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CAPTURING THE FULL VALUE OF RENEWABLE ENERGY FOR BUSINESSES IN ERCOT



Becoming a sustainable business doesn't have to be complicated. In fact, today's challenging market comes with a silver lining — favorable conditions to secure renewable energy calibrated to risk tolerance.

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Introduction

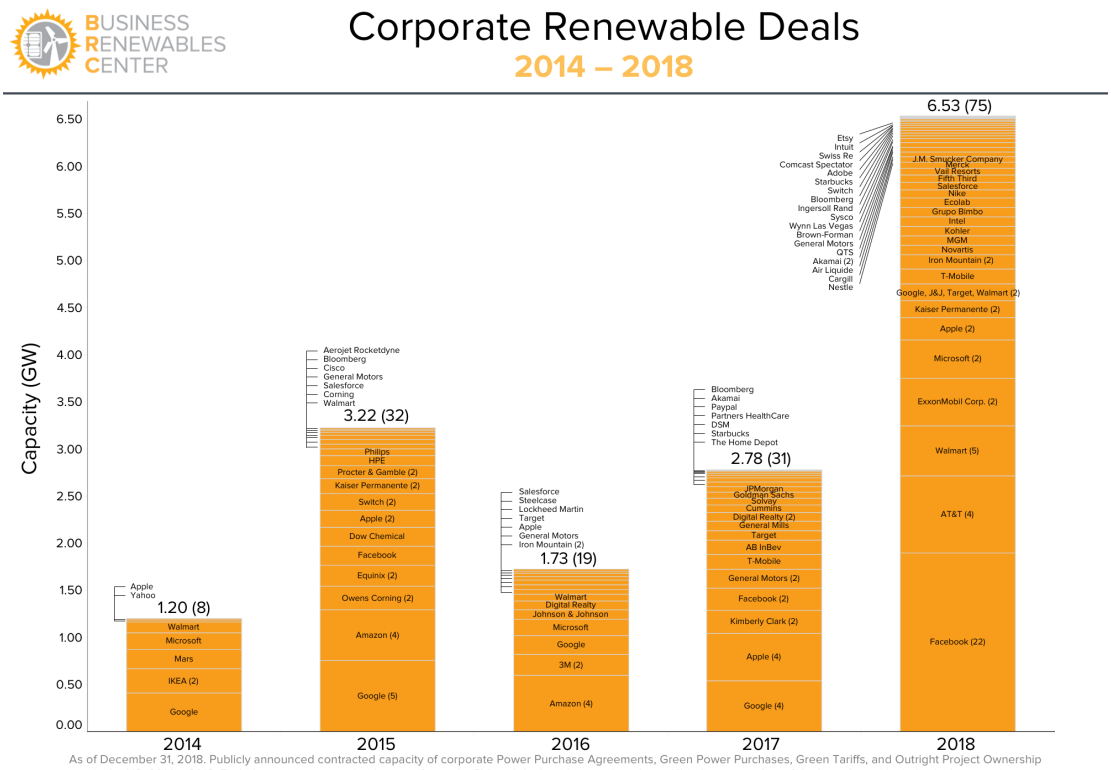
Today's smart businesses are seeking ways to green their electric supply and leverage the increasingly favorable prices of renewable energy. In fact, commercial and industrial customers contracted for more renewable megawatts in 2018 than ever before. Technology and data companies lead the way. But in the next few years, the industrial sector may top all others as more manufacturers commit to 100% renewables. In Texas, low wind and solar energy prices serve as a strong motivator for companies to sign large offtake agreements.[1]

But as companies explore renewable options, they often find themselves stymied by product complexity and market uncertainty. This paper examines why these challenges exist within the Electric Reliability Council of Texas (ERCOT). We also offer insight into an opportunity emerging out of the changing market and a simplified way to capture it, calibrated to various levels of risk tolerance.

Abundance of Renewables in Texas

Texas businesses find themselves presented with an abundance of low-cost renewable energy, as their state leads the way in wind power development. With 24.9 GW of installed wind capacity as of fourth quarter 2018, Texas beats California — the state commonly viewed as the renenewable leader — by four times. A yawning gap even exists between Texas and the number two state for wind power, Iowa, which has only about a third as much wind capacity as Texas. ERCOT saw wind capacity surpass coal in 2017 and generate 15% of the Lone Star State's power. Falling costs were a chief driver — wind power costs have declined by about one-third since 2010.

Solar energy has been slower to come to Texas, although that is beginning to change. The state ranks sixth nationally but is third when it comes to projected solar growth. Over the next five years, Texas expects to add 4.2 GW to the 2.5 GW now installed. Solar growth in Texas, as elsewhere, is spurred by increasingly favorable pricing. Since 2010, the cost to install solar has dropped by more than 70%.



As of December 31, 2018. Publicly announced contracted capacity of corporate Power Purchase Agreements, Green Power Purchases, Green Tariffs, and Outright Project Ownership in the US, 2014 – 2018. Excludes on-site generation (e.g., rooftop solar PV) and deals with operating plants. (#) indicates number of deals each year by individual companies.
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Credit: Rocky Mountain Institute

[1] Wood Mackenzie, Corporate Procurement of Wind and Solar 2018, January 2019

Why Has Renewable Energy Grown So Much?

The simple answer is that tax incentives and favorable government policies helped create economies that drove down costs, so that more and more households, businesses, institutions, and communities could join the renewable energy revolution.

But there's more to the story. The renewable energy boom took root three decades ago when states like Texas began to deregulate the power industry.

At the time, opening markets to competition was viewed as a way to spur innovation. Advocates of industry deregulation often pointed to the breakup of the Bell telephone monopoly — and the ensuing emergence of cell phones and other new products — as analogous to what would occur within a deregulated power industry. It wasn't clear at the time what the 'cell phone' of the energy industry might be — what electricity products and innovations would arise. But now it's clear that one result was a diversification of energy type. Nuclear and fossil fuel energy dominated U.S. electric supply prior to the opening of markets; afterward, renewable energy began to gain traction, particularly as customer choice was introduced. Electricity customers showed a growing preference for renewable energy.

In Texas, power industry deregulation began in earnest during the 1990s. New laws and regulations allowed competitive entities to supply wholesale power, which was previously the domain of electric utilities.

Today two-thirds of electricity consumers in the U.S. are served by competitive power markets, governed by independent system operators (ISOs) and regional transmission organizations (RTOs), of which ERCOT is one.

The RTOs/ISOs oversee wholesale power bidding, where generators compete to supply electricity. The goal is to ensure adequate supply to meet demand at the lowest possible cost.

Electric industry restructuring also gave birth to what's known as retail choice — the ability for retail customers to choose an electricity supplier other than their local utility. Texas is among 13 states and the District of Columbia that allow retail choice, which is significant for many reasons, including fostering electricity product differentiation. For example, customers can now choose to purchase electricity that is generated from particular sources, such as wind or solar, something they could not do prior to industry restructuring.

As the first state to form an RTO/ISO, Texas had a jumpstart on bringing new, competitive options to energy customers. The first commercial wind farm began operating in the state in 1995, the same year that the state legislature voted to deregulate wholesale generation.

Then Governor George W. Bush fueled more growth in wind power by signing a 1999 law calling for 2,000 MW of renewable power capacity by 2009, a target the state reached four years early. Texas grew the resource by parlaying one of its biggest renewable energy assets, the windy and vast plains of West Texas.

Texas also encouraged wind development by creating competitive renewable energy zones (CREZ), designed to incentivize construction of transmission lines that could carry energy from large wind farms in remote plains to population centers. The policy encouraged 3,600 miles of transmission lines that now allow the flow of 18,000 MW of primarily wind generation.



The Influence of Renewables on Wholesale Markets

With the creation of CREZ, renewable energy strategists put forward an effective plan to seed and grow the renewable energy market. They succeeded in making Texas a national leader in renewable energy. But few were aware, until relatively recently, how profoundly an influx of renewables would affect the supply and demand balance.

It's important to note that renewables add tremendous benefit to ERCOT's energy supply — reducing emissions and injecting a free source of fuel (sun and wind), which can be leveraged against the input costs of coal and natural gas. But renewables also induce a kind of perfect storm that can lead to power shortfalls and create price pressures within ERCOT.

These shortfalls and pressures come as Texas's surging economy demands more power. The state is experiencing one of its longest expansionary cycles, according to a report by the Real Estate Center at Texas A&M University. Crude oil production, single-family housing starts, and commodity exports all reached record highs during 2018 with growth expected to continue in 2019.

This economic dynamism — combined with hot weather — led to record breaking demand for electricity in summer 2018, a peak of 73,473 MW, set on July 19, 2018. ERCOT is forecasting even greater peak demand for summer 2019, an estimated 74,853 MW. The economic and corresponding rise in power demand can be traced largely to the vibrant oil and gas industries in West Texas, where ERCOT expects a boisterous 8% growth in electricity demand through 2023.

Such demand would not be a problem if enough power plants were being built to serve it. But new supply is not being introduced fast enough to replace plants that are retiring and closing. ERCOT reported delay or cancellation of power plants totaling more than 5,300 MW in 2018.

As a result, ERCOT is warning that 2019 could bring a historic-low summer reserve margin — the cushion of power-generating capacity available for when electricity demand surges. In its December Capacity, Demand and Reserves (CDR) Report, ERCOT forecasts a 7.4% reserve margin for Summer 2019, which is more than six percentage points lower than its target of 13.75%. How does this affect businesses and the price they pay for electricity?

Like sugar, cotton and corn, wholesale power is a commodity. And as such, its pricing is subject to market forces. When demand nears supply, prices will rise. Electricity is particularly vulnerable to price volatility because, unlike other commodities, it cannot currently be stored in meaningful quantities.

Prices can rise when the grid operator must run less efficient (i.e. more expensive) generators, last resort equipment used only because less costly generation is unavailable or already in use.

In Texas, prices also can rise through a mechanism called the Operating Reserve Demand Curve (ORDC), which ERCOT put in place to ensure that wholesale power prices accurately reflect shortage conditions. Instituted in 2014, the ORDC automatically increases the price of power as reserves get tighter. The ORDC adder activates when operating reserves decrease below 6,000 MW and continue to decline, with the maximum price adder applied when reserves drop to 2,000 MW.

This price adder reflects the "value of lost load" — the expected economic impact to customers if reserves draw down so low that ERCOT must institute rolling blackouts. Loss of electric power is expensive, especially for businesses, if they must halt production, cease transactions, and send home workers. As reserves drop, the probability increases that the grid will need to shed load and restrict electric use for certain customers. The ORDC adder signals this potential problem so that the market can respond appropriately.

ORDC is designed to let power prices rise to a point that averts this worst-case scenario by incentivizing power plant owners to run more generators, including their costly, less efficient emergency resources. How high? When the ORDC activates, prices can rise to a cap of $9,000/MWh, a significant leap from the average power price of $30-35/MWh over the last several summers.

A New Wrinkle for Markets

But today's influx of renewable energy adds a new wrinkle to the functioning and pricing of wholesale markets, as last summer revealed. ERCOT predicted low summer reserve margins for 2018. So the industry braced for the likelihood of prices broaching the ORDC cap, especially if temperatures reached record highs. The temperatures did rise as feared,

RENEWABLE IMPACT IN ERCOT



5.7B

savings
2010-2017



Over
10,000
permanent jobs
created in 2017

but the prices did not and Texas' vast wind fleet gets part of the credit. The record-demand days also happened to be windy days, so wind power helped avert a power shortfall.

This, of course, is good news — clean, renewable energy helped suppress wholesale power prices. But it also reveals a worrisome vulnerability created by the state's increasing dependence on wind power to meet peak usage. We cannot control when the wind blows; it is an intermittent resource. So just as it appeared when most needed last summer, it may disappear another time when most needed. With fewer conventional power plants to act as a cushion, this phenomenon creates more potential scarcity and price risk.

Renewable energy's intermittent nature is particularly problematic in Texas because unlike most other parts of the U.S,, ERCOT is an electrical island. It is not directly connected to other states so it cannot easily import power when a shortfall occurs.

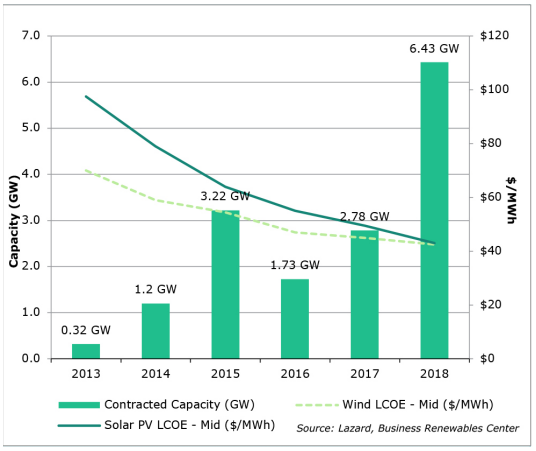
What does this mean for the energy customer in ERCOT? We appear to be entering a period of price uncertainty as market operators and regulators work out this new reality. Over the short-term, the next five years, NRG expects to see more renewables and fewer conventional power plants. This is likely to create a tighter market and greater price volatility.

Texas will eventually build more renewable energy, which will help diffuse problems created by intermittency. For example, adding more solar energy could help avert wind power shortfalls, since the two resources can work in tandem. If the wind isn't blowing, the sun may be shining and vice versa. And as battery technology improves and becomes less expensive, it can help balance disparities on a greater scale. Batteries store energy that can be discharged quickly when the grid suddenly demands power. However, they are still used sparingly, largely because of their cost.

But if by 2026, ERCOT replaced all of its coal-fired generation with renewables, it would still need to add far more renewable megawatts to the system than it lost from the coal-fired generation because of renewable intermittency. An analysis by Wood Mackenzie, found that it would take almost 34.6 GW of additional renewable capacity to replace 13.7 GW of ERCOT's coal-fired generation in 2026. And even then, without additional firm resources, there would be several hours of curtailed demand and about 20 hours per year when operating reserves fall below required levels, according to the research firm.[2]

None of this is to suggest a reduction in the development and use of renewables. Wind and solar bring an array of benefits to ERCOT's energy supply. Modeling by TXP-IdeaSmiths found that renewables saved ERCOT customers $5.7 billion from 2010 to 2017. The same report identified $1.5 billion in economic activity/output, just over $430 million in earnings, and more than 10,225 permanent jobs produced by renewable energy in 2017.

The bottom line is that the grid and its rules were designed for conventional fuels. The influx of renewables requires an adjustment in rules and practices, not just by grid operators and market players, but also by customers who find themselves facing an uncertain market. *But NRG sees a silver lining.*



Renewable Growth and Impact on Forward Pricing

[2] Wood Mackenzie, Can ERCOT Easily Replace Coal with Renewables? January 2019
[3] Radius Global Market Research, NRG Renewable Energy Procurement Research — Quantitative among Industrials, September 2018

Silver Lining Creates Favorable Conditions for Businesses to Secure Renewables

Based on forward prices in ERCOT, a period of lower prices appears to be emerging and creating favorable conditions for renewable energy buyers in the coming years. Backwardation is occurring — the price of power for future delivery is lower than today's spot price. The forward market appears to be pricing in some solution to ERCOT's reserve margin challenge we described in this paper.

The lower prices open the door for smaller businesses to procure competitively priced renewable products under long-term agreements. Until now, such contracts appeared affordable only to large operations. It's clear that smaller businesses see the advantage of renewables for their operations. An NRG survey of businesses in deregulated markets found that 65% of small businesses and 73% of medium businesses intend to purchase renewable energy within five years. Among all size businesses, about 77% have procured or are interested in procuring renewable energy in the future.[3]

So how can businesses take advantage of this emerging opportunity to go green?

Renewable Energy Contracts for Texas Businesses

First and foremost, it is important that a business does not choose its renewable energy product in a vacuum but balances it with its overall electricity portfolio. Businesses also must weigh the pros and cons of their choices in a market of complex products that range from virtual power purchase agreements to customer-sited solar panels. Which products offer the benefits the business seeks?

This is where assistance from a knowledgeable and vetted energy partner comes into play. A leading energy provider with decades of market experience, NRG collaborates with businesses to create customized products calibrated to budget and risk tolerance. We consider the customer's historic energy spend and risk appetite and then structure a renewable energy contract with resources that are sized, located, termed and priced accordingly.

Named Renewable Select, NRG's product is designed to simplify renewable procurement and avoid a lengthy and complex contracting process. NRG offers a straightforward retail supply contract, not a restrictive 12- to 20-year power purchase agreement based on one plant's production. The customer can procure the amount of renewable energy desired — no large commitments are required.

RENEWABLE SELECT VS ALTERNATIVES

FEATURES	RENEWABLE SELECT	OFF-SITE RENEWABLE	ON-SITE SOLAR	REC PURCHASES
Low-Cost Pricing	✓	✓		
Renewable Energy Credits	✓	✓	✓	✓
Promotion/ Marketing	✓	✓	✓	✓
Additionality Claim	✓	✓	✓	
Pointing Rights	✓	✓	✓	
Project Tours	✓	✓	✓	
No Building Modifications	✓	✓		
Simplified Retail Contract	✓			

The types of renewable products available through Renewable Select reflect varying degrees of risk tolerance. Customers can choose from:

- **Fixed Price** – offers predictability and simplicity of a set price/MWh for the contract duration.
- **Percent Fixed & Index (PF&I)** – creates the ability to control exposure to index markets by purchasing fixed-price blocks that follow load shape with the remaining quantity at index prices.
- **Block & Index (B&I)** – provides sophisticated customers exposure to the wholesale market by purchasing blocks suited to their risk and load profile. Consumption above or below block volumes is settled at index prices.



A Renewable Select customer knows exactly where its power is coming from and can point to the physical location where the energy is generated. In some cases, the customer can secure naming rights to the project. In addition, there is no juggling of multiple bills by electricity source; the customer receives one consolidated bill.

The time has arrived for businesses of all sizes to become part of the renewable energy revolution. Gaining a stake in the renewable energy market opens up an opportunity to not only exhibit responsible corporate stewardship, but also gain pricing advantage by acting at the right time in changing energy markets. It doesn't have to be difficult or risky to become a sustainable business. As a long-term energy partner, NRG stands ready to guide the way.

About NRG Energy, Inc.

At NRG, we're redefining power by putting customers at the center of everything we do. We create value by generating electricity and serving nearly three million residential and commercial customers through our portfolio of retail electricity brands. A Fortune 500 company, NRG delivers customer-focused solutions for managing electricity, while enhancing energy choice and working towards a sustainable energy future. More information is available at nrg.com. Connect with NRG on Facebook, LinkedIn and follow us on Twitter at @nrgenergy.

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