electricity
AS AN INDISPENSABLE ECONOMIC DRIVER

By Terry Preuninger, P.E.

Texas is creating jobs at a rapid clip; corporations are relocating headquarters here, and population expansion is outpacing the rest of the nation. When it comes to economic development, Texas knows how to get things done. Its pro-business atmosphere is as much a source of pride as smoked brisket, the Dallas Cowboys, and a pair of well-worn Lucchese boots.

Electricity is a major factor in the state's overall economic development success. When site selectors study locations around the country for a corporate headquarters or manufacturing facility, the cost of electricity is a primary consideration. Second to personnel, it is the greatest operating expense for many major companies.

Given its climate, population, and strength of industrial activity, Texas leads the country in the consumption of electricity. With that, competitive pricing is a fundamental underpinning of the state's economic success and viability.

In 2002, a Texas law that created a competitive electricity market went into effect. This law gave customers the ability to choose their retail electric providers. Greater competition means lower consumer prices and greater customer choice. The law required investor-owned utilities to unbundle their generation, transmission, distribution and retail functions. For example, Oncor, the largest Texas electric utility, used to be part of a one-stop shop, from generation to retail. Now, it solely focuses on the transportation of electricity through its transmission and distribution network.

In Texas, both electricity-generating operations and investments in plants are driven by prices. Wholesale and retail prices are set by competitive market rates – and, in turn, drive market rates. The role of the wholesale market is to allow trading among generators, retailers and other financial intermediaries for short- and long-term electric delivery.

Oncor employees at the Transmission Grid Management Center where its vast transmission grid is monitored, assuring reliable service to 10 million over 91 counties and 401 cities in Texas.

The wholesale market is open to any independent entity meeting regulatory qualifications that wants to try to invest in power generation, connect to the grid and find another party willing to purchase its output. The market in Texas is governed by the Electric Reliability Council of Texas (ERCOT) and the Public Utility Commission of Texas (PUC). The Electric Reliability Council of Texas manages the flow of electric power to 23 million Texas customers, or 85 percent of the state's electric load and 75 percent of its land area. The Public Utility Commission of Texas was established by the Texas Legislature in 1975 and given regulatory oversight of electric and telecommunications utilities in the state. The mission of the PUC is to protect customers, foster competition, and promote high-quality infrastructure.

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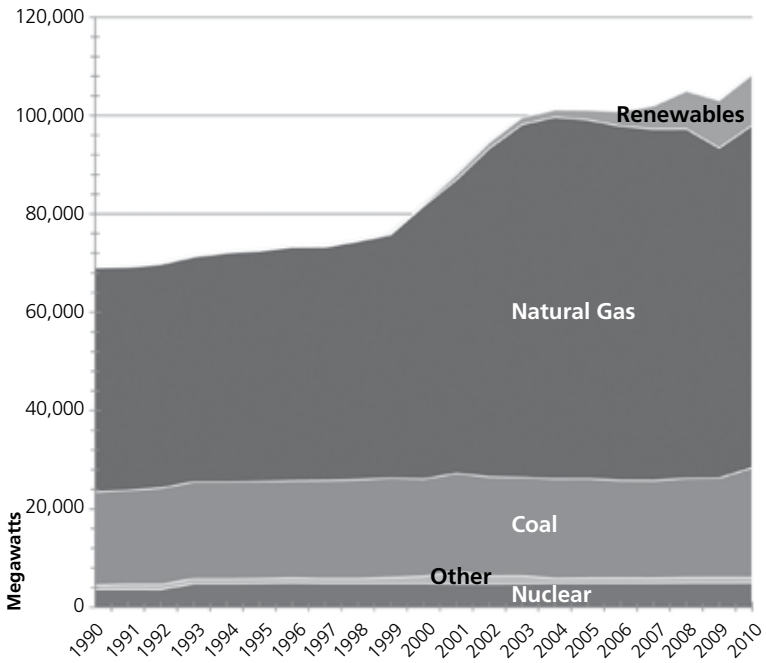
COMPETITIVE PRICING AND AN INNOVATIVE SYSTEM ATTRACT BUSINESS TO TEXAS

Reliable and cost-effective electricity is a vital component of a robust economy. In Texas, a business-friendly state with a booming energy sector and growing population, the electricity industry is the oil between the gears – it keeps economic development expanding at an impressive rate. To help spur economic development, electric utilities and regulatory bodies have adopted a nimble and innovative approach to keeping the lights on – and keeping the bills reasonable – for every Texas resident and business.

Table 1. Texas Electric Generation by Primary Energy Source



Source: U.S. Energy Information Administration, Form EIA-860, "Annual Electric Generator Report."

For example, if leaders of a large corporation move their business to Texas and want to reduce electricity costs, they can gain the necessary approvals and become an electricity retailer. They can sell electricity to themselves and to market and can profit by reselling pre-purchased electricity at peak times.

In a competitive electricity market, generators offer electricity to retailers who re-price it for market. In this system, a transparent cause and effect exist. As demand and accessibility change, prices fluctuate. With that, investors in generation and grid management can pinpoint locations of grid congestion and focus infrastructure development where market demand is highest.

While the rest of the country is primarily divided into two grids, the Western Interconnection and the Eastern Interconnection, Texas has a grid of its own – the ERCOT Interconnection. Texas never faces dilemmas like: Who pays for a transmission line that takes energy from Colorado and delivers it to Illinois, even though it passes through Kansas and Missouri?

Since the electricity market in Texas is primarily intrastate, there is generally less federal regulation. An independent grid allows Texas to more easily plan the flow of its power. The process of creating new infrastructure is streamlined. The PUC is the primary regulatory entity.

More than 1,200 active entities generate, transmit, buy, sell or use wholesale electricity. Since 1999, there have been 9,300 miles of transmission lines built and $7.9 billion invested in new transmission and upgrades, with up to $8.9 billion in transmission under consideration or development through 2017.

According to ERCOT data, natural gas made up 40.5 percent of the energy used in Texas in 2013. Coal was close behind, at 37.2 percent, followed by nuclear and wind, at 11.6 and 9.9 percent, respectively. The overall price of electricity is impacted by the cost of resources and the efficiency of the generators used.

With more natural gas available than the market demands, it's a relatively inexpensive resource. This contributes greatly to the low cost of electricity.

It is this system of affordable power that contributes to the state's booming economic success. From 1990 to 2010, the predominant sources of new generation facilities in Texas were natural gas and wind, as shown in Table 1. Here, where the electricity market is as independent and business-friendly as the rest of the state, the balance comes out in favor of the consumer.

SUCCESSES

Electricity is almost always on the short list of cost considerations when companies scout locations for offices, manufacturing plants, and e-commerce hubs. With Texas' competitive market, businesses gravitate here for its low prices, reliability, and accessibility.

Texas has become a hub for data centers, and the Dallas-Fort Worth area is a major industry hot spot. These facilities, used to house computer systems for electronic storage and communication, are typically located in high-security, specially built structures and include redundant safeguards to ensure constant power, cooling, data storage, and security. Worldwide, data centers use about 30 billion watts of electricity, according to estimates sourced by *The New York Times*. Data centers in the U.S. make up one-quarter to one-third of that total, with Texas being one of a handful of geographical hubs. These facilities require a massive amount of power from the state's grid – and they come here because they know they can get it affordably and reliably.

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Data centers are an economic boon for cities and states because they represent huge capital investments, often worth billions of dollars. That is what makes them welcome additions to communities. Though they provide few jobs once built, they offer hundreds of temporary construction jobs while in development. Data centers also draw other businesses that provide materials, support services, and talent. The state offers tax incentives to data center companies, giving them further reason to come to Texas.

Martin Peck, the Lincoln Property Company senior vice president who manages Lincoln Rackhouse, the data center-focused division of the real estate company, noted that site selection for these facilities is different from that of traditional commercial real estate.

While most businesses want "location, location, location … at the corner of Main and Main," Peck said, "a data center needs to be at the intersection of power and fiber [cable that transmits data at the speed of light]."

Power, Peck said, is one of the "driving factors" that determine the location of a data center. A major appeal of Texas is that it has its own power grid. Large web-dependent businesses tend to locate one data center in each grid, so that even a catastrophic outage would not affect their service, Peck said.

Lincoln Rackhouse data center in Plano, Texas. The 310,000-square-foot data center was leased to a financial services firm and Lincoln Rackhouse is currently doubling the data center size.

Lincoln Rackhouse owns a 310,000-square-foot data center in Plano, Texas. Last year, they leased a large portion of their capacity to a financial services firm. The firm was considering both the Dallas and Chicago areas but selected Dallas, in part, because of the independent Texas grid, Peck said.

Lincoln Rackhouse also offers consulting and site-selection services to data center companies and companies looking for server space. Peck tells clients what he has found to be true: With an abundant natural gas supply that keeps electricity prices low, power prices in Texas are very competitive.

"We have more than a 200-year supply of natural gas. Given that, we don't anticipate big [price] spikes like you have to deal with elsewhere," he said. And with an independent grid, Texas has "robust and abundant"

New advanced digital meters being readied for installation on Oncor's system. Oncor completed the change out of its fleet of more than 3 million analog meters to this next-generation meter before the end of 2012.

reliability. And it matters – while an office building uses 6 to 9 watts of electricity per square foot, a data center uses 150.

"These are real marvels of technology, these facilities," Peck said. "Your largest operating expense is power."

In selecting sites, Peck looks for areas that are in close proximity to two separate electrical substations to ensure adequate power. With data centers, it's all about safeguards and redundancy.

Owners of a data center work closely with electrical engineers and the local utility, Peck said. In the case of his facility in Plano, he worked closely with Oncor, the regional transmission and distribution utility. In a region known as one of the biggest data center hubs, Oncor is highly experienced in this arena. Oncor assigns project managers to seamlessly usher the job to completion.

"Not all utilities are as pro-growth as Oncor is," Peck said. "They know exactly what we're looking for."

While data centers are fantastic economic boosts for the state, they aren't the only businesses that are drawn to Texas at least in part by the electricity system. Village Farms has established three locations for its greenhouses in Texas – in Marfa and Fort Davis in the 1990s and in Monahans in 2012. More than half of their facilities are based here.

Success doesn't come without challenges. ERCOT, as an independent grid operator and a drawing factor in Texas' economic development, must keep up with growing demand. So, too, must affiliated market-drivers, including generators and transmission and distribution utilities.

Oncor celebrated the installation of its 1 millionth advanced digital meter on June 1, 2012

First and foremost, they came to Marfa and Fort Davis for the climate, which is great for growing tomatoes. Electricity became a stronger concern when the company decided to expand to Monahans, where they've implemented fans for ventilation and plan to install lights. In winter at the newest facility, electricity could account for 25 percent of operating costs, which is significantly higher than the first two locations, where they have 100 acres of "conventional greenhouse designs."

In terms of expansion considerations, Jonathan Bos, who works in development at Village Farms, said climate and personnel came first, followed by the availability of utilities. Village Farms chose Monahans because there was better access to electricity, gas and carbon dioxide distribution networks. It was also closer to highways and potential employee bases.

The 30-acre greenhouse in Monahans requires a great deal of power, and Village Farms wanted to ensure that utilities were available for future expansion. They worked with Oncor to arrange transformer upgrades to meet their needs.

The Monahans project was planned in four phases, with phase one currently up and running. Expansion will be determined by the market, economy, company success, and availability of labor. But electricity is at the ready.

AREAS OF CONTINUED FOCUS

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Texas has become the nation's capital of incredible growth. The U.S. Census Bureau estimates that the state's population reached over 26 million in 2012, an increase of 3.6 percent from 2010. That's double the rate of the U.S., with no slowdown in sight. The state has earned a reputation as a business-friendly leader, creating jobs and drawing employees from across the nation. Here, where the size of the economic pie is growing, utilities must keep pace.

Meanwhile, as generators respond to the market demands, Oncor and others must maintain and expand infrastructure to keep pace with development and population density. Oncor invests more than $1 billion each year in infrastructure to provide and improve service and reliability.

The company has been a leader in implementing advanced grid technologies. For example, Oncor was the first utility in the country to integrate its advanced metering system (or AMS) with its outage management system in order to detect outages without notification from the customer. This system has been successful in alerting Oncor to 20 percent of clear-weather outages as soon as they occur. With this system, the company can determine the problem and make repairs before a customer even returns home from work. It is initiatives like this that keep the Texas electrical system competitive and keep business flowing.

These advanced meters replaced 50-year-old technology with cutting-edge digital meters. With this technology, customers can see how much electricity they're using at any time and can easily manage their energy use to conserve and save money. Improvements like this empower the customer and also help to ensure reliability by automatically communicating electricity usage and outages to Oncor. This proactive improvement and forward thinking in the Texas electric industry help the state economy maintain its edge.

Competitive pricing, reliable infrastructure, and ample power drive business to Texas and enhance its venerable economy. The ongoing conversation about how to grow and develop effectively is quintessentially Texan, as it revolves around maintaining the state's competitive edge while delivering results that are both cost-effective and reliable. Texas encouraged infrastructure expansion and renewable generation with cutting-edge legislation.

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THE GREAT BEYOND

With growing demand, innovative sources of power are key to consistent future service. This is one of the reasons why, in 2005, the Texas Legislature enacted legislation to develop a comprehensive transmission infrastructure plan to connect renewable energy facilities to consumers.

The new legislation directed the PUC to identify Competitive Renewable Energy Zones (CREZ), which are geographic areas where wind facilities would likely be built based on prevailing winds. The PUC designated these areas and mapped the transmission upgrades necessary to deliver energy from the new sources to customers, according to the PUC. The project was meant to loosen grid congestion, and in the process, it provided the pathways necessary to ensure that energy created by wind producers in West Texas would make it to high-demand markets in the major population centers.

The CREZ project was constructed by seven transmission and distribution utilities, with Oncor having the largest share. The project, which was completed in 2013, enables connection to the grid for over 18,000 megawatts of wind (or other) electricity sources. The project also supports the increased energy needs of the West Texas oil and gas industry.

So, the state – and ratepayers – took on the cost of building transmission lines with the idea that wind companies would follow. Thus far, the project has been a success, with Texas continuing to lead the nation in wind power capacity, as indicated in the 2012 graphic created by the National Renewable Energy Laboratory.

In addition to the promise of more wind power, the CREZ project created many jobs for the construction of the transmission lines and the building and operation of wind facilities. Oncor sourced as much building material as possible from Texas, including recycled steel. The project was a huge boost for both the electricity industry and the entire state.

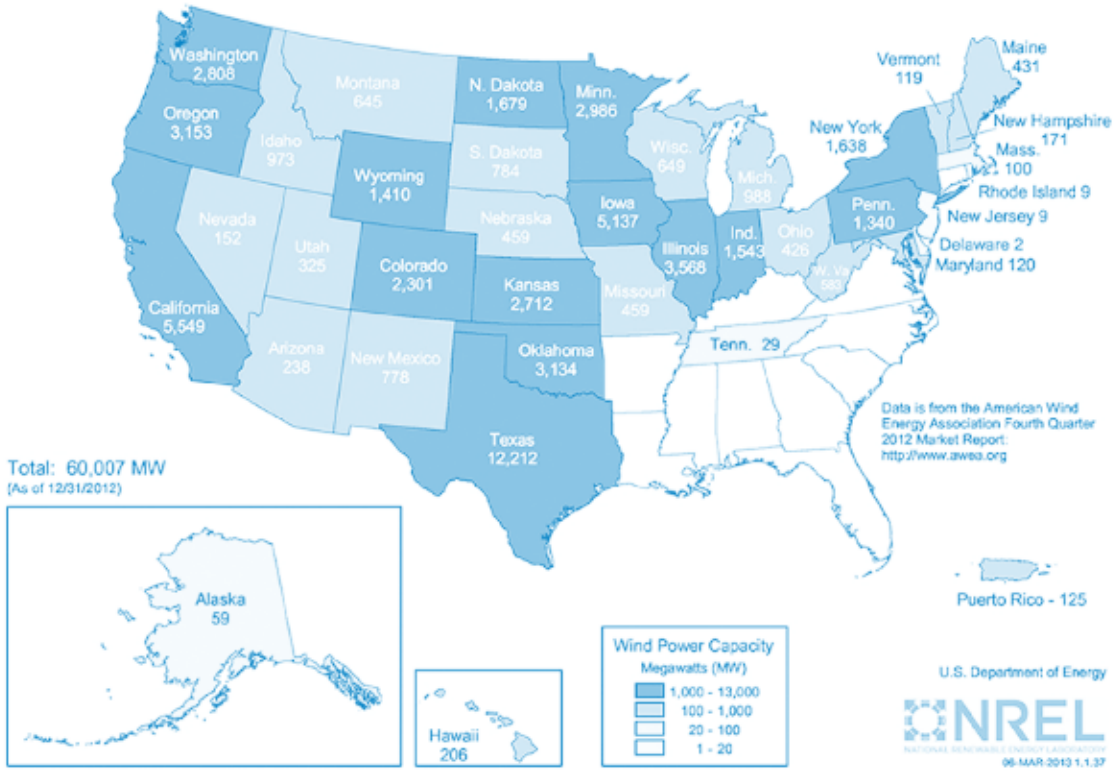
Texas is home to six of the 10 largest wind projects in the U.S., including Roscoe Wind Farm and Horse Hollow Wind Farm, according to the governor's office. The state ranks sixth in the world for wind energy production.

The challenge with wind power is obvious – it's available only when the wind is blowing. And power generation must constantly meet consumption, as there's no mainstream way of storing electricity. With that, unless the turbines are spinning at peak times of power usage, they're of limited value. Of course, there is at least one solution: batteries.

In Texas, battery storage is becoming a cutting-edge method of evening out peaks in demand. It's viewed as a way to maintain reliability in years to come. Duke Energy, for example, created the Notrees Battery Storage Project in Ector and Winkler counties. The project's 36-megawatt battery helps to store and manage output from the company's Notrees Wind Power Project.

To build the storage facility, Duke Energy matched a $22 million Department of Energy grant. A Texas-based company designed and implemented the battery, which has been operating since 2012. By evening out the variables in production and demand, this project

2012 Year End Wind Power Capacity (MW)



Electricity generated in a West Texas wind farm is delivered to cities and other parts of the state through Oncor's transmission system built as a part of the Texas CREZ project.

makes renewable energy a more practical option and enhances its economic viability. It leads the way for others as an example of forward thinking and innovation in the Texas electricity system.

Another form of energy storage, compressed air energy storage (CAES), will soon be established in East Texas by Apex, a Houston-based energy company. Construction on the 49-acre Bethel Energy Center is planned to begin in 2014 in Anderson County, according to the Apex website. The facility is expected to begin operation in early 2017.

To store energy using CAES, Apex will use compressors with electric motors to inject air into an underground storage cavern during off-peak hours. Then, when demand increases, the pressurized air will be released and heated so it turns turbines and generates electricity for the grid. This type of energy storage can be accomplished in salt dome caverns, as is the case in Anderson County, or in underground aquifers, depleted underground resource reservoirs or rock mines.

The Bethel Energy Center project, the second facility of its kind in the U.S., will create 20 to 25 high-paying jobs and 200 temporary (about three years) construction jobs. Apex bills it as one of the country's "cleanest dispatchable power plants" (energy sources that can be placed in service in a short amount of time). It will encourage development of wind and solar power by storing energy created during low-demand periods and deploying it at peak times. It's an innovative middle step to improving reliability and delivering electricity to the consumer when the consumer demands it.

Texas prides itself on its business-friendly "get the job done" attitude. Industries are encouraged to progress and grow without excessive government impediments. This same approach has allowed Texas utilities to innovate and prosper.

There's no silver bullet for continuously meeting the energy needs of the state while maintaining a competitive edge in pricing and service. It takes diverse sources to maintain a competitive system. But with booming business and astronomical growth as markers of success, Texas is leading the way.