

Wind Power Pricing Fact Sheet

Texas Has Among The Lowest Power Prices In The Country, Led By Wind And Natural Gas

Negative Pricing Has Minimal Impact on Average Power Price in ERCOT

Negative Pricing Reflects Excess Electricity Generation, Transmission Constraints, And Economic Factors. “Negative pricing events in electricity markets reflect a complex set of economic, reliability, environmental, and safety variables. The interaction of these variables differs depending on the region, season, and time in question, but negative pricing often reflects some combination of excess generation (often exacerbated by must-run requirements), transmission constraints, and economic factors.” (“Staff Report to the Secretary on Electricity Markets and Reliability,” [U.S. Department of Energy](#), 8/17)

In Texas, System Wide Negative Pricing Occurred For Just 64 Hours In All Of 2017. “In 2017, system-wide negative pricing occurred during 64 hours; in 2018, as of August, during 30 hours.” ([ERCOT](#), 8/18)

Other Energy Sources Are Leading Contributors to Negative Pricing

In ERCOT, Low Natural Gas Prices Have Displaced More Than Twice As Much Coal As Renewables. “Natural gas is a direct competitor with coal because both can be dispatched – turned on – when a grid operator needs more power. That is helpful for grid reliability. But, as the cost of natural gas has fallen, coal has become less competitive because it is cheaper to operate a natural gas power plant. The result of all this is that while renewables compete with conventional sources of power, they do not displace nearly as much coal as cheap natural gas. In fact, cheap gas displaces, on average, more than twice as much coal than renewables have in ERCOT.” (Joshua D. Rhodes et al, “Are Solar And Wind Really Killing Coal, Nuclear And Grid Reliability?” [The Conversation](#), 5/11/17)

Many Coal-Fired Power Plants Have “Inflexible Contracts” With Coal Mines And Railroads, Forcing Them To Take Delivery, And Create Large Stockpiles Of Coal. “However, many coal power plants have inflexible contracts with coal mines for the purchase of coal and with railroads for the delivery of that coal. As a result, while Texas coal consumption fell by 15 million tons in 2015, Texas coal deliveries only fell by 10 million tons. The extra five million tons were added to coal piles at power plants across Texas, leading to a 37 percent increase in coal stockpiles at Texas power plants over the course of 2015.” (Michael Goggin, “Negative Prices Still Rare, Mostly Caused By Other Energy Sources,” [American Wind Energy Association](#), 4/15/16)

- **The Amount Of Coal Stockpiled At Texas Power Plants At The Start Of 2016 “Would Fill A Coal Train Stretching From Coast To Coast Across The United States.”** “For reference, the 19.5 million tons of coal stockpiled at Texas power plants as of the start of 2016 would fill a coal train stretching

from coast to coast across the United States. The 197 million tons stockpiled at coal power plants nationwide could fill a coal train stretching nearly around the world.” (Michael Goggin, “Negative Prices Still Rare, Mostly Caused By Other Energy Sources,” [American Wind Energy Association](#), 4/15/16)

With Limited Space To Stockpile Coal, Some Coal-fired Power Plant Operators May Choose to run their units, Burning Off The Coal To Create Space for New Deliveries In Order To Avoid Large Contract Penalties For Refusing Coal They Don’t Need, Even When Prices Go Negative. “Many coal power plants have limited space to stockpile coal. ... As a result, it appears that many power plants have decided to continue operating at a loss simply so that they can continue to burn coal to avoid those large contract penalties. In some cases it appears that these coal power plants continue producing electricity as power prices fall well below the cost of operating the plant, even as power prices go negative.” (Michael Goggin, “Negative Prices Still Rare, Mostly Caused By Other Energy Sources,” [American Wind Energy Association](#), 4/15/16)

This Creates An “Out-Of-Market Incentive” To Keep Operating Even Though Negative Prices Signal That Generation Should Be Reduced. “The inflexibility of the coal contract provisions thus acts as an out-of-market incentive to continue operating coal power plants despite power prices going negative and sending a signal that generation should be reduced. Different policies have led to a similar outcome in China, with coal generation inefficiently displacing wind generation in some hours.” (Michael Goggin, “Negative Prices Still Rare, Mostly Caused By Other Energy Sources,” [American Wind Energy Association](#), 4/15/16)

Coal, Nuclear And Hydroelectric Plants Contribute To Negative Pricing. “In addition to coal, other types of generation also contribute to negative prices. In the U.S., nuclear plants almost never change their output in response to changes in demand or power prices, and hydroelectric plants sometimes continue operating despite negative power prices.” (Michael Goggin, “Negative Prices Still Rare, Mostly Caused By Other Energy Sources,” [American Wind Energy Association](#), 4/15/16)

Renewable Energy Reduces Energy Costs For Texas Consumers

When Renewable Resources Displace More Costly, Less Efficient Conventional Power Options They “Substantially Lower The Cost For Electricity.” “That means as more wind and solar farms are installed, more capacity is inserted at the cheapest end of the bid stack. This insertion pushes out other generators such as nuclear, natural gas and coal, causing some of them to no longer be dispatched into the grid – that is, they don’t supply power into the grid (or get paid). So as more renewables are installed, power markets dispatch fewer conventional options. And, because the marginal cost of these new sources is almost free, they substantially lower the cost for electricity. (Joshua D. Rhodes et al, “Are Solar And Wind Really Killing Coal, Nuclear And Grid Reliability?” [The Conversation](#), 5/11/17)

In ERCOT, Wholesale Market Prices “Tend To Be Lower When More Wind Generation Is Being Produced.” “Generally speaking, system-wide prices in the ERCOT wholesale market tend to be lower when more wind generation is being produced.” ([ERCOT](#), 8/18)

Renewable Energy Policies Rarely Drive Negative Pricing And Have A Minimal Impact On Market Average Prices

A Comprehensive Study Found That Renewable Energy Policies Account For An Extremely Small Share Of Negative Prices At Retiring Coal And Nuclear Power Plants. “AWEA has now made our prior analysis far more comprehensive by examining full-year 2016 price data for all retiring power plants in

the main wholesale electricity markets that have a large amount of wind generation: PJM, MISO, SPP, and ERCOT. The results ... confirm that any instances of renewable policies like the Production Tax Credit (PTC) and state renewable standard credits being factored into market prices have a trivial impact on retiring power plants. Across more than 1.8 million data points, which cover all 2016 pricing intervals in the day-ahead electricity market for all retiring power plants in those regions, only 55 instances of negative prices were found that could have been set by a wind project receiving the PTC. The analysis includes market price data for all power plants that have retired since 2012 or have announced plans to retire. Our analysis focused on the day-ahead electricity market (the results bolded below), as that is where nuclear and coal generators sell most, if not all, of their generation. However, the results show that wind plants almost never set prices for an additional 2.4 million data points in the real-time electricity market as well.” (Michael Goggin, “Negative Prices Still Rare, Mostly Caused By Other Energy Sources,” [American Wind Energy Association](#), 4/15/16)

Wholesale Electricity Price Data Shows That Negative Prices Accounted For 0.73% Of ERCOT-Wide Average Market Prices In 2017. “Much of the focus of recent press articles has been on the main electricity market in Texas, known as the Electric Reliability Council of Texas, or ERCOT. A close examination of wholesale electricity price data shows that negative prices accounted for only 0.73% of ERCOT-wide average market prices in 2017. These events have an even smaller impact on demand-weighted average market prices because they tend to occur during hours of lower electricity demand, and because prices go negative by only a dollar or two in almost all cases.” (Michael Goggin, “Negative Prices Still Rare, Mostly Caused By Other Energy Sources,” [American Wind Energy Association](#), 4/15/16)

Analysis Shows Negative Pricing Events “Have Had Almost No Impact On Annual Average Day-Ahead Or Real-time Wholesale Electricity Prices.” “According to analysis from [Lawrence Berkeley National Laboratory], negative pricing events have historically been rare at many major pricing hubs (less than two percent of total hours in real-time markets in 2016), and have had almost no impact on annual average day-ahead or real-time wholesale electricity prices.” (“Staff Report to the Secretary on Electricity Markets and Reliability,” [U.S. Department of Energy](#), 8/17)

Smart Investing By Texas Leaders In Transmission Capacity And Our Evolving Market Dynamics Have And Will Continue To Alleviate Negative Pricing

Curtailments Of Wind Generation “Have Steadily Dropped” And Occurrences Of Negative Pricing Have Declined As A Result Of Transmission Lines Built Under The State’s Competitive Renewable Energy Zones (CREZ). “Curtailments of wind generation on the Texas electric grid have steadily dropped since 2011 as more than 3,500 miles of transmission lines have been built, largely as a result of the state’s Competitive Renewable Energy Zones (CREZ) program. Occurrences of wind-related negative real-time electricity prices have similarly declined as the CREZ transmission expansions have allowed wind power to flow to more electricity demand areas in the state.” (“Fewer Wind Curtailments And Negative Power Prices Seen In Texas After Major Grid Expansion,” [U.S. Energy Information Administration](#), 6/24/14)

Under Gov. Rick Perry, The Texas Energy Market Went From “Coarse” And “Slow” To “Fine-Tuned” And “Fast” Leading To A “Cheaper, Cleaner And More Reliable” Grid. “And, interestingly enough, the requirements for reserve capacity (backup power for when wind power dips) to manage the grid smoothly went down, not up, over the past few years in Texas, despite rapid growth in wind generation development during Governor Perry’s tenure. That is, the costs for managing variability in the grid decreased. Why has there been little disruption to the reliability of the Texas grid? Because alongside rapid growth in wind installations was a market transformation in ERCOT. While Secretary Perry was governor, the Texas market went from a coarse, slow market to a fine-tuned, fast market. Innovating

the market to one that is dynamic and fully functioning made it easy to include more wind into the system. It's also a sign of how advanced technologies enable us to reinvent the grid toward one that is cheaper, cleaner and more reliable." (Joshua D. Rhodes et al, "Are Solar And Wind Really Killing Coal, Nuclear And Grid Reliability?" [The Conversation](#), 5/11/17)

Summer 2018 Showed That Texas' Diverse Energy Portfolio Can Withstand Extreme Demands

Leading Up To The Summer, Some Cautioned There may not be sufficient resources to Support The State's Electricity Needs. "This summer was supposed to be brutal with days of triple-digit temperatures, less generating capacity and predictions the power grid couldn't support the state's electricity needs." (L..M. Sixel, "How Texas Power Grid Weathered Blazing Heat, Record Electricity Demand," [Houston Chronicle](#), 8/2/18)

High Temperatures And The Closure Of Three Coal-Fired Power Plants Contributed To This Concern. "The hot weather and record power use came months after three large coal-fired power plants shuttered, taking thousands of megawatts of generation off the Texas grid and narrowing the amount of excess power generating resources to the smallest in years." (Rye Druzin, "Texas Grid CEO Talks About Surviving Record Heat," [San Antonio Express-News](#), 9/17/18)

As Predicted, Power Use "Broke Multiple Records In July." "That balancing act was tested vigorously this summer as power use broke multiple records in July, topping out on July 19 when 73,259 megawatts were consumed between 4 p.m. and 5 p.m. That was more than 1,000 megawatts higher than the previous record set the previous afternoon." (Rye Druzin, "Texas Grid CEO Talks About Surviving Record Heat," [San Antonio Express-News](#), 9/17/18)

But ERCOT Did Not Have To Call For Conservation; The Lights Stayed On. "But regulators didn't call for consumers to cut back. The lights stayed on. And wholesale prices didn't spike as high as some feared." (L..M. Sixel, "How Texas Power Grid Weathered Blazing Heat, Record Electricity Demand," [Houston Chronicle](#), 8/2/18)

"The Grid Operator Passed A Crucial Test." "Through the hot weather and higher power use, prices rose across the state but Magness said ERCOT did not have to issue an emergency call for conservation. For many, the grid operator passed a crucial test." (Rye Druzin, "Texas Grid CEO Talks About Surviving Record Heat," [San Antonio Express-News](#), 9/17/18)

Bill Magness CEO Of ERCOT: "There were also a lot of days when the wind production was high when we needed it. So the various types of generation came through." (Rye Druzin, "Texas Grid CEO Talks About Surviving Record Heat," [San Antonio Express-News](#), 9/17/18)