid market, which has effectively limited VPPAs to RTO/ISO regions.

- **Renewable energy offerings in vertically integrated utility territories that leverage organized wholesale market structures:** While vertically integrated utilities outside of

[1] Renewable Energy Buyers Alliance, Corporate Renewable Deals 2016-2020YTD (Oct 15, 2020), https://rebuyers.org/deal-tracker/; National Renewable Energy Laboratory, Jenny Heeter and Eric O'Shaughnessy, "Status and Trends in the Voluntary Market (2019 data)" (Sept. 23, 2020), available at https://www.nrel.gov/docs/fy21osti/77915.pdf.

RTO/ISO regions have introduced renewable energy offerings, often called "green tariffs," those operating within RTOs/ISOs are able to incorporate organized wholesale energy market and capacity pricing to develop programs that are transparent, crediting participants fairly while avoiding adverse impacts on non-participants.

- **Flexible and customizable renewable energy offerings from non-utility suppliers in regions with competitive retail service:** Retail competition, itself an option facilitated by wholesale market competition, has enticed service providers to develop a range of renewable energy products—ranging from tailored, customer-specific offerings to plug-and-go subscription programs—to meet growing demand for clean energy among customers of all sizes.

- **More cost-effective options for distributed energy resources (DERs) due to the ability of these resources to provide value at both the retail and wholesale levels:** DERs such as demand response, battery storage, and solar PV can provide both savings to the retail customer and revenue-generating services to the wholesale market, making them more cost-effective for the corporate buyer. Recent Federal Energy Regulatory Commission orders on storage and DERs will create new opportunities for DER wholesale market participation.

- **More competitive and cost-effective integration of advanced energy technologies:** Organized competitive wholesale markets foster competition of supply and demand resources, facilitate coordinated regional transmission planning, provide access to transmission at a single rate, and better enforce open access to the transmission system, all of which serve to enable market entry for cost-competitive advanced energy resources. Organized wholesale markets also send price signals that force outdated and uncompetitive fossil units to retire, lowering emissions and opening up new opportunities for advanced energy while saving customers money.

Given the key role that organized wholesale markets play in enabling voluntary advanced energy procurement by customers, expanding and improving these markets would open new opportunities for large customers to meet their own emission reduction and renewable energy goals while also accelerating the broader energy transition. Based on interviews with a diverse array of corporate buyers, energy developers, and other market participants, this paper identifies a series of potential reforms that would serve to expand opportunities for customer-driven advanced energy deployment:

1. **Expand organized wholesale markets** to areas where they do not currently exist—namely the Southeast and in Southwestern states like Colorado, Arizona, New Mexico, and Nevada—to enable additional renewable and advanced energy contracting opportunities for commercial and industrial

(C&I) customers, expand opportunities for customer-sited DERs, and increase advanced energy penetration on the grid.

2. **Improve existing organized wholesale markets** to expand opportunities for advanced energy procurement by C&I customers by:

    a. Building additional cost-effective transmission and increasing the capacity of existing transmission infrastructure to bolster the availability of and customer access to renewable projects and ensure a robust market for corporate procurement;
    b. Clarifying and simplifying interconnection and operational requirements for emerging resource types and configurations;
    c. Ensuring that markets accurately value the capacity and ancillary services benefits of renewable generation, distributed energy resources, and other advanced energy technologies; and
    d. Clarifying the drivers of wholesale market prices and increasing the transparency of those prices to help developers and buyers better understand the risks and opportunities of new projects.

3. **Prepare for the transition to a decarbonized electricity system** through broader reforms to organized wholesale markets that will position them to support a grid that is dominated by advanced energy resources.

4. **Ensure that advanced energy buyers have a sufficient voice in the RTO/ISO decision-making process** by reducing the barriers to participation that empower market incumbents to protect their interests. Large customers share responsibility for stepping up to engage in the RTO/ISO stakeholder process to make their interests known.

These reforms will expand opportunities for large corporate buyers to access a greater number and variety of affordable, reliable advanced energy options to meet their individual needs. At the same time, expanding opportunities for large buyers to make progress toward their sustainability goals brings benefits to all grid customers by accelerating progress toward a decarbonized electricity system that is affordable, reliable, and customer-focused. Easing the path for corporate buyers to meet their clean energy goals will also help state and federal policymakers achieve clean energy targets more quickly and at less risk to ratepayers. Expanded and reformed, organized competitive wholesale markets can play a pivotal role in facilitating a customer-driven transition to clean energy for all.

INTRODUCTION

Corporate and institutional demand for advanced energy is a well-documented trend that has accelerated in recent years. Companies are being driven by their customers, investors, insurers, and employees to prioritize sustainability and take actions to reduce their environmental impact. At the same time, the cost of advanced energy technologies is rapidly falling, creating an added economic incentive for corporate energy buyers. While there are several ways to procure advanced energy, well-designed organized wholesale electricity markets operated by Regional Transmission Organizations and Independent System Operators (RTOs/ISOs) enhance most of them. Organized wholesale markets are one of the most important tools for corporate buyers to pursue advanced energy, and expanding and improving these markets would open new opportunities for large customers to meet their emission reduction and clean energy goals. In addition to helping companies to meet their corporate goals, organized wholesale markets also serve the objective of delivering reliable electricity cost-effectively, an important criteria for all energy users, including clean energy buyers.

Part I of this paper explains the main ways that large customers are pursuing advanced energy and explores the role of organized competitive wholesale markets in facilitating this activity. **Key benefits of organized competitive wholesale markets are highlighted throughout with an orange check mark.** Insights were informed by interviews with a diverse array of corporate buyers, energy developers, and other market participants. The findings are further substantiated by eight case studies that demonstrate how leading companies are confronting barriers and finding solutions.

Part II identifies ways to improve opportunities for corporate advanced energy buyers, ranging from expansion of organized wholesale markets into regions that do not currently have them, to various improvements to existing wholesale markets, and to amplifying the voice of large clean energy buyers in RTO/ISO stakeholder processes.

Making progress on these recommendations will require action by regulators, legislators, market operators, and other stakeholders at the federal, regional, and state level. The benefit of taking action is clear: large corporate buyers are playing a pivotal role in accelerating the decarbonization of the electricity sector. In just the past five years, corporate buyers were responsible for more than 24 gigawatts (GW) of new renewable energy capacity in the U.S.[2] Just as important, these companies are sources of experimentation and innovation, developing new deal structures and serving as early adopters of new technologies. Taking steps to expand and improve organized wholesale markets will allow this activity to continue and grow, benefitting not just corporate buyers but all electricity customers.

[2] Renewable Energy Buyers Alliance, Corporate Renewable Deals 2016-2020YTD (Oct. 15, 2020)), https://rebuyers.org/deal-tracker/.

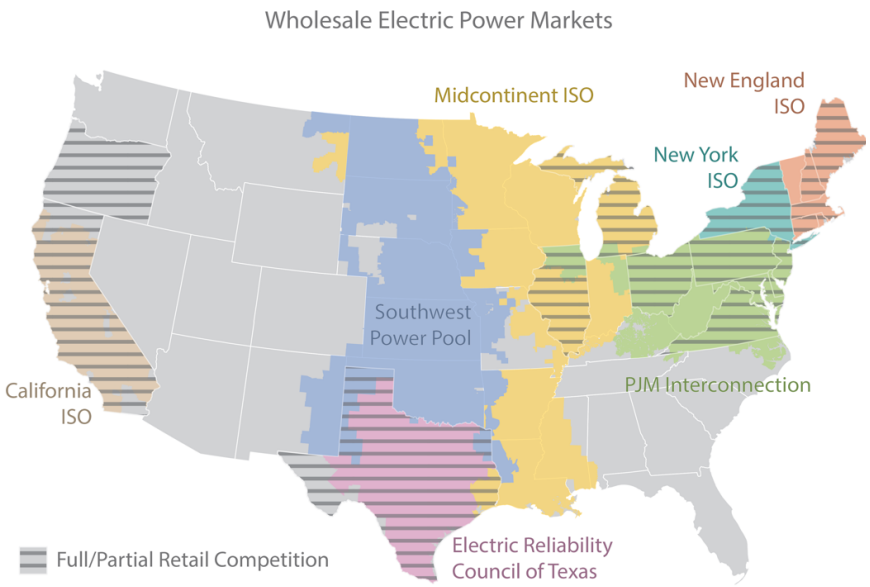
PART I: CORPORATE STRATEGIES FOR ADVANCED ENERGY DEPLOYMENT

When it comes to procuring electricity to meet their own needs, actions taken by companies to increase deployment of advanced energy and decrease emissions caused by their electricity usage can be categorized into three broad buckets. First, companies can pursue *large-scale renewable energy* through a variety of procurement options, including bilateral contracts, direct access programs, competitive retail markets, or green tariff offerings from utilities. The buyer may purchase just the environmental attributes of a renewable energy project, or environmental attributes bundled with electricity. This pathway accounts for the vast majority of renewable energy deployed by C&I customers, and each project can be hundreds of megawatts in size. Second, companies can invest in much smaller *onsite energy projects* to reduce their own energy costs and simultaneously provide valuable services to the grid—this includes a range of distributed energy resources (DERs), including solar PV, battery storage, demand response and energy efficiency, electric vehicles, and more. Third, companies can take various actions to *lower the carbon intensity of the electric grid overall,* thus lowering the carbon content of the electricity that serves their facilities. The main tool to do this is advocacy, i.e., working with utilities, regulators, and policymakers to increase deployment of advanced energy and retire costly and high-emitting fossil fuel resources.

All three pathways for companies to expand their use of advanced energy and reduce their carbon emissions footprint rely on or benefit from well-designed competitive wholesale electricity markets (for an explanation, see *Overview of Wholesale and Retail Competition*, p. 9). **Expanding competitive wholesale electricity markets, making transactions more accessible to customers, and designing market rules that are fairer to advanced energy technologies can empower companies to cost-effectively meet their clean energy and sustainability goals, and at the same time accelerate the transition to a cleaner and less expensive grid.**

This section explains the main ways that large customers are pursuing advanced energy and explores the role of competitive wholesale markets in facilitating this activity. Insights were informed by interviews with a diverse array of corporate buyers, energy developers, clean energy and environmental attribute brokers, and other market players. The eight case studies that follow serve to demonstrate how leading companies are confronting barriers to accessing advanced energy and finding solutions in practice. **Across all transaction types and decarbonization strategies, a common theme emerges: In the presence of an organized competitive wholesale market, customers have access to more transparent, more competitive, more varied, and more flexible options to procure advanced energy to meet their needs.**

Overview of Wholesale and Retail Competition



For most of the 20th century, the generation, transmission, delivery, and sale of electricity was treated as a natural monopoly. States granted vertically integrated utilities monopoly franchises to serve customers, subject to cost-of-service regulation of the rates, terms, and conditions of that service. While this model still exists relatively unchanged in some parts of the country, various layers of competition in generation, transmission, and retail sales have been introduced over the past several decades. In particular, driven by a desire to reduce consumer costs and increase reliability, many regions have transitioned to relying on independently operated competitive wholesale market structures, and some have also introduced competition for the retail sale of electricity.

From a policy standpoint, there has been greater focus to date placed on the lack of retail competition as a primary barrier to large customers meeting their demand for advanced energy, but both forms of competition have important implications for corporate buyers, and are referenced frequently in this report.

Wholesale Competition. Approximately two-thirds of electricity sales in the U.S. occur in organized competitive wholesale markets operated by Regional Transmission Organizations and Independent System Operators (RTOs/ISOs). RTOs/ISOs are independent of market participants and transmission owners, and their main roles are to plan and operate the transmission system and to operate and oversee competitive markets for energy, ancillary services, and (in some cases) capacity. These markets provide an open and non-discriminatory opportunity for multiple entities to provide wholesale services, rather than just vertically integrated monopolies.

With the exception of the Electric Reliability Council of Texas (ERCOT), which operates as its own interconnection located fully within Texas, RTOs/ISOs fall under the jurisdiction of the Federal Energy Regulatory Commission (FERC). These RTOs/ISOs are the California Independent System Operator (CAISO), the Independent System Operator of New England (ISO-NE), the Midcontinent Independent System Operator (MISO), New York ISO (NYISO), PJM Interconnection, Inc. (PJM), and the Southwest Power Pool (SPP). Participation in an RTO/ISO is primarily voluntary, with transmission owners making the choice to join, sometimes subject to approval of the states where they operate. States

can also encourage or even require (in the case of California) RTO/ISO membership.

Outside of the organized competitive wholesale markets, there is more limited competition at the wholesale level. In the western U.S., several utilities are participating in the Energy Imbalance Market (EIM) operated by CAISO. This market allows for the purchase and sale of wholesale electricity in real-time to resolve imbalances in supply and demand from what was expected. While the EIM has produced substantial benefits compared to the status quo, it falls short of delivering the long-term benefits of an independently operated transmission system, integrated transmission planning across a broad geographic area, and the independent operation of multiple markets for the sale of wholesale services. In other regions, wholesale energy is transacted primarily through bilateral sales. For example, in the Southeast, wholesale spot power markets account for less than 1% of supply.[3] Because of the lack of an open, non-discriminatory market, the vast majority of wholesale electricity is generated by the vertically integrated monopoly utilities, and there are few competing power generators.

Retail Competition. Also called retail choice, retail competition refers to the ability of end-use customers to choose their electricity supplier rather than being captive to a franchised monopoly utility. Several states underwent "restructuring," or a transition to retail competition, in the 1990s and 2000s, requiring vertically integrated utilities to unbundle generation, transmission, and distribution services. In these states, regulated utilities still provide distribution services, but customers can take service from a range of different competitive retail providers. Many retail providers offer a variety of product and service offerings, including different rate structures and renewable energy options. Rather than engaging with a retail provider, some large customers participate in the wholesale market more directly, working with an intermediary to facilitate wholesale market transactions through a "wholesale direct access" arrangement.

Presence of an RTO/ISO does not necessarily equate to availability of retail competition; many of the utilities in MISO and all the utilities in SPP remain vertically integrated retail monopolies. However, an organized wholesale market structure serves as an important foundation for full retail competition.

Even in the absence of full retail choice, some large customers in states like California, Michigan, Oregon, and Virginia have the option to select an alternative electricity supplier through a direct access program. These programs offer participating customers the same flexibility as retail choice, but participation in them is generally capped or restricted.

[3] Jennifer Chen, Duke University Nicholas Institute for Environmental Policy Solutions, Evaluating Options for Enhancing Wholesale Competition and Implications for the Southeastern United States (March 2020), https://nicholasinstitute.duke.edu/publications/evaluating-options-enhancing-wholesale-competition-and-implications-southeastern, at 20.

Renewable Energy Procurement

The first strategy many corporate purchasers use to meet clean energy and decarbonization goals is to support development of renewable energy at large scale. They do so through power purchase agreements and renewable energy offerings from utilities or competitive retail suppliers. This section also explores the emerging trend toward developing hybrid renewables-plus-storage projects.

POWER PURCHASE AGREEMENTS

Power purchase agreements (PPAs) are a popular tool for corporate and institutional electricity customers to reduce their carbon footprint and achieve their climate goals by supporting development of renewable energy. Technology companies were early leaders in procuring renewable energy through PPAs, but interest has spread across different sectors of the economy. Companies in the manufacturing, retail, and telecommunications industries are now among the leaders in renewable energy procurement through PPAs.

PPAs have numerous advantages for corporate energy buyers. First, they can help buyers ensure that their purchases contribute to the development of new generation resources. The environmental attributes associated with PPAs are clearly traceable to a specific project, making it easier for companies to demonstrate their sustainability efforts to the public. Additionally, with long-term fixed-price contracts, PPAs can also give companies financial certainty with regard to their power prices and, depending on the market structure, act as a hedge against future energy price volatility.

Over the last decade, corporate energy buyers have been responsible for bringing nearly 40 GW of renewables onto the grid.[4] Much of the growth in PPAs has occurred in just the past few years, with many smaller, first-time buyers entering the market.

In a traditional PPA, a buyer agrees to purchase power and renewable energy certificates (RECs) from a renewable energy project at a fixed price over a set number of years. Today, however, more than 80% of corporate renewable energy PPAs in the United States are "virtual," taking the form of a financial swap rather than a physical exchange of electricity.[5] Without requiring the physical delivery of electricity, virtual power purchase agreements (VPPAs) allow buyers to be located anywhere, with the buyer taking only the renewable attributes of the power, accounted for by RECs. In addition to making

[4] Bloomberg New Energy Finance, 2020 Sustainable Energy in America Factbook (2020), https://data.bloomberglp.com/professional/sites/24/BNEF-BCSE-2020-Sustainable-Energy-in-Amercia-Factbook_FINAL.pdf.

[5] Bloomberg New Energy Finance, "Corporate Clean Energy Buying Leapt 44% in 2019, sets new record" (Jan. 28, 2020), https://about.bnef.com/blog/corporate-clean-energy-buying-leapt-44-in-2019-sets-new-record/.

renewable energy procurement more accessible to buyers regardless of the location of their operations, VPPAs also help buyers avoid other challenges of physical PPAs. Most importantly, physical PPAs typically require a buyer to deliver the electricity purchased through the grid to their point of consumption, or find a third party to take over that responsibility. VPPAs avoid this requirement.

Importantly, VPPAs are only possible in organized wholesale markets. While the offtaker (customer) of a VPPA can be located anywhere, the renewable energy project developer must be able to deliver power into a competitive, liquid market, which has effectively limited VPPAs to RTO/ISO regions. With VPPAs now the primary vehicle for companies to meet their renewable energy and sustainability goals, this makes organized wholesale markets critically important in facilitating corporate renewable energy procurement.

Case Study 1: Increasing VPPA Flexibility with Aggregation of Buyers and Suppliers across PJM, ERCOT, and SPP, ERCOT

As public concern about climate change and sustainability increases, interest in renewable energy procurement has grown among companies beyond the Fortune 100, including smaller companies and institutional buyers (such as municipalities, hospitals, and colleges and universities). For buyers with lower electricity demand, it may not be possible to use all the electricity generated by a single renewable energy project or even gain access to the market on reasonable terms because their needs may be too small to support the contracts that developers need to finance projects.

Increasingly, buyers are taking advantage of new aggregation strategies that combine the electricity demand of multiple buyers to bridge this gap and better match demand to the scale of typical renewable energy projects. For example, a group of four companies—Apple, Akamai, Etsy, and Swiss Re—came together to purchase the output from a wind project in Illinois and a solar project in Virginia, resulting in a total of 290 MW of renewable energy in PJM. The companies, supported by help from 3Degrees (a company that helps buyers with renewable energy purchases and other sustainability efforts), signed individual VPPAs with one or both projects at varying sizes and with similar but not identical terms and conditions. The collaboration allowed all four companies to leverage their individual impact as well as allowing the smaller offtakers to gain market access and achieve economies of scale that would not otherwise be possible.[6]

[6] 3Degrees, "Apple, Akamai, Etsy and Swiss Re partner on largest renewable energy aggregation to date" (2018), https://3degreesinc.com/resources/renewable-energy-aggregation-case-study/.

In addition to aggregation of demand, aggregation of supply via partial-offtake from multiple different projects allows buyers to reduce risk through diversification across developers, regions, markets, and technologies. In 2019, Starbucks demonstrated the potential of VPPA aggregation by purchasing a combined 146 MW of wind and solar power from three separate renewable energy projects located in different RTOs/ISOs.[7] Because Starbucks split its demand across multiple suppliers, it only committed to purchase a portion of the electricity generated by each project. With aggregation, the remaining output could be sold to other buyers.

According to typical VPPA terms, Starbucks will receive the environmental attributes of the power while helping to provide the revenue certainty needed to make each of the projects viable. As a national retailer, Starbucks benefits from a VPPA structure that enables partial-offtake from numerous projects across different RTOs/ISOs because it can better match the geographic distribution of its stores and renewable energy purchases.[8]

The deal consisted of three individual contracts with different developers for power produced by a wind project in Oklahoma (SPP) and solar projects in Texas (ERCOT) and North Carolina (PJM). LevelTen Energy, a software and analytics company that specializes in VPPA aggregation, brokered the deal through its renewable energy marketplace and ensured nearly identical terms for each of the contracts.[9]

Together, aggregation of buyers and suppliers is helping to reduce VPPA transaction costs and make renewable energy procurement more accessible to more entities of varying size. Greater accessibility of renewable energy procurement helps amplify the role that buyers can play in transitioning the grid to clean energy.

With the flexibility of VPPAs and the emergence of aggregation models (see Case Study 1), renewable energy procurement through competitive wholesale markets is more accessible than ever. However, VPPAs do come with challenges for some buyers.

[7] Greentech Media, "Starbucks Buys Aggregated Wind and Solar Portfolio with Help from LevelTen" (June 5, 2019), https://www.greentechmedia.com/articles/read/starbucks-buys-aggregated-wind-and-solar-portfolio-with-help-from-levelten.

[8] Utility Dive, "A renewable energy mutual fund? Starbucks charts new path with 146 MW procurement" (June 6, 2019), https://www.utilitydive.com/news/a-renewable-energy-mutual-fund-starbucks-charts-new-path-with-146-mw-procu/556182/.

[9] LevelTen Energy, "LevelTen Creates Groundbreaking Renewable Energy Portfolio to Support More Than 3,000 US Starbucks Stores" (June 5, 2019), https://leveltenenergy.com/blog/company-news/starbucks-ppa-portfolio/.

As financial swaps, VPPAs expose buyers to fluctuating wholesale market prices. To ensure that renewable energy projects have the stable cash flows that make them financeable, VPPA terms typically require the buyer to compensate the project if the wholesale market price drops below the contract price. If the market price rises above the contract price, the project instead pays the buyer the difference. In this way, the project always receives a fixed price, while the VPPA buyer bears the risk of fluctuating market prices.

One way to reduce this risk is for buyers to purchase electricity at prices that closely align with the fluctuating market prices they are exposed to via their VPPA. Therefore, when market prices go up, the customer is hit with a higher electricity bill, but also receives a payout from its VPPA; when market prices go down, the customer saves on its electricity bill but owes money through its PPA. Customers can achieve this alignment through direct wholesale market access in an RTO/ISO region, or through a market-based rate from their retail supplier, which allows the customer to purchase retail electricity at a price that is based on underlying wholesale market prices. Market-based prices are more readily available in areas with both retail choice and organized competitive wholesale markets, although some vertically integrated utilities participating in organized competitive wholesale markets are starting to offer market-based rates in response to customer demand (see Case Studies 2 and 3).

A range of other products and services have emerged to help address other risks associated with long-term renewable energy purchases. These include proxy generation PPAs, which allocate operational risk to the project and away from the buyer by settling the PPA based on measurement of the expected rather than actual generation; volume firming agreements, which redirect weather-related risk and price risk associated with misalignment between project production and the customer's demand to a financial insurer better able to manage this risk; and other hedging or insurance products.[10] Such solutions are becoming increasingly common to help buyers avoid taking on risk they are not equipped to manage alone.[11]

[10] See RE-Source, Risk mitigation for corporate renewable PPAs (March 2020), http://resource-platform.eu/files/toolkit/RE-Source-risk-mitigation-for-corporate-sourcing.pdf; Kenneth Davies, Giji M. John, Lee Taylor, Proxy Generation PPAs (2018), https://orrick.blob.core.windows.net/orrick-cdn/Proxy_Generation_PPAs.pdf; https://blogs.microsoft.com/on-the-issues/2018/10/16/buying-renewable-energy-should-be-easy-heres-one-way-to-make-it-less-complex/.

[11] Rachit Kansal, Tim Singer, Rocky Mountain Institute, Corporate Purchaser's Guide to Risk Mitigation (2019), https://rmi.org/insight/corporate-purchasers-guide-risk-mitigation/.

Case Study 2: Dominion's Market-Based Rate Offering Helps Amazon Reduce VPPA Risk in PJM

An innovative utility program from Dominion Virginia Power (Dominion) has helped Amazon minimize VPPA price risk—and has since been replicated by utilities across the country.

Like many tech companies, Amazon operates large data centers in Virginia. In the absence of full retail competition, Amazon must purchase its electricity from Dominion, its local utility. Due to the participation of Dominion and other utilities in the states in the PJM market, however, Amazon is able to procure renewable energy for its data centers through VPPAs with projects in Virginia or elsewhere in the 13-state PJM footprint.

In order to reduce its exposure to VPPA price risk, Amazon worked with Dominion to establish a new market-based rate that tracks with the wholesale market price of electricity.12 The VPPA price is inversely related to the market-based retail rate. When wholesale electricity prices decrease, Amazon owes money through its VPPA but faces a lower retail electricity price from Dominion. When wholesale electricity prices increase, Amazon earns money through its VPPA, compensating for higher electricity prices from Dominion.

Market-based rate programs like this one reduce the risk of wholesale market engagement for corporate buyers. They are also a way for vertically integrated utilities like Dominion to attract and retain corporate customers searching for the most attractive locations to do business. By helping its corporate customers achieve their sustainability goals and keeping them in the rate base, Dominion can also keep costs low for its ratepayers while also improving the overall economic climate and job market in Virginia.

GREEN TARIFFS FROM VERTICALLY INTEGRATED UTILITIES

While VPPAs are by far the most common tool for large buyers to pursue renewable energy, many buyers are partnering with their electricity provider to procure renewable energy through a retail offering. In regions without retail competition, this means a program offered by a vertically integrated utility (in regions with retail competition, competitive retail suppliers are offering similar options,

[12] Greentech Media, "Amazon and Dominion Power forge a new renewable energy path in Virginia" (July 1, 2016), https://www.greentechmedia.com/articles/read/amazon-and-dominion-power-forge-a-new-renewable-energy-path-in-virginia.

described below). These programs, often referred to as green tariffs, avoid the complexity of negotiating power contracts, which can be a challenge for buyers with limited experience participating directly in wholesale electricity markets. Green tariffs also allow buyers to pursue renewable energy close to where they do business, bringing environmental benefits to their utilities and economic benefits to their communities. While green tariffs can be developed outside of organized competitive wholesale markets, vertically integrated utilities within RTOs/ISOs have leveraged these markets to develop green tariffs with more transparent market-based pricing structures (see Case Study 3). By working with their retail provider, buyers are also able to keep their renewable energy purchases on their electricity bill, which can help buyers manage costs and risks.

Green tariffs can be divided into three broad categories: sleeved PPAs (where the utility effectively passes through the power purchase price and terms to the customer, with some additional administrative fees), renewable subscription programs (where customers contract for electricity from a renewable project or projects at either a fixed or variable price, generally assessed as a rider, with fees and credits added onto the customer's underlying retail bill), and market-based rates (explained above and in Case Study 2). In both sleeved PPAs and renewable subscription programs, companies enter into an agreement with their local utility to buy renewable electricity from a specific project, which could be serving the individual customer or a group of customers. The utility may contract for renewable power or own and operate a project itself. **Such programs do not require the presence of an organized wholesale market, but can leverage wholesale market pricing, if available, to ensure fair market-based costs and credits and provide customers with increased transparency** (Case Study 3).

Case Study 3: GM Works with Consumers Energy to Meet the Needs of its Flint Factory with Wind Energy in MISO

Even in regions where VPPAs are available, some sustainability-focused companies operating in states without retail competition may wish to avoid potentially fluctuating cash flows of VPPAs or want to prioritize procurement of renewable energy close to their facilities. For these buyers, green tariffs are an increasingly popular option.

Green tariffs operate like normal retail rates but guarantee that the customer's electricity is served either partially or fully by renewable energy. This option allows companies to avoid the complexity of PPAs and better manage the price risk associated with a long-term renewable energy purchase.

General Motors, for example, has begun procuring wind energy through a green tariff from Consumers Energy in Michigan. Through this program, GM is matching 100% of the electricity needed to operate its Flint engine plant with the output of a Consumers wind farm located only 50 miles away.[13]

Because Consumers Energy operates in MISO, the green tariff credit structure is based on energy and capacity prices at a local MISO hub. While the tariff structure is quite similar to a VPPA, the transaction stays on GM's electric bill, appropriately assigning any risk or cost directly to GM, thereby simplifying the decision-making process and long-term management of the contract while also ensuring other customers do not incur additional costs.

Green tariffs are helping GM make progress toward its goal of sourcing 100% of its electricity demand company-wide from renewables by 2050, and they are becoming more readily available in markets with vertically integrated utilities. However, without the pressures of a competitive market, utilities may provide buyers with fewer contractual options, more limited supply, and less competitive prices than they would receive in markets that allow for retail choice. While expanding competition in electricity markets may better serve the diverse needs of buyers, green tariffs in any market are a positive step toward enhanced customer choice and greater access to advanced energy.

RENEWABLE ENERGY OFFERINGS FROM COMPETITIVE RETAIL PROVIDERS

While many vertically integrated utilities provide customer offerings through green tariffs, retail competition for the business of C&I customers is another way to ensure that large customers have a range of procurement structures and pricing options in addition to VPPAs. Where retail competition already exists, buyers can pursue sleeved PPAs, which operate much like the sleeved PPAs provided by vertically integrated utilities, but with a competitive retailer acting as an intermediary between the buyer and an independent power producer. Some retailers are also providing more flexible renewable products that are available for a shorter term, have reduced transaction costs and a faster time to market, and deliver savings early on (Case Study 4). **These more varied offerings allow a greater range of customers to find a renewable energy option that suits their needs, and they are arising in places where retail competition—enabled by the presence of an**

[13] General Motors, "Powering a Cleaner Grid Through Green Tariffs" (Mar. 9, 2019), https://www.generalmotors.green/product/public/us/en/GMGreen/energy_efficiency.detail.html/content/Pages/news/us/en/gm_green/2018/0309-green-tariffs.html.

organized competitive wholesale market—creates pressure to meet the needs and preferences of customers who can easily switch providers.

Case Study 4: In ERCOT, Customers Find Options with Competitive Retail Providers

In Texas, customers with very different renewable energy needs are increasingly taking advantage of both the competitive retail market and competitive wholesale market to meet their electricity needs cost-effectively with renewable energy. The three examples below reflect very different contract lengths and offtake amounts – something that individual monopoly utility programs often struggle to deliver – and all take advantage of the strong opportunities for renewable energy development in the ERCOT market.

First, in service of its sustainability goals, which include becoming carbon neutral by 2050, the City of Houston enrolled in NRG's Renewable Select program to purchase 100% renewable energy for city operations. Through Renewable Select, the city will purchase 100% of its electricity from a dedicated, new-build third-party utility-scale solar project. The city expects to save $9.3 million annually and is committed for only five years, with two one-year renewal options.[14]

Second, the U.S. Army is working with renewable energy developer Apex Clean Energy to purchase 65.8 MW of renewable energy to serve its operations at Fort Hood. The Army signed a 28-year agreement for an onsite solar installation and off-site wind project, which will make up approximately 40% of its electricity use and save an estimated $168 million over the contract life.[15] The output from these projects will be integrated directly into its retail electricity supply by Texas-based retailer MP2 Energy. In addition to delivering the renewable energy, MP2 will provide retail electricity service to meet the remaining 60% of Fort Hood's electricity needs and help to manage the risk associated with the renewable assets.[16]

[14] Office of the Mayor of Houston, "The City of Houston Commits to 100% Renewable Energy" (Apr. 30, 2020), https://www.houstontx.gov/mayor/press/2020/100-percent-renewable-energy.html.

[15] Apex Clean Energy, "U.S. Army Signs Power Purchase Agreement with Apex Clean Energy for Hybrid Wind/Solar Energy Project" (Jan. 20, 2016), https://www.apexcleanenergy.com/news/us-army-signs-power-purchase-agreement-apex-clean-energy-hybrid-windsolar-energy-project/.

[16] MP2 Energy, "MP2 Energy Chosen to Partner with Apex Clean Energy to Provide Energy for Fort Hood" (July 19, 2016), https://www.mp2energy.com/news/mp2-energy-chosen-with-apex-to-provide-electricity-for-fort-hood/.

Third, in addition to tailored solutions, many competitive retailer providers in ERCOT have introduced standard offerings, including options for customers to choose different "shades of green" to match their needs and preferences (e.g., allowing the customer to choose a product that supports new renewable energy projects). These options result in an even lower barrier to entry for clean energy buyers by reducing complexity and increasing flexibility and choice.

HYBRID RENEWABLES+STORAGE PROJECTS

The emergence of paired renewable energy and energy storage "hybrid" power plants has also drawn interest from large customers. While these hybrid plants do not necessarily require a different procurement model (i.e., they can be pursued via PPAs, VPPAs, green tariffs, or competitive retail offerings), they do bring new considerations for both buyers and grid operators.

With the growth of renewable energy, the need for grid balancing services may increase, and oversupply of power while the sun is shining or the wind is blowing could lead to depressed market prices and curtailment of generation. Companies signing long-term PPAs or VPPAs want to avoid curtailment, since it works against their sustainability goals and increases their overall costs. These trends have already appeared in California where solar generation has been widely deployed. Hybrid resources can help mitigate the intermittency of renewables and will play an important role in maintaining the value of renewable generation at higher levels of penetration. Additionally, some buyers are interested in using energy storage to help match their demand with renewable generation resources in real-time to ensure that they are using carbon-free electricity in all hours (Case Study 7).

Hybrid resources are also beneficial for grid operators, because the combination of storage systems with the renewable generation resource improves the entire resource's availability, with the hybrid power plant operator optimizing the dispatch of the integrated hybrid resource to best meet grid needs. For these reasons, hybrid resources are likely to play a growing role in renewable energy deployment and corporate procurement; current interconnection queues show a sharp uptick in hybrid resources, corroborating this prediction.[17]

[17] Lawrence Berkeley National Laboratory, Hybrid Power Plants: Status of Installed and Proposed Projects (July 2020), https://emp.lbl.gov/publications/hybrid-power-plants-status-installed.

Case Study 5: Google Pursues Solar+Storage in Nevada

Google recently highlighted the potential of hybrid resources to shape clean energy purchases to demand by procuring 350 MW of solar with up to 280 MW of storage in Nevada.[18] Utility and grid operator NV Energy agreed to procure these resources on behalf of Google to serve the technology company's planned datacenter in the region. The project adds to an existing list of large-scale hybrid projects in NV Energy's Integrated Resource Plan.[19] While this project is not located in an organized wholesale market, and therefore relies on the cooperation of NV Energy, hybrid renewables+storage resources represent a growing share of resources in the interconnection queue across several RTOs/ISOs.

NV Energy has stated that the energy will be sold to Google at a fixed price that is "cost-effective and competitively priced compared to other available options."[20] The deal also allows excess energy generated by the project to be sold to NV Energy and allows Google's facility to purchase energy from the grid in times of need.

The solar-plus-storage procurement provides several key benefits to both Google and NV Energy. First, the nature of the combined procurement will allow Google to match energy generation with consumption in real time. Energy generated by the solar panels can be stored and dispatched to match the load curve of Google's facility. This is in contrast to projects that lack storage capabilities, which prevent matching generation and consumption in real-time and instead match aggregate generation with consumption over longer periods of time.

The project will also help NV Energy comply with a Nevada law that requires 50% of the utility's power to come from renewable sources by 2030 and 100% from carbon-free sources by 2050.[21]

This innovative deal will help Google demonstrate it is possible to use increasing amounts of energy, as required by its growing data centers, and still continue leading on sustainability. The project will make it possible for Google's Nevada data center to run on 100% renewable electricity

[18] Greentech Media, "Google Inks Huge Corporate Solar-Plus-Storage Deal in Nevada" (Jan. 8, 2020), https://www.greentechmedia.com/articles/read/google-inks-huge-ci-deal-in-nevada-with-a-prominent-place-for-storage.

[19] Solar Magazine, "Nevada Utility NV Energy Goes "Solar Plus Storage" in a Big Way" (Aug. 5, 2019), https://solarmagazine.com/nevada-utility-nv-energy-goes-solar-plus-storage-in-a-big-way/.

[20] Broad Group, "Google, NV Energy to build 'biggest ever' battery-backed solar storage to power $600m Nevada data center" (Jan. 13, 2020), https://www.broad-group.com/data/news/documents/b1m08w6mgm7ncc.

[21] Utility Dive, "Nevada regulators approve NV Energy plan for 1,190 MW solar, 590 MW storage" (Dec. 9, 2019), https://www.utilitydive.com/news/nevada-regulators-approve-nv-energy-plan-for-1190-mw-of-new-solar-resource/568659/.

in all hours of the day, a goal the company recently committed to reach by 2030 for all of its operations worldwide.[22] Google's agreement provides the grid with peaking support – a capability enabled by the project's storage system — further increasing the value of the project to the grid and all customers.

Onsite Energy Management and Advanced Energy Deployment

In addition to procuring advanced energy offsite through a variety of contract structures, many companies are deploying demand response, solar PV, batteries, fuel cells, and other distributed energy resources (DERs) at their own facilities to reduce their energy costs and make progress toward sustainability goals. While companies can pursue DERs outside of organized wholesale markets, the opportunity to provide valuable grid services to wholesale markets can improve project economics and support new and innovative use cases for DERs. FERC's landmark Order No. 2222 will only increase the opportunities for large customers to pursue DERs in regions with organized wholesale markets.

DEMAND RESPONSE

Demand response is a large and growing market, and commercial and industrial customers accounted for more than two-thirds of the over 30 GW of potential peak demand savings from retail demand response programs in the U.S. in 2018.[23] In addition to providing a new revenue stream to customers that have flexible electricity usage, demand response can help defer or avoid costly investments in transmission and distribution system upgrades and new generation capacity. It also increases the flexibility of the grid, which is increasingly important to facilitate the integration of higher penetrations of renewable energy while maintaining reliability and keeping costs down.[24]

Competitive organized wholesale markets under FERC jurisdiction provide a greater opportunity for corporate customers to incorporate demand response into their purchasing strategies. RTO/ISOs have integrated demand response resources into their markets in response to FERC policies requiring them to allow these resources to participate in the markets on a basis comparable to generation.

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[22] Google, "Our Third Decade of Climate Action: Realizing a Carbon-Free Future" (Sept. 14, 2020), available at https://blog.google/outreach-initiatives/sustainability/our-third-decade-climate-action-realizing-carbon-free-future.

[23] Federal Energy Regulatory Commission, 2020 Assessment of Demand Response and Advanced Metering (December 2020), https://www.ferc.gov/sites/default/files/2020-12/2020%20Assessment%20of%20Demand%20Response%20and%20Advanced%20Metering_December%202020.pdf, at 19.

[24] Id., at 28-29.

Participation in organized market wholesale demand response programs is growing quickly, increasing by 9% from 2018 to 2019 to reach nearly 30 GW of demand resource participation.[25] **The opportunity to participate in both retail and wholesale demand response programs allows customers to save more money while contributing to the reliability and flexibility of the system overall.** Demand response not only helps the customers participating directly; it also helps reduce overall costs for all customers by avoiding investments in new generation and other physical assets. Case Study 6 outlines how customers can take advantage of both wholesale and retail demand response programs, in addition to strategic energy management, to realize significant cost savings while also supporting grid needs.

Case Study 6: Temple University Saves $10 Million and Earns $4 Million Through Wholesale and Retail Demand Response in PJM

Over the course of just over a decade, Temple University in Philadelphia has avoided $9 million in capacity costs, saved $1.5 million through strategic energy supply management, and earned $4.1 million in gross revenue from participating in various demand response programs, all without disrupting the university's electricity needs. Temple University's demand response strategy and participation is managed by Enel X North America, with certain demand response actions controlled directly by Enel X and others requiring light-touch involvement by the university.

The savings and earnings from demand response come from a range of programs and strategies spanning both the PJM wholesale market and the retail market. In the wholesale market, the university participates in PJM's Synchronized Reserve Market , supplying fast-response demand reductions at times of grid disruption through remote controls operated by Enel X. The university also participates in PJM's Emergency Load Response Program (ELRP), getting paid to reduce consumption for a brief period when needed, and PJM's Economic Demand Response product, leveraging on-site natural gas and solar and controllable chilled water and HVAC systems to get paid for capacity removed from the grid.

In the retail market, Temple has participated in demand response through its local utility's program under Pennsylvania's energy efficiency law, Act 129, which is similar to PJM's ELRP but with a

[25] Id., at 20.

longer notification and response period.[26] This program has earned the university over $1.3 million in net revenue over seven years.

In addition, the university has saved money by using technology tools to actively manage its electricity use, such as by reducing demand during likely system peaks, thereby lowering costly demand charges.[27] The ability to align internal energy management with both wholesale and retail system needs through direct market participation has clear benefits for the university, and does not come at the expense of the university's core functions.

BEHIND-THE-METER ENERGY STORAGE

Onsite battery storage technology is increasingly cost-competitive, and offers many benefits to customers and both the distribution system and bulk power system. For customers, onsite batteries can reduce energy costs by smoothing electricity demand throughout the day to minimize demand charges (monthly costs that are based on peak demand). Batteries can also be used to protect customers' operations from temporary grid outages, which is especially important for facilities like data centers, hospitals, or critical community services that place a high value on around-the-clock reliability. For companies that wish to increase their use of renewable energy and reduce the carbon emissions associated with their energy use, batteries can be charged when rooftop solar panels are producing energy or when clean energy is available on the grid.

More deployment of distributed storage can also provide benefits to utilities, customers, and grid operators if markets allow storage owners and operators to derive value from providing multiple services in retail and wholesale markets, sometimes called "value-stacking." Customer-sited batteries can provide grid benefits in the form of resource adequacy, transmission congestion relief, local distribution overloading relief, and deferral of distribution and transmission system upgrades.[28]

Few programs currently exist for utilities to compensate customers for deployment of onsite battery resources, making this an untapped opportunity, although there are ongoing efforts in New York and elsewhere to address this gap.[29] For transmission grid and organized wholesale market operators,

[26] Pennsylvania Act 129 is the state's landmark energy efficiency legislation passed in 2008, requiring the Public Utilities Commission to set savings requirements that each utility must meet.

[27] Enel X North America, "Customer Spotlight: Temple University Earns Millions by Stacking Demand Response Programs" (2019), https://www.enelx.com/content/dam/enel-x-na/resources/case-study/pdf/P19014_cs_temple-university.pdf.

[28] Fitzgerald, Garrett, James Mandel, Jesse Morris, and Hervé Touati, Rocky Mountain Institute, The Economics of Battery Energy Storage: How multi-use, customer-sited batteries deliver the most services and value to customers and the grid (Sept. 2015), http://www.rmi.org/electricity_battery_value.

[29] See New York Public Service Commission, Dec. 13, 2018 Order in Docket No. 18-E-0130, Order Establishing Energy Storage Goal and Deployment Policy. Policies pursued to enable behind-the-meter battery storage include changes to utility

potential services that can be provided by battery storage include frequency regulation, spin/non-spin reserves, voltage support, and black start.[30] A battery, for example, could respond to a need for frequency regulation (a service that helps ensure the grid stays stable amid common momentary disturbances) in the wholesale market while it would otherwise be sitting idle, while remaining available to rapidly switch to providing backup power for its owner's facilities in the event of an emergency. These grid-level services are procured competitively in organized wholesale markets (Case Study 5), while in areas without such markets, they are provided by a vertically integrated utility. Enactment of wholesale market participation models for energy storage—including behind-the-meter storage—in response to FERC's recent Order Nos. 841 and 2222 will unlock new opportunities for customer-sited energy storage, both alone and in aggregation with other resources, to compete to provide these services and earn revenues. **Taking advantage of the full stack of values that energy storage can provide means allowing the battery to provide both distribution-level and transmission-level services, and only in organized competitive wholesale markets do batteries have an opportunity to compete to provide transmission-level services.** The importance of lowering barriers to entry for newer resource types like storage and other DERs is explored in the second part of this paper (see p.35).

Case Study 7: Leveraging Backup Generators and Batteries at Microsoft Data Center for Grid Services in PJM

The data centers that serve as the backbone of the internet consume a lot of electricity, and keeping them up and running in the event of power loss on the grid is critical for technology companies like Microsoft. To ensure a constant supply of power at its data centers, Microsoft employs a fleet of backup generators and batteries. These resources are expensive and rarely used, so the company is exploring value-stacking opportunities that involve using their backup resources to both reduce data center energy costs and provide grid services in wholesale markets when backup power is not needed.

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rate design, a fast response demand response program, and competitive procurements issued by utilities to secure dispatch rights to third-party storage resources.

[30] Fitzgerald, Garrett, James Mandel, Jesse Morris, and Hervé Touati, Rocky Mountain Institute, The Economics of Battery Energy Storage: How multi-use, customer-sited batteries deliver the most services and value to customers and the grid (Sept. 2015), http://www.rmi.org/electricity_battery_value.

A project at Microsoft's southern Virginia data center was one of the first tests of this kind of battery value-stacking.[31] The batteries provide grid balancing services in the PJM market and can be dispatched instantaneously, much faster than the natural gas peaker plants that typically serve that function. With the need for system balancing services likely to rise with more generation from variable renewables, behind-the-meter C&I batteries can play an important role on the grid. Creating a new revenue source from otherwise underutilized assets also allows data center operators to invest in the cleanest and most advanced generators and storage systems and to become an asset on the grid. Other customers receive benefits as well, since increasing the utilization of these assets helps avoid new rate-based investments and lowers overall system costs.

There are numerous obstacles to scaling up battery value-stacking at data centers across the country. First, the business model is more challenging for data centers outside of organized wholesale markets where compensation for grid services from storage is now mandated. Second, since value-stacking requires the balancing of multiple uses of a battery, transparent, real-time price signals from the wholesale market are necessary to efficiently manage the resource. Improved communication of real-time and forward pricing between RTOs/ISOs, utilities, and customers is key to unlocking the full value of customer-sited batteries.

AGGREGATED DISTRIBUTED ENERGY RESOURCES

Some customers are uninterested or unable to manage and monetize the full stack of services that DERs can provide not only to their own operations but to both the distribution and transmission systems, due to the complexity and scale required to take advantage of such opportunities. In this case, aggregators can step in to provide that service across a broad customer base, taking many smaller systems and bidding them into the wholesale market as a single resource (Case Study 8). Just as with single DERs, the opportunity for DER aggregations to participate in both retail and wholesale markets ensure that these assets are able to deliver (and be compensated for) their full value, making DERs available to more customers.[32] The option for aggregated DERs to participate in organized wholesale markets is not yet available in all RTOs/ISOs or for all services, although the recent finalization of FERC Order No. 2222 is slated to change that. **DER aggregation in organized**

[31] Scientific American, E&E News, "How big batteries at data centers could replace power plants" (July 19, 2018), https://www.scientificamerican.com/article/how-big-batteries-at-data-centers-could-replace-power-plants/.

[32] One notable recent example of aggregated DERs providing capacity in wholesale markets is in ISO-NE, where Sunrun and National Grid worked together to clear 20 MW of aggregated distributed solar-plus-storage assets in the Forward Capacity Auction. See Advanced Energy Economy, Opening the Door to DERs: How FERC Order No. 2222 Creates Opportunity for Distributed Energy Resources to Participate in Wholesale Electricity Markets (Oct. 2020), https://info.aee.net/opening-the-door-to-ders.

☑ **competitive wholesale markets presents a path forward to ensure that the DERs being added at a growing pace by customers will be optimized to meet both customer and grid needs.**[33] As more customers—including large companies—adopt electric vehicles, the need to integrate managed charging and ultimately vehicle-to-grid capabilities with wholesale markets will also increase. Importantly, aggregation also expands the benefits of DERs to more customers by improving the utilization and therefore the economics of onsite resources.

Case Study 8: Aggregators Bid Distributed Batteries into Wholesale Markets in CAISO

For many small companies with DERs, it is not possible to participate directly in wholesale markets. But in some jurisdictions, individual customers' batteries can be combined together by aggregators like Stem or Advanced Microgrid Solutions (AMS) and bid into wholesale markets. When aggregated, DERs can provide valuable services to the grid and create an extra financial incentive for individual customers to invest in advanced energy.[34]

In CAISO, utility Southern California Edison (SCE) has been a leader in enabling aggregated DERs to compete in the market. In one of the first examples of DERs competing directly with conventional resources, AMS and Stem both won bids to aggregate a combined 135 MW of distributed storage and provide flexible capacity to SCE. The utility noted that aggregated DERs provide a unique set of advantages over conventional resources, including the fact that distributed energy storage systems do not have a single point of failure, contributing significantly to grid resilience.[35]

To fulfill its obligations under the deal, AMS helped equip 27 Walmart stores in Southern California with 40 MWh batteries that are able to both reduce Walmart's energy bills and provide resource

[33] Advanced Energy Economy, Opening the Door to DERs: How FERC Order No. 2222 Creates Opportunity for Distributed Energy Resources to Participate in Wholesale Electricity Markets (Oct. 2020), https://info.aee.net/opening-the-door-to-ders.

[34] Advanced Energy Economy, Putting Distributed Energy Resources to Work in Wholesale Electricity Markets (Sept. 2019), https://info.aee.net/der-in-wholesale-electricity-markets.

[35] Greentech Media, "Stem Wins Big With 85MW of Energy Storage in SCE Procurement" (Nov. 5, 2014), https://www.greentechmedia.com/articles/read/stem-wins-big-with-85-mw-of-energy-storage-in-sce-procurement.

adequacy value to the utility SCE.[36] Using AMS's automated battery optimization system, the storage assets can also get additional revenue by participating in the CAISO wholesale market.

In California, distributed storage also provides growing resilience benefits for the grid. When a major heat wave hit California in June 2017, electricity prices in the CAISO wholesale market spiked. Either rapid increases in supply or reductions in demand were needed to prevent blackouts. Taking advantage of CAISO's Proxy Demand Response (PDR) mechanism, Stem was able to dispatch its network of batteries at businesses and institutions across the state within minutes to provide 1.6 MW of flexible capacity to the grid.[37] During the rolling blackouts in California in 2020, Stem's customer-sited storage assets again provided essential grid services, delaying charging and providing 50 MW of demand reduction while avoiding business interruptions for storage customers. Yet the inability to deliver energy to the grid — which Stem's batteries are technically capable of doing — constrained the role these assets were able to play, something that could be addressed to ensure these assets are able to provide more value to the grid during both emergency and non-emergency events.[38] Stem's California customers include companies and institutions like Albertson's, Whole Foods, JCPenny, Extended Stay America Hotels, Bed Bath & Beyond, and the University of California system.[39]

Designing wholesale market rules that make it easier for both large individual companies and aggregators to sell DER services in wholesale markets can unlock the full value of these resources and benefit both customers and the grid.

Meeting Sustainability Goals by Expanding the Adoption of Clean Energy and Reducing Costs for All Customers

Another key tool that companies employ to meet their own renewable energy and greenhouse gas reduction goals is to encourage market and regulatory reforms that will allow for the cost-effective adoption of more clean energy on the grid serving all customers. Reducing the emission profile of the

[36] Greentech Media, "Advanced Microgrid Solutions breaks 2 gigawatt hours in grid services" (Mar. 19, 2019), https://www.greentechmedia.com/articles/read/advanced-microgrid-solutions-breaks-2-gigawatt-hours-in-grid-services.

[37] Stem, "Stem energy network delivers emergency grid relief in California Heat" (June 28, 2017), https://www.stem.com/stem-energy-storage-network-delivers-emergency-grid-relief-in-california-heat/.

[38] Ted Ko, Stem, "How Storage Helped California Reduce the Blackouts – And How It Can Help Avoid Them in the Future" (Aug. 20, 2020), https://www.stem.com/how-storage-helped-california-reduce-the-blackouts-and-how-it-can-help-avoid-them-in-the-future/.

[39] Stem, "Projects," https://www.stem.com/projects/ (accessed Sept. 2020).

electricity on the grid lowers the emission profile of a company's operations while potentially also providing benefits to their employees and communities. This is especially important for smaller buyers, such as medium and small businesses, educational institutions, hospitals, or medium and small cities and towns who share the sustainability and clean energy objectives of their larger counterparts, but not have the scale or resources to directly drive the clean energy transition through their own purchases.

The most straightforward way to do this is to work with utilities, regulators, and policymakers to increase deployment of clean resources and to prepare the grid for higher penetrations of renewable energy in the future. This strategy is equally applicable across all market and regulatory configurations, but the challenges and opportunities will differ depending on whether there is an organized wholesale market and whether the retail market is competitive, vertically integrated, or a hybrid. **However, organized wholesale markets offer several benefits over non-RTO/ISO regions when it comes to cost-effective and reliable buildout of renewable energy and other advanced energy resources.** Specifically, regional markets foster competition of supply and demand resources, facilitate coordinated transmission planning, ease the ability to access transmission at a single rate, and better enforce open access of all parties to the transmission system, all of which serve to enable market entry of cost-competitive advanced energy resources and help clean energy obtain and deliver them. Competitive wholesale markets also send price signals that force outdated and uncompetitive fossil units to retire, lowering emissions and opening up new opportunities for advanced energy while saving customers money.[40]

For growing companies with operations spanning multiple states or even countries, another way to lower the carbon footprint of purchased electricity is to grow or shift electricity use into areas with lower carbon intensity and higher renewable energy penetration. This is an important element of sustainability strategy for Salesforce, which explained in a 2018 *Clean Energy Strategy* whitepaper that it "works to locate offices and data centers on cleaner grids, with strong government policies to further reduce greenhouse gas emissions."[41] Google has recently announced an even more sophisticated application of this strategy, based on shifting electricity use to different times of day. Specifically, Google announced that it can now "shift the timing of many compute tasks to when low-carbon electricity sources, like wind and solar, are most plentiful."[42] Relatedly, companies can prioritize their

[40] Advanced Energy Economy, Jeff Dennis, "Why Wholesale Markets are Important to an Advanced Energy Future" (Sept. 2020), https://blog.aee.net/why-wholesale-markets-are-important-to-an-advanced-energy-future

[41] Salesforce, Salesforce's Clean Energy Strategy: The what and how of reaching 100% Renewable Energy and beyond (2018), https://www.salesforce.com/content/dam/web/en_us/www/documents/white-papers/sustainability-clean-energy-strategy-2018.pdf.

[42] Google, "Our data centers now work harder when the sun shines and wind blows" (Apr. 22, 2020), https://www.blog.google/inside-google/infrastructure/data-centers-work-harder-sun-shines-wind-blows/.

advanced energy procurement in regions with higher emissions, and prioritize any electrification efforts (such as electric vehicle adoption) in regions where the electricity serving their load is cleaner. These strategies allow companies to use their purchasing power to increase demand for a cleaner grid for their operations and for all customers. It also has positive job creation and economic development implications for states and communities that seek to transition to cleaner sources of electricity, and who enact policies that support that transition.

PART II: EXPANDING AND IMPROVING WHOLESALE MARKETS FOR CORPORATE PROCUREMENT

The diversity of procurement options and volume of market activity may seem to imply that corporate procurement of advanced energy is relatively frictionless—or at least, that policy and regulatory frameworks do not get in the way. To the contrary, there are many barriers that are slowing or preventing even greater market activity. This section explores these challenges, and identifies opportunities for improvements, with a focus on expanding organized wholesale markets into regions where they do not currently exist, improving existing wholesale markets, and ensuring that the perspective of clean energy buyers is adequately represented in decision-making processes.

Expanding Wholesale Markets to Unlock Procurement Opportunities

Expanding organized wholesale markets into regions that do not have them currently would open new opportunities for companies to procure advanced energy while also bringing important cost and reliability benefits, especially as renewable energy penetration rapidly grows. This is particularly relevant in the Southeast, where momentum is already building in the Carolinas, and in the West, where states like Colorado, Arizona, New Mexico, and Nevada are all actively considering expanded wholesale markets.[43]

As explained in the prior section, the clean energy procurement and emission reduction strategies pursued by corporate buyers all benefit from—or in some cases even require—the presence of an organized wholesale market. In particular, VPPAs are the dominant tool for C&I buyers to meet their sustainability goals, and buyers point to constrained supply as one of the major obstacles to procuring renewable energy. Expansion or creation of new RTOs/ISOs in regions that do not have them (see map on p.9) would open new VPPA opportunities. Specifically, while a C&I buyer signing a VPPA can be located anywhere, the seller must be able to liquidate the physical electricity. Generally, these buyers have found that RTO/ISO markets, with their ease of access and open day-ahead and real-time energy

[43] See South Carolina House Bill 4940 (enacted 2020), creating the Electricity Market Reform Measures Study Committee.to study the feasibility of establishing or joining an RTO, among other questions; Colorado Public Utilities Commission Docket No. 19M-0495E exploring different options for market structures, including RTO participation (see also Advanced Energy Buyers Group comments in this docket, submitted Nov. 15, 2019 and available at https://info.aee.net/hubfs/Advanced%20Energy%20Buyers%20Group_Comments%20in%20Proceeding%20No%20(2).pdf); NevadaLegislative Committee on Energy, Nov. 19, 2020 Letter to Governor Steve Sisolak Re: Integrated Western Energy Market, available at https://www.leg.state.nv.us/App/InterimCommittee/REL/Document/16728, stating that the Committee "[urges]

the governor of Nevada, the Office of Energy, Office of the Governor, the Public Utilities Commission of Nevada, and NV Energy to support an integrated western energy market."

markets, are the best means of doing so. This need for a non-discriminatory way to deliver physical electricity has allowed a few regions to benefit disproportionately from the growth in the C&I PPA market. In fact, more than one third of newly signed C&I PPA capacity in 2019 was located in Texas' ERCOT market.[44]

The skew in the C&I market toward projects in competitive wholesale markets is reflective of a broader trend. Much of the growth in renewable generation has occurred within competitive wholesale markets, while other regions with strong renewable potential have lagged behind: regions served by organized wholesale markets have less than half of the nation's wind power potential but account for 75 percent of wind energy produced in the U.S.[45] The Southeast region, for example, has significant solar resources but still maintains the lowest share of wind and solar generation in the United States.[46] These disparities are not a coincidence, but rather a reflection of the role that competition plays in facilitating new entry of cost-competitive advanced energy resources. In transparent marginal-cost based markets, near-zero marginal cost renewable energy will win out over aging and more expensive thermal generation with higher marginal costs driven by the costs of fuel. Further, wholesale markets that balance electricity supply and demand over larger regions are also better equipped to integrate intermittent wind and solar generation and capture potential cost savings.

Expanding or developing competitive wholesale markets in regions that do not have them would open up untapped markets for C&I PPAs, creating opportunities beyond existing markets like ERCOT, SPP, and PJM that currently host the majority of C&I VPPAs. This would also allow companies with operations outside of existing RTOs/ISOs to pursue local projects. As explained previously, this brings multiple benefits. For one, many companies want to not only reduce their own environmental impact but also bring cleaner energy and the jobs and economic benefits that come with it to their communities. In addition, VPPAs provide a better financial hedge when the electricity is being sold into the same market that the C&I buyer operates in. This is especially true where a company's electricity costs are correlated to their renewable energy VPPA, whether through expanded retail choice (which is itself effectively only possible in organized wholesale markets), a market-based rate, or expanded utility offerings. Expansion of RTOs/ISOs will therefore make renewable energy cheaper

[44] Bloomberg New Energy Finance, 2020 Sustainable Energy in America Factbook (2020), https://data.bloomberglp.com/professional/sites/24/BNEF-BCSE-2020-Sustainable-Energy-in-Amercia-Factbook_FINAL.pdf.

[45] Aspen Institute, Governance of Electricity Markets, https://assets.aspeninstitute.org/content/uploads/files/content/docs/ee/EE_ENERGY_GOVERNANCE.PDF

[46] National Renewable Energy Laboratory, 2016 Renewable Energy Grid Integration Data Book (June 2018), https://www.nrel.gov/docs/fy18osti/71151.pdf.

and more accessible for buyers while leveraging private investment to reduce emissions in the electricity sector.

Beyond increasing the availability of VPPAs, expansion of organized wholesale markets would bring other important benefits to companies pursuing aggressive sustainability targets, including new opportunities to pursue a range of DERs, greater flexibility for states to unlock opportunities for retail choice or direct access to wholesale markets, and cost-effective opportunities to increase advanced energy penetration on the grid as a whole.

Large companies pursuing opportunities to meet their electricity needs with advanced energy resources are not the only customers that benefit from expanding competitive wholesale markets, however; all customers on the grid can share in the cost advantages produced by competition, and states and communities benefit from increased jobs and economic development. A recent study of the Southeast showed that introducing a competitive RTO to the region would result in more than $280 billion in cumulative customer savings by 2040 while creating 285,000 clean energy jobs and lowering emissions by 37%.[47] These economic and environmental benefits accrue to all customers, including corporate buyers who are likely to take such factors into consideration when deciding where to locate or expand their operations.

Improving Existing Markets to Facilitate Corporate Advanced Energy Procurement

While companies interviewed for this report consistently pointed to RTO/ISO expansion as the top opportunity to reduce friction and expand opportunities for corporate clean energy procurement, they also pointed to several ways that existing RTO/ISO rules and practices could be changed or updated to remove barriers for companies seeking to meet ambitious sustainability targets.

TRANSMISSION CONSTRAINTS AND INTERCONNECTION DELAYS LIMIT RENEWABLE ENERGY SUPPLY

Buyers and developers alike point to inadequate transmission infrastructure as a key issue blocking project development at the scale and price needed to meet corporate demand. Well-planned transmission investments would help to ease constraints preventing the delivery of cost-effective renewable energy and jumpstart project development in untapped markets. Independent planning and operation of transmission by RTOs/ISOs is an especially important tool to unlock cost-effective

[47] Energy Innovation and Vibrant Clean Energy, Economic And Clean Energy Benefits Of Establishing A Southeast U.S. Competitive Wholesale Electricity Market (Aug. 2020), available at https://energyinnovation.org/publication/economic-and-clean-energy-benefits-of-establishing-a-southeast-u-s-competitive-wholesale-electricity-market/.

transmission buildout and efficient use of existing infrastructure, yet improvements to existing rules and incentives are needed.

Industry professionals point to Texas as a leader in transmission investment. In 2005, the Texas state legislature ordered the construction of a network of new transmission lines covering its ERCOT market, called the Competitive Renewable Energy Zone (CREZ) project. Through this program, the Public Utility Commission of Texas prioritized geographic zones for significant transmission infrastructure investment, and transmission projects were constructed between 2010 and 2014. Wind capacity additions jumped from an annual average of 738 MW of new wind capacity between 2010 and 2013 to 2,679 MW in 2014 and 2015 following the completion of the CREZ project; the project also resulted in a sharp drop in wind curtailments and a reduction in the occurrence of wind-related negative real-time pricing, according to the U.S. Energy Information Administration.[48] Significant economic development in Texas is continuing to create substantial electricity demand, and more transmission development will be needed to fully unlock the value of wind and solar resources in the state; ERCOT's 2020 Long-Term System Assessment finds that transmission limitations "could reduce the amount of ERCOT demand that can be served by renewable resources."[49] Though Texas already enjoyed abundant natural wind resources, transmission enhancements made it possible for developers to fully utilize them. As noted above, Texas has emerged as a clear leader for C&I renewable energy projects; ample transmission capacity was one important factor enabling this growth.

Meanwhile, demand for renewable energy in New York and California is expected to surpass supply in part because transmission constraints are limiting the ability to build projects.[50] Significant investment in transmission infrastructure, complemented by tighter coordination to better enable energy trading between regions, would help alleviate this issue. Indeed, a report prepared for the Western Interstate Energy Board found that renewable energy penetration in the West in 2035 could be boosted from 52% in a business-as-usual scenario to 70% if such measures were taken.[51] These findings point to the importance of broader regional competitive wholesale markets operated by RTOs/ISOs, which

[48] Rocky Mountain Institute, Transmission Investments Affect the Value of Your Wind PPA (Mar. 2017), http://businessrenewables.org/wp-content/uploads/2017/05/BRC_ValueofWindPPA_InsightBrief_Final.pdf; U.S. Energy Information Administration, " Fewer wind curtailments and negative power prices seen in Texas after major grid expansion" (June 24, 2014), available at https://www.eia.gov/todayinenergy/detail.php?id=16831&src=email.

[49] ERCOT System Planning, 2020 Long-Term System Assessment for the ERCOT Region (Dec. 2020), http://www.ercot.com/content/wcm/key_documents_lists/89026/2020_LTSA_Report.zip, at iii.

[50] Greentech Media, "7 Transmission Projects That Could Unlock a Renewable Energy Bounty" (Apr. 9, 2020), https://www.greentechmedia.com/articles/read/9-transmission-projects-laying-the-paths-for-cross-country-clean-energy.

[51] Energy Strategies for Western Interstate Energy Board, Western Flexibility Assessment: Investigating the West's Changing Resource Mix and Implications for System Flexibility (Dec. 2019), https://westernenergyboard.org/wp-content/uploads/2019/12/12-10-19-ES-WIEB-Western-Flexibility-Assessment-Final-Report.pdf.

generally engage in more coordinated transmission planning across broader regions and can thereby channel transmission investment to projects that provide the most value.

While expansion of RTOs/ISOs would help to unlock cost-effective transmission buildout, barriers still exist within and between RTO/ISO regions. For example, transmission planning processes fail to fully account for growing demand for clean energy created by government policy objectives and customer preferences. To meet customer needs cost-effectively and reliably, transmission planning and policy should take into account future renewable energy development required to meet federal, state, and local policies, in addition to the well-documented consumer demand for renewable energy that is also driving significant renewable energy buildout.[52] In addition, transmission planning processes inside and outside RTOs/ISOs fail to adequately consider the need for larger inter-regional transmission projects that are especially important to accessing renewable energy potential that is far from existing load centers and transmission lines. RTO/ISO transmission planning processes have also, in recent years, tended to result in smaller local transmission solutions geared toward only immediate needs, rather than larger regional projects that solve multiple immediate and longer-term needs. Additional transmission is also an important tool to maintain reliability in an electricity system increasingly dominated by variable renewable energy resources, and proactively preparing to meet future needs will lead to more reliable, less costly outcomes.

The Biden Administration has recognized that policies supporting an optimized buildout of the nation's transmission network is a critical pillar of its strategy to address climate change, and calls are growing for the Federal Energy Regulatory Commission (FERC) to revisit its transmission planning and cost-allocation policies to accelerate such a buildout. In recent comments to FERC, the Advanced Energy Buyers Group outlined five principles for good transmission policy to meet the needs of large corporate buyers. Specifically, AEBG recommends pursuing transmission policies that will advance the following objectives: (1) unlock opportunities to ensure loads may utilize the most cost-effective renewable energy projects; (2) always consider and aim to minimize the cost of meeting transmission needs; (3) improve reliability and market efficiency of necessary transmission expansion; (4) expand independent planning and operation of transmission; and (5) facilitate higher levels of renewable energy penetration consistent with policy requirements and customer demand.[53] Pursuing these

[52] Analysis from WoodMackenzie projects that demand for renewable energy among the Fortune 1000 could reach 85 GW across the United States over the next decade. See Wood Mackenzie, on behalf of the American Wind Energy Association, "Analysis of Commercial and Industrial Wind Energy Demand in the United States," (2019), https://www.awea.org/resources/publications-and-reports/analysis-of-commercial-and-industrial-wind-energy.

[53] Advanced Energy Buyers Group comments in Federal Energy Regulatory Commission Docket No. RM20-10-000, July 1, 2020, available at https://info.aee.net/hubfs/AEBG%20Comments%20in%20Docket%20No.%20RM20-10.pdf.

priorities will require considerable effort by federal, regional, and state entities, but would ultimately improve outcomes for all customers while increasing access to advanced energy for large buyers.

Difficulty accessing existing transmission and bringing projects online through the interconnection process is an additional barrier delaying and sometimes preventing development of otherwise cost-effective projects that can meet corporate demand. Projects can take years to move through interconnection queues, adding significant cost, risk, and uncertainty. Allocation of transmission costs can also create a barrier to development. Here, ERCOT again provides an example for other markets to consider replicating. In the ERCOT market, new generators pay only the direct costs of interconnecting. These generators are not responsible for downstream transmission upgrades that may be required to bring the electricity to load centers. These upgrades benefit the system, so their costs are shared across market participants.[54] This structure significantly reduces friction for new entrants and could be adopted in other regions.

NEW TECHNOLOGIES FACE AMBIGUITY AND BARRIERS TO ENTRY

As described in Part I, large customers are often at the forefront of adopting new technologies. However, new resource types or configurations often face significant hurdles as they try to enter markets designed around resources with different capabilities and characteristics. Resource definitions, registration requirements, qualification processes, interconnection processes, and market participation rules all present potential stumbling blocks, and the path to update these rules and procedures is often much slower than the pace of technology innovation. While it is project developers who are faced with navigating these challenges, it is customers who are ultimately affected, either by higher costs or lack of options to adopt new technologies.

One current example of this challenge is co-located or "hybrid" resources, combinations of energy storage and another resource, generally solar or wind, behind a single point of interconnection. Despite the potential benefits of deploying hybrid projects, the process of commissioning and operating hybrid resources remains ill-defined in many markets, and hybrid resources themselves can be configured in multiple ways. Most RTOs/ISOs lack straightforward rules for handling these flexible resources, although discussion of developing such rules is underway in several regions.[55] FERC also

[54] Analysis Group, ERCOT Texas's Competitive Power Experience: A View from the Outside Looking In (Oct. 2008), https://www.analysisgroup.com/globalassets/content/insights/publishing/tierney_ercot_texas_study_11-082.pdf.

[55] For example, ERCOT's Battery Energy Storage Task Force developed rules for DC-coupled hybrid resources in 202, see Battery Energy Storage Task Force, http://www.ercot.com/committee/bestf; PJM in 2020 initiated discussion of hybrid resources, see PJM Inside Lines, "New Subcommittee Focuses on Hybrid Resource Needs" (August 6, 2020), https://insidelines.pjm.com/new-subcommittee-focuses-on-hybrid-resource-needs/.

recently held a technical conference to highlight and explore these challenges.[56] While many C&I buyers are only just starting to think about hybrid resources, some leading companies already see renewables plus storage as an opportunity to better match their energy consumption with carbon-free generation in real-time (see Case Study 5). As sustainability commitments become more ambitious, and as the value of smoothed renewable generation grows, more developers and buyers are likely to look to hybrid resources.

Distributed energy resources have faced similar barriers in navigating wholesale markets designed around older resources. FERC's Order No. 2222 directs RTOs/ISOs to address these barriers and ensure that all DERs are able to provide services they are technically capable of providing—but in the meantime, these resources face delay and uncertainty, and in many cases have been closed out of wholesale markets altogether.[57]

More broadly, the current challenges facing hybrid resources and DERs point to the mismatched timeframes of technology change and regulatory and RTO/ISO market rule changes. As technologies continue to evolve and improve, regulators and grid operators are faced with a constant need to re-evaluate and revise market rules to remove barriers to competition by new resources. These markets will need to become more adaptable to technology change in the future.

WHOLESALE MARKETS DO NOT FULLY REFLECT THE VALUE OF ADVANCED ENERGY RESOURCES

Many advanced energy resources can now beat conventional resources on both price and performance.[58] However, energy market structures designed at a time when fossil-fired units dominated both the generation fleet and the interconnection queue often systematically disadvantage renewable energy and other advanced energy technologies. Buyers are eager to see changes to market structures and rates that would avoid imposing unnecessary and costly operating requirements and fully compensate resources for their value to the energy grid, including emission reduction benefits not currently valued in wholesale markets. Such changes would significantly improve the supply of projects and the cost-competitiveness of advanced energy resources.

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[56] Federal Energy Regulatory Commission, Technical Conference regarding Hybrid Resources (Docket No. AD20-9-000), July 23, 2020, https://www.ferc.gov/news-events/events/technical-conference-regarding-hybrid-resources-docket-no-ad20-9-000-07232020.

[57] Advanced Energy Economy, Opening the Door to DERs: How FERC Order No. 2222 Creates Opportunity for Distributed Energy Resources to Participate in Wholesale Electricity Markets (Oct. 2020), https://info.aee.net/opening-the-door-to-ders.

[58] See Lazard, Levelized Cost of Energy Analysis, Version 14.0; and Levelized Cost of Storage Analysis, Version 6.0 (Oct. 19, 2020), available at https://www.lazard.com/perspective/levelized-cost-of-energy-and-levelized-cost-of-storage-2020/.

Specific deficiencies and necessary reforms vary by RTO/ISO, and a detailed discussion is beyond the scope of this report. A recent report by Advanced Energy Economy details several examples, including structural disadvantages preventing investment in advanced transmission technologies and non-wires alternatives, failure to value increasingly important grid services like flexibility, onerous and unnecessary metering requirements for DERs, and restrictions on the provision of certain services by renewable energy resources.[59]

Wholesale markets also fail to recognize the emission reduction benefits that advanced energy resources provide. As states and customers set policies and targets reflective of the value placed on clean generation, the omission of emission costs in wholesale markets leads to the inefficient under-valuing of advanced energy resources in these markets. FERC recently held a technical conference and issued a proposed policy statement raising the issue of whether, and how, RTO/ISO markets can accommodate state-set prices on carbon emissions.[60] A final policy statement could provide guidance to the RTOs/ISOs that takes a first step in resolving disconnects between state and customer policies that value clean generation and wholesale market designs.[61]

OPAQUE PRICING MECHANISMS MAKE PROJECT RISK ASSESSMENT DIFFICULT

Understanding the factors affecting the locational marginal price (LMP) of electricity and its likely trajectory in the future (forward price curves) helps buyers weigh the benefits and risks of long-term PPAs. The existence of public LMP data is a valuable feature of competitive wholesale markets, but many buyers note that the methodology for calculating LMP is not transparent and varies across markets. In addition, costs added on to LMP (sometimes called "uplift," caused by factors such as the commitment of generating resources to operate out of economic merit order or the need to preemptively start aging inflexible units regardless of whether they are needed to address potential reliability risks in certain hours) can blur the market signals LMP pricing methodologies are intended to send. The uncertainty that comes from opaque market signals creates added risk for potential PPA buyers. Greater pricing transparency and access to public market data can also enable more flexible contract structures, benefiting buyers.

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[59] Advanced Energy Economy, Wholesale Market Barriers to Advanced Energy – And How to Remove Them: Case studies of regulations impacting advanced energy technologies in wholesale markets (May 2019), https://info.aee.net/hubfs/Wholesale%20Market%20Barriers_FINAL%20(1).pdf.

[60] Federal Energy Regulatory Commission Docket No. AD20-14-000, Notice of Proposed Policy Statement (Oct. 15, 2020), available at https://www.ferc.gov/media/ad20-14-000-0.

[61] See Advanced Energy Economy, Comments in Docket No. AD20-14-000 (Nov. 16, 2020), at 8, urging the Commission "to broaden the scope of a final Policy Statement to include a recognition that RTO/ISO market rules that accommodate or implement a broader range of state policies (along with local policies and voluntary utility and customer commitments) are within the Commission's jurisdiction, can be shown to be just and reasonable, and should be encouraged."

Additionally, current participation models and information flows designed for a system dominated by centralized power plants do not always allow DERs to respond quickly to pricing signals. The day-ahead market is that last opportunity to submit a bid for many grid resources. However, if given closer to real-time market signals, battery storage and demand response resources are capable of responding much more rapidly than thermal power plants. Additionally, providing multi-day or intra-day offer opportunities can better match wind and solar output to weather forecasts and conditions. Markets can take advantage of these qualities by providing more transparent information on current and future wholesale prices and enabling faster transactions. Transparency in pricing would also enable better forecasting and control of customers' demand response capabilities and battery storage systems.[62] Even if customers have outsourced the management of their DERs and demand response participation to a third party (e.g., Case Study 6), the ability of that third party to respond more quickly to pricing signals will increase the value realized by the customer.

Ensuring that Markets are Equipped to Meet Future Grid Needs

In addition to specific barriers to advanced energy deployment, the current wholesale markets will require broader structural changes to facilitate the transition to a decarbonized electricity system dominated by advanced energy, and to ensure reliable operation of that system. Challenges span all segments of the wholesale markets: transmission planning, resource adequacy constructs, energy and ancillary services markets, and system operations. These markets and operational practices were designed around a different set of resources, and have yet to be updated to meet the changing economic and operational realities of a system that will be increasingly dominated by renewable energy and other low- and zero-carbon resources. In addition, markets currently fail to incorporate the value that states and customers place on increasing the penetration of clean generating resources and decreasing electricity-sector emissions.

A growing number of RTOs/ISOs are conducting studies and/or engaging in stakeholder discussions to identify gaps, reform existing markets, and consider new products or services to better prepare for future grid needs.[63] A growing body of academic research and industry reports offers recommendations to evolve wholesale markets for a clean energy future, with solutions ranging from incremental tweaks to a complete redesign (or elimination) of certain markets. They include familiar

[62] Massachusetts Institute of Technology, MIT Energy Initiative, Utility of the Future (2016), http://energy.mit.edu/wp-content/uploads/2016/12/Utility-of-the-Future-Full-Report.pdf.

[63] See NYISO, "Reliability and Market Considerations for a Grid in Transition: Discussion Kickoff" (Jan. 2020), https://www.nyiso.com/documents/20142/10169030/20200108%20Grid%20in%20Transition%20Discussion%20MIWG.pdf/10784af0-9e48-b2c3-e494-773311ff7ed5; New England Power Pool, "Potential Pathways to the Future Grid," http://nepool.com/Fut_Grid_Poten_Pathways.php; MISO Renewable Integration Impact Assessment (RIIA)" https://www.misoenergy.org/planning/policy-studies/Renewable-integration-impact-assessment/#t=10&p=0&s=&sd=.

concepts that already exist in some format, such as incorporating carbon pricing into wholesale markets, as well as novel and untried ideas, such as instituting a "Forward Clean Energy Market" (FCEM) or "Integrated Clean Capacity Market" (ICCM), either of which could be designed to explicitly incorporate bids for clean energy by voluntary advanced energy buyers alongside states, utilities, cities, and other entities facing compliance requirements.[64] Other potential changes—such as reforming energy and ancillary services markets to ensure reliable operation of a system dominated by variable renewable resources, or adjusting pricing models to allow prices to rise higher during times of scarcity as an alternative to ensuring resource adequacy through capacity markets —will not directly increase clean energy deployment, but will allow the grid to accommodate higher penetrations of renewable energy and potentially improve incentives to rely on clean resources (and retire aging fossil fuel resources), whether procured by voluntary buyers or other market participants.

Systematically evaluating, planning for, and implementing both incremental and broad-ranging fundamental reforms will allow for a more efficient, cost-effective transition to a decarbonized electricity system while also opening new opportunities for customer-driven advanced energy deployment. As noted elsewhere in this paper, doing the hard work of evolving and adapting these markets will allow for a faster transition to a clean energy economy, at lower cost and with more benefits for customers. Failure to adapt risks undermining the various benefits that organized competitive wholesale markets offer to large clean energy buyers and customers more broadly.

Incorporating the Perspective of Clean Energy Buyers into the Stakeholder Process

While large clean energy buyers have been a key driver of demand for advanced energy in recent years, their interests are underrepresented in the decision-making processes of RTOs/ISOs and FERC. RTOs/ISOs utilize a stakeholder process to develop their market rules before they are filed with FERC for approval; while customer groups representing residential or industrial customers are able to participate in some (but not all) of the RTO/ISO stakeholder processes, they typically do not represent the perspective of customers focused on clean energy purchasing options. With limited input from clean energy buyers, RTOs/ISOs lack insight into future demand for renewable energy and are unable to plan accordingly. Companies are also missing an opportunity to promote market rules that will keep

[64] See The Brattle Group, How States, Cities, and Customers Can Harness Competitive Markets to Meet Ambitious Carbon Goals: Through a Forward Market for Clean Energy Attributes (Expanded Report Sept. 2019), https://www.brattle.com/news-and-knowledge/publications/how-states-cities-and-customers-can-harness-competitive-markets-to-meet-ambitious-carbon-goals-through-a-forward-market-for-clean-energy-attributes-expanded-report; Kathleen Spees, "The Integrated Clean Capacity Market: A Design Option for New England's Grid Transition" (Oct. 2020), http://nepool.com/uploads/FGP_NPC_20201001_Spees_Integrated_Clean_Capacity_Market.pdf.

customer costs low and advance their sustainability goals, including by enabling growth in advanced energy.

Corporate energy purchasers do not actively engage in RTO/ISO processes for a variety of reasons. Most notably, the resource requirements of participation are hefty. Some RTOs/ISOs hold over 300 meetings annually,[65] and MISO requires a $15,000 application fee to become a member.[66] Even for Fortune 100 companies, this presents a barrier; many large companies have operations across all of the U.S. RTOs/ISOs, and meaningful engagement in the stakeholder process would require a large team of full-time staff. These companies—even the largest buyers—are not in the energy business and have only small energy procurement teams and limited regulatory staff focused on energy issues. Contrast this with utilities and power generators, who often have large teams of regulatory and market design experts devoted full time to engagement in a single RTO/ISO stakeholder process.

In addition, the existing governance structures of RTOs/ISOs across the country give an outsized voice to incumbent power generators and utilities, which are typically invested in conventional energy resources or have incentives that run counter to the goal of robust competition.[67] Therefore, buyers interested in promoting advanced energy in RTOs/ISOs may struggle to be heard even if they engage more actively in stakeholder processes.

While these barriers are significant, the disconnect between buyers and the markets in which they operate is a shared responsibility. Few companies procuring advanced energy on a large scale have taken steps to engage with market operators, and most have not built the necessary in-house expertise to do so.[68] Walmart, which operates its own competitive retail supplier, and Google, which has made a recent push to participate directly in RTO/ISO processes, are among the rare exceptions.[69] There exists significant untapped potential for buyers, RTOs/ISOs, and RTO/ISO stakeholders to work together more closely to address the barriers and opportunities outlined in this paper.

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[65] R Street, How the RTO Stakeholder Process Affects Market Efficiency (Oct. 2017), http://2o9ub0417chl2lg6m43em6psi2i-wpengine.netdna-ssl.com/wp-content/uploads/2017/10/112.pdf.

[66] Greentech Media, "Google: Coming Soon to an RTO Near You?" (Oct. 29, 2019), https://www.greentechmedia.com/articles/read/google-coming-soon-to-an-rto-near-you.

[67] R Street, How the RTO Stakeholder Process Affects Market Efficiency (Oct. 2017), http://2o9ub0417chl2lg6m43em6psi2i-wpengine.netdna-ssl.com/wp-content/uploads/2017/10/112.pdf; Kleinman Center for Energy Policy, PJM Governance: Can Reforms Improve Outcomes (May 2017), https://kleinmanenergy.upenn.edu/sites/default/files/proceedingsreports/PJM%20Governance%20Reforms.pdf.

[68] Kleinman Center for Energy Policy, PJM Governance: Can Reforms Improve Outcomes (May 2017), https://kleinmanenergy.upenn.edu/sites/default/files/proceedingsreports/PJM%20Governance%20Reforms.pdf.

[69] Greentech Media, "Google: Coming Soon to an RTO Near You?" (Oct. 29, 2019), https://www.greentechmedia.com/articles/read/google-coming-soon-to-an-rto-near-you.

RTOs/ISOs should actively solicit feedback and engage with buyers on planning and tariff decisions, and make the stakeholder process more accessible to them. FERC Order No. 719 requires that RTOs/ISOs ensure that "any customer or other stakeholder affected by the operation of the RTO or ISO, or its representative, is permitted to communicate its views to the RTO's or ISO's board of directors" and that "deliberation and consideration of RTO and ISO issues are not dominated by any single stakeholder category."[70] Barriers to entry into the stakeholder process—namely cost, availability of seats, and ongoing engagement requirements—should also be reduced or eliminated.

Summary of Recommendations for Reform

Companies are increasingly committed to mitigating their own environmental impact and taking action to address climate change by promoting a cleaner and more modern energy system. While there have been many successes in this area, much work lies ahead to unleash the full potential of corporate advanced energy procurement. Specifically, as discussed above, the following changes to wholesale markets would increase opportunities for large customers to meet their demand for advanced energy:

1. **Expand organized wholesale markets** to areas where they do not currently exist—namely the Southeast and in Southwestern states like Colorado, Arizona, New Mexico, and Nevada—to enable additional renewable and advanced energy contracting opportunities for commercial and industrial (C&I) customers, expand opportunities for customer-sited DERs, and increase advanced energy penetration on the grid.

2. **Improve existing organized wholesale markets** to expand opportunities for advanced energy procurement by C&I customers by:

    a. Building additional cost-effective transmission and increasing the capacity of existing transmission infrastructure to bolster the availability of and customer access to renewable projects and ensure a robust market for corporate procurement;
    b. Clarifying and simplifying interconnection and operational requirements for emerging resource types and configurations;
    c. Ensuring that markets accurately value the capacity and ancillary services benefits of renewable generation, distributed energy resources, and other advanced energy technologies; and

[70] R Street, How the RTO Stakeholder Process Affects Market Efficiency (Oct. 2017), http://2o9ub0417chl2lg6m43em6psi2i-wpengine.netdna-ssl.com/wp-content/uploads/2017/10/112.pdf.

d. Clarifying the drivers of wholesale market prices and increasing the transparency of those prices to help developers and buyers better understand the risks and opportunities of new projects.

3. **Prepare for the transition to a decarbonized electricity system** through broader reforms to organized wholesale markets that will position them to support a grid that is dominated by advanced energy resources.

4. **Ensure that advanced energy buyers have a sufficient voice in the RTO/ISO decision-making process** by reducing the barriers to participation that empower market incumbents to protect their interests. Large customers share responsibility for stepping up to engage in the RTO/ISO stakeholder process to make their interests known.

If these measures are implemented, renewable energy and other forms of advanced energy will be more accessible and financially compelling for a wider range of corporate and institutional buyers. The collective action of these customers, in turn, will accelerate the transition to a decarbonized grid.

CONCLUSION

As large corporate buyers continue to play a pivotal role in the transition to a cleaner electricity system, the role of well-functioning organized wholesale markets in facilitating their purchasing activity has come into sharper focus. As this paper demonstrates, large buyers have more flexible, transparent, competitive, and varied options to pursue a range of advanced energy technologies within RTO/ISO regions than they do outside these regions. This has translated to faster renewable energy deployment by corporate buyers in these markets relative to non-RTO/ISO regions, and has also enabled experimentation and innovation across a range of new technologies and services.

Expanding competitive wholesale markets into regions that do not currently operate under an RTO/ISO is likely the most impactful opportunity to expand opportunities for corporate advanced energy procurement. Doing so would also bring other benefits to large customers with respect to cost, transparency, and reliability.

Reforms to the existing markets would also allow companies to accelerate progress toward their sustainability goals. Relieving transmission constraints and streamlining interconnection processes and market participation rules for new technologies would make it easier for companies to pursue advanced energy projects. Ensuring that both grid-scale and distributed energy resources are fairly compensated for their performance (and fairly charged for any costs they cause) would make the

economics of advanced energy more compelling. Greater transparency in pricing would make it easier for buyers to actively participate in wholesale markets.

More broadly, efforts to reform competitive wholesale markets to meet the needs of a changing grid would secure the role of wholesale market competition in delivering a least-cost transition to an increasingly decarbonized electricity system. Revisions to market governance structures and increased participation by clean energy buyers in stakeholder processes would also help to ensure that the needs of these buyers are integrated into the decision-making process on an ongoing basis.

Expanding opportunities for corporate advanced energy procurement will not only help large companies to make progress toward their sustainability goals, it will allow them to play a larger role in accelerating the transition to a cleaner grid—a benefit that will accrue to all customers.